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EPA

Process-Based Self-Assessment Tool for the Organic Chemical Industry

EPA Office of Compliance
Chemical Industry Branch

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Background: The organic chemical manufacturing industry is subject to numerous Federal regulations that have been enacted to protect human health and the environment. A complex web of requirements results from the fact that little correlation exists among regulations that target the same medium or activity. Industrial facilities are responsible for understanding and complying with these requirements. Historically, EPA has relied on a command and control approach to regulate industrial facilities, but now is combining its traditional method with innovative compliance assessment techniques such as self-assessments and facility management systems.

Many industrial facilities have found that using a complete facility Environmental Management System (EMS) approach uncovers cost effective solutions for tackling all the requirements as a whole instead of as individual components. In line with this discovery, EPA is encouraging self-assessments as part of a complete facility EMS approach to evaluate compliance with environmental regulations. A facility's drive to identify cheaper, more effective ways to achieve compliance is consistent with EPA's mission of clarifying and simplifying environmental regulatory control.

Purpose of document: This guide is a resource on Federal environmental regulations for small- to medium-sized organic chemical manufacturing facilities. The purpose of this manual is two-fold: 1) to provide a general approach for performing a multimedia self-assessment to evaluate compliance with environmental regulations, and 2) to provide industry-specific process and regulatory information necessary for conducting an assessment at an organic chemical manufacturing facility. The general approach section describes the steps for planning, conducting, and following up a multimedia self-assessment. Industry-specific information is given to supplement the generic self-assessment approach. This document describes processes found throughout the chemical manufacturing industry and identifies potential releases from each process and the environmental legislation associated with them. Additional regulatory requirements (such as applicability, exemptions, monitoring, record keeping, and reporting) potentially affecting organic chemical manufacturers are summarized by statute in the appendices.

Approach: The self-assessment tools and statutes are described in the following sections:

- **Module 1 - Process-Based Self-assessment Approach:** This module addresses process-based self-assessments and facility management systems. Because every organic chemical manufacturing facility is unique, a general assessment protocol is provided which can be adapted to an individual facility. The protocol gives the steps for completing a process-based self-assessment. These steps include defining the objectives and scope of the assessment, identifying the assessment team, compiling and evaluating background information, and preparing the assessment plan or strategy. Sample worksheets and templates are included to help develop and conduct the assessment.

- **Module 2 - Assessment Tool for Production Unit Processes:** This section identifies many of the common unit processes performed at organic chemical manufacturing facilities and lists possible releases and their related regulations. The unit processes include materials handling, reactions, heat transfer, and separation. The materials handling segment covers equipment such as pipes, pumps, and storage tanks while the reactions section describes various reactors. Heat transfer equipment such as heat exchangers, condensers, and evaporators are covered, along with separation techniques like distillation, ion exchange, filtration, drying, crystallization, centrifugation, and extraction.

- **Module 3 - Assessment Tool for Waste Treatment Operations:** This module describes waste treatment operations for air, water, and solid waste and identifies potential releases and associated regulatory concerns. Baghouses, wet scrubbers, thermal incinerators, flares, adsorption, boilers, cyclones, and electrostatic precipitators are discussed for air emissions. Primary, secondary, and tertiary wastewater treatment processes are summarized for water, and landfills, sludge incineration, halogen acid furnaces, and surface impoundments are described for solid waste.

- **Appendix A - Clean Air Act (CAA):** Clean Air Act Titles I, III, V, and VI are summarized in this appendix. Topics include NAAQS, NESHAPs, MACTs, permitting, chemical accident protection, and stratospheric ozone protection. This appendix also includes a section on assessment considerations that should be evaluated during the on-site facility assessment. Regulatory summaries are provided for performance standards, national emission standards, provisions for prevention of chemical accidents, and protection of stratospheric ozone.

- **Appendix B - Safe Drinking Water Act (SWDA):** This appendix describes the public water system program, underground injection control program, considerations for assessors, and regulatory requirements. Detailed descriptions of the regulatory requirements include national primary and secondary drinking water regulations which may be applicable to facilities that produce their own potable water and the underground injection control program.

- **Appendix C - Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):** This appendix summarizes the registration, reporting and packaging requirements for pesticides and identifies key site assessment considerations. FIFRA regulations described herein that may apply to organic chemical manufacturers include registering pesticides and producers of pesticides, labeling and packaging pesticides, submitting reports, and keeping records.

- **Appendix D - Resource Conservation and Recovery Act (RCRA):** The RCRA appendix delineates the requirements for generation, transportation, treatment, storage, and disposal of hazardous waste. Land disposal restrictions and underground storage tank regulations are also discussed. The appendix also contains a section detailing specific RCRA assessment considerations. RCRA legislation summarized for organic chemical manufacturers includes classification of generators; requirements for hazardous waste generators and transporters; regulations for hazardous waste treatment, storage, and disposal; and restrictions on land disposal and underground storage tanks.

- **Appendix E - Emergency Planning and Community Right-to-Know Act (EPCRA):** This appendix describes four regulatory programs applicable to organic chemical manufacturers: hazardous substance notification, emergency planning and notification, hazardous chemical reporting to the community, and toxic chemical release inventory. The section also suggests key areas to evaluate during compliance assessments. Regulatory summaries are included for the following: designation, notification, and reportable quantities of hazardous substances; emergency planning and notification; and reporting of hazardous chemicals and toxic chemical releases.

- **Appendix F - Clean Water Act (CWA):** This appendix includes effluent limit guidelines, categorical pretreatment standards, NPDES and pretreatment programs, effluent trading, spills and pollution prevention of oil and hazardous substances, and reportable quantities of hazardous substances. The appendix also includes a section on assessment considerations for water treatment and summaries of regulations pertaining to the pretreatment and discharge of effluent, discharge and pollution prevention of oil, and designation of hazardous substances and their reportable quantities. Legislation specific to wastewater discharges from the manufacture of organic chemicals, plastics, synthetic fibers (OCPSF), pesticides, pharmaceuticals, and gum and wood chemicals are also detailed.

- **Appendix G - Toxic Substances Control Act (TSCA):** The TSCA appendix explains the requirements behind testing, premanufacture notices, significant new use reporting, and specific hazardous substances and mixtures such as water treatment chemicals. Record keeping and reporting are delineated, including reporting requirements for significant adverse reactions, health and safety data, and substantial risks. Applicable regulations for exporters and importers, premanufacture notification, significant new uses, and protection against unreasonable risks are identified along with suggestions of areas to target in a self-assessment. Chemical-specific regulations are also described.

- **Appendix H - References and Resources:** This appendix includes references relating to process operations and waste treatment, pollution prevention, environmental regulations, inspection procedures, and other relevant materials. A list of resources for information about performing facility self-assessments is also given.

This manual may not include all the Federal environmental regulations that an organic chemical manufacturer must comply with, but it should serve as a starting point. Site assessors should be aware that, in many instances, State or local regulations may be more stringent than Federal requirements. Also, site-specific Federal, State, or local permits may contain additional requirements beyond those specified in the regulations. As such, part of a facility's EMS should be to check Federal, State, and local regulations regularly and keep abreast of pending legislation that may impact the facility.

DISCLAIMER

This document is intended as an aid to compliance with federal regulatory requirements. The document does not, however, substitute for EPA's regulations, nor is it a regulation itself. Thus, it cannot impose legally binding requirements on EPA, States, or the regulated community. Because circumstances vary, this document may not apply to a particular situation based on the circumstances, and facilities may be subject to requirements that are different from or in addition to those described in this document. EPA may change this guidance in the future, as appropriate.

NOTES TO USERS OF THIS DOCUMENT

This document contains both internal and external hyperlinks. Internal links, noted with magenta text, link the reader to the applicable section, figure, appendix, etc. being referenced. External links, noted with blue text, link the reader directly to a page on the Internet (for readers with access to the Internet), consistent with the information being described in this document. In addition, selecting the bookmark option from the top menu in the Adobe Acrobat Reader software provides the user with a point and click table of contents to simplify navigation in the document.

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MODULE 1. PROCESS-BASED SELF-ASSESSMENT APPROACH

1.1 INTRODUCTION

Historically, the U.S. Environmental Protection Agency (EPA) has relied on a command-and-control approach to environmental protection. Today, however, EPA is combining traditional enforcement activities with more innovative compliance approaches. EPA's Office of Compliance was established in 1994 to focus on sector-based compliance assistance-related activities. In line with this shift, EPA is encouraging the development of self-assessment programs at individual facilities. Such assessments can be a critical link to continuous environmental improvement and compliance.

Chemical manufacturing in the United States is a broad, complex industry. Unlike most industries, almost every organic chemical manufacturing facility is unique in the way that it processes raw materials into saleable products. Developing specific facility-assessment procedures that are accurate and consistent for the entire industry is difficult, if not impossible. This module does not attempt to present detailed procedures. Rather, it provides a general assessment protocol that can be implemented to suit the needs of individual organic chemical manufacturing facilities.

EPA developed this manual primarily for small to medium sized organic chemical manufacturing facilities. It promotes process-based self-assessments and provides an overview of the most common production unit operations, associated waste streams, and summaries of the regulations and statutes potentially applicable to those waste streams. Exhibit I-1 lists the basic elements to be addressed and evaluated in a multimedia, process-based assessment.

Assessment Tool for Production Unit Processes

The manual is not a facility-specific compliance guide but a starting point by which facilities can determine the regulations they must comply with. Facilities interested in developing or enhancing a comprehensive and ongoing assessment program can use this manual as a technical resource and tailor the information given to meet their specific needs.

Exhibit 1-1. Basic Elements to be Addressed and Evaluated in Multimedia Process-Based Assessments

Raw Materials Receiving Storage Mixing Transport	**Waste Handling** Generation Collection Storage Treatment Disposal
Manufacturing Process R&D Operations Laboratory Operations Production Unit Operations Product Storage Product Shipping	**Facility Operations** Operations and Maintenance Emergency Response

Module 1 outlines a process-based facility assessment approach specific to organic chemical manufacturing operations and addresses this as a component of facility management systems. Modules 2 and 3 focus on production unit processes and waste treatment operations, respectively, identifying specific emissions/releases and regulations that potentially apply to each unit process and treatment operation. Appendices A through G contain narrative summaries of environmental statutes and regulations applicable to the organic chemical manufacturing industry that can assist facility representatives in identifying specific regulatory requirements. The reader should note that this self-assessment tool is intended solely as guidance. Because applicable regulations are specific to each individual facility, the reader is advised to use the Federal Register or the Code of Federal Regulations to determine applicable requirements. In addition, Appendix H identifies a variety of references and resources that can facilitate the preparation, conduct, and follow-up associated with process-based self-assessments.

1.2 PROCESS-BASED SELF-ASSESSMENTS AND FACILITY MANAGEMENT SYSTEMS

Businesses are faced with the challenge of achieving economic sustainability and success while limiting the impact that their activities, products, or services may have on the environment and human health. Business leaders have recognized that the implementation of a comprehensive environmental management system (EMS) are usually more effective and less costly than reacting to environmental problems as they arise. The benefits of a proactive environmental program has been well documented. Generally, EMSs outline an organization’s structure, policies, practices, procedures, processes, and resources intended to help a facility achieve both its economic and environmental goals, without sacrificing one for the other.

Effective EMSs include a significant compliance assurance component designed to detect, correct and prevent violations. A second goal of an effective EMS should include components to ensure continuous environmental improvement through pollution prevention, employee involvement, community outreach, and additional environmental activities. Major components of an EMS include the following:

- Management commitment to environmental protection, supported by policies and procedures

- Compliance assurance through self-assessment, regulatory tracking, and environmental planning

- Implementation through a formal structure, internal and external communications, training, and education

- Measurement and evaluation

- Review and improvement by addressing "root causes" of any deficiencies

ISO 14001 is in the forefront of environmental management approaches designed to ensure environmentally responsible behavior worldwide. Specifically, ISO 14001, a series of environmentally-related standards and specifications, outlines five issues basic to EMSs:

(1) environmental policy,
(2) planning,
(3) implementation and operation,
(4) checking and corrective action, and
(5) management review.

A major component of an effective compliance assurance program includes periodic and routine self-assessment. The self-assessment activities include both formal and informal inspections and reviews of critical areas and programs by responsible individuals. A successful compliance assurance program goes beyond the traditional "find and fix" approach and should include training, measurement and tracking, distribution and communication, corrective action, and accountability. To ensure compliance, action points that require corrective action and accoutability should be set at limits tighter than the relevant regulations require. A self-assessment program plays an integral part in

Under EPA's Environmental Leadership Program (ELP), the Ciba-Geigy Corp. St. Gabriel Plant has endeavored to up and maintain an EMS and multi-media compliance assurance program that is second to none. A case study of Ciba's self-assessment program is provided in Section 1.6 of this Tool.

the cyclical nature of an EMS, in which planning, implementation, measurement, and review are an ongoing process.

1.3 PREPARING FOR A PROCESS-BASED SELF-ASSESSMENT

The various steps and the order of the steps to be taken in preparing for an assessment depend on the intended scope of the assessment. However, the following four steps are almost always required:

- Define the objective and scope of the assessment (e.g., whole facility, specific unit production operations, or a single media focused assessment)

- Identify evaluator or assessment team members (e.g., skills or expertise needed)

- Compile and evaluate background information (e.g., associated permits)

- Prepare assessment plan/strategy (e.g., order of actions to be taken).

While most process-based evaluations require that these four steps be performed, the order of these steps and the level of intensity at which they are conducted will vary depending on the nature and scope of the assessment. It is very important to keep the planning and preparation efforts in scale with the level of effort estimated for the assessment and to keep the planning process dynamic in response to information identified during preparation (e.g., the scope of the assessment might change after review of facility background information).

Define Objective and Scope

> *The process-based self-assessment approach is one of the tools available to a facility developing or enhancing a comprehensive compliance assurance program. The process-based self-assessment approach provides environmental managers with a link between identified wastestreams and Federal Regulatory Requirements.*

The scope of any assessment will often be based on areas of concern and, in some cases, on available resources. For example, the manufacture of a specific chemical might be identified as the source of chronic water compliance problems. In this instance, the assessment can focus entirely on the production units potentially contributing to the compliance problem. It is important to note that using the process-based assessment approach, the production of this one chemical or the generation of one particular wastestream might require an evaluation of ancillary process operations, such as raw material storage and handling or even wastestreams with maintenance activities.

Optimally, facilities should perform process-based self-assessments on a regular and periodic basis. They can be in the form of several routine, focused assessments performed independently, or in concert with a pollution prevention opportunity assessment or like project action, or as one comprehensive site assessment.

Identify Assessment Team

The expertise of an individual or team of individuals should be consistent with assessment objectives, the level of available resources, and the complexity of the facility being evaluated.

> *Individuals responsible for facility assessments should combine good assessment skills (including the ability to gather factual, consistent information through interviewing techniques and astute observations) with sound understanding of the processes and wastestreams under evaluation.*

If a team of individuals is used it should consist of people familiar with the following:

- Process chemistry
- Engineering
- Equipment
- Standard operation and maintenance procedures
- Applicable environmental regulatory requirements.

At larger facilities, a team of several people will be needed to ensure that all aspects of the facility can be adequately evaluated.

Once the team is formed, communication among members is of critical importance. The team leader should have overall responsibility for the assessment. This leader should maintain the focus of the evaluation and be able to encourage communication so that background information and knowledge are freely shared throughout the assessment process (i.e., pre-assessment, actual onsite and follow-up assessment activities). It is important that, for each area reviewed, at least one team member should be knowledgeable of the process operations for that area. However, the assessment team should try to allow a "fresh set of eyes" to evaluate a process. The person responsible for a particular operation might be the most knowledgeable of day-to-day operations but not be the best choice in identifying the significant compliance issues.

Compile/Evaluate Background Information

The assessment team will need to collect the documents, such as permits, manuals, regulations, and enforcement actions, required to perform the compliance evaluation. These documents provide the information needed to characterize facility processes (i.e., unit production operations) and identify known regulatory requirements.

While State and Federal regulations require facilities to maintain and have available many documents (e.g., shipping manifests, inspection records, discharge monitoring records) useful in evaluating facility processes, the following have been found helpful in identifying environmentally significant wastestreams:

- Mass balance worksheets (raw materials = input, waste/products = output)
- Facility map(s) showing buildings, unit production operations, and waste management areas/operations
- Piping and instrumentation diagrams (P&IDs)
- Facility water/wastewater balance information
- Plant sewer map(s) showing all building collection systems, laterals and sewer mains, and heat/material balance sheet(s) for the process(es)
- Operations manuals for specific processes
- *OSHA Process Safety Management Manual for Highly Hazardous Chemicals* (required by 29 CFR 1910.119)
- List of emission points or wastestreams that have required or voluntary monitoring (includes air, sewers, land, surface water)
- List of imported or exported feedstock, recyclables, and waste materials
- Excess air emissions reports
- Pre-manufacturing notices (PMNs)
- Hazardous waste biennial reports
- Hazardous waste minimization reports

- Life cycle analysis (products)

- Spill logs

- Process and operations reviews (PR/OPs) or hazard and operability studies (HAZOPs)

- Any startup, shutdown, or malfunction plan

- Pollution prevention plan

- Compliance Management System or EMS

- Background information relevant to the Toxic Substance Control Act (TSCA) (e.g., list of imported or exported feedstocks, recyclables, and waste materials)

- Past Emergency and Planning and Community Right-to-Know Act (EPCRA) Toxic Release Inventory (TRI) reports and TRI data summaries for similar facilities (i.e., similar facilities with dissimilar emissions might provide an indication of pollution reduction opportunities).

> *It may also be useful to contact industry-specific trade associations and state technical assistance providers to inquire about audit/compliance guides or training manuals that may be available for specific segments of the industry. Appendix H of this guide provides a comprehensive list of available resources/references that may be of assistance to organic chemical manufacturing facilities during the conduct of a process-based self-assessment. These references are organized topically for ease of use.*

Because one of the initial activities in a process-based self-assessment is an evaluation of facility industrial processes and supporting activities relevant to the wastes/by-products generated and actual/potential environmental impacts, an understanding of facility operations (unit production operations and associated waste management operations) is critical for a successful evaluation. Likewise, it is important to have at least a basic understanding of applicable, or potentially applicable, environmental regulations. Therefore, in addition to reviewing information relating to the primary evaluation objective(s), it is important to compile and review background information regarding facility operations and the facility's compliance history. It is also useful to prepare a pre-assessment worksheet that serves as an internal check on the performance of all necessary pre-evaluation activities and can be used as a planning tool for pre-assessment activities.

Prepare Assessment Plan/Strategy

The assessment plan/strategy ensures that team members are focused on the assessment objectives, activities, assignments, and schedules and that required information is obtained in an efficient and effective manner. The breadth and scope of the plan, which will vary as a function of the assessment objectives and the size and complexity of the facility, can be fairly simple or complex. Most plans will include these items:

> *To exemplify the potential value of preparing a mass balance, a chemical facility, as part of its EPCRA 313 report preparation, prepared a mass balance to approximate the emissions of chemicals from its processes. The facility was surprised to find that it was emitting more than 1 million pounds of methanol to the atmosphere via fugitive emissions. Upon recognition of this problem, the facility readily identified the source of its methanol emissions to be product separation centrifuges. Replacing these centrifuges with a single vacuum filtration unit reduced methanol emissions by more than 99.9 percent.*

- General background information on the facility, including processes and known regulatory issues
- Assessment objectives
- Assessment activities
- Team member responsibilities
- Tentative schedule for assessment activities, including dates for team meetings
- Health and safety plan, sampling plan, and/or quality assurance plan as appropriate.

Exhibit 1-2 provides an example of an assessment plan worksheet.

For complex facilities, the assessment plan can also prioritize the individual unit production operations used in the manufacturing processes and associated waste management operations to be evaluated. The suggested strategy for evaluating process operations is to conduct a material mass balance to follow material flows through the plant (i.e., raw materials to wastes/products). Material flows should be followed as far as possible, beginning with raw material receiving and storage and continuing with manufacturing, utilities and maintenance, product storage, and

Exhibit 1-2. Example Worksheet for a Process-Based Self-Assessment Plan

I. Scope and Objectives of the Assessment

II. Assessment Activities

- Actions to be taken
- Processes to be evaluated
- Individuals to be interviewed
- Additional documents to be reviewed
- Operations to be observed
- Additional resources needed

III. Evaluators (provide the names of all members with needed expertise)

- Team Leader
- Clean Air Act Knowledge
- Clean Water Act Knowledge
- Resource Conservation and Recovery Act Knowledge
- Safe Drinking Water Act Knowledge
- Emergency Planning and Community Right-to-Know Act Knowledge
- Federal Insecticide, Fungicide, and Rodenticide Act Knowledge
- Toxic Substance Control Act Knowledge
- Process Expertise
- Facility Maintenance Operation Expertise
- Other

IV. Schedule

- Team meetings
- Onsite evaluation
- Preliminary Report
- Final Report and Action Plan

V. Background Information Review (provide comments on reviewed materials)

- Shipping manifests
- Previous assessments or inspection reports
- Discharge monitoring reports
- Process block flow diagram(s)
- Environmental permits
- Operation and maintenance manuals
- Applicable regulations
- Mass balance worksheets
- Facility map(s)
- Piping and instrumentation diagrams
- Facility water/wastewater balance information
- Plant sewer map(s)
- Operations manuals for specific processes
- *OSHA Process Safety Management Manual for Highly Hazardous Chemicals*
- List of emission points or wastestreams that have required, or voluntary monitoring
- List of imported or exported feedstock, recyclables, and waste materials
- Excess air emissions reports
- Pre-manufacturing notices
- Hazardous waste biennial reports
- Hazardous waste minimization reports
- Life cycle analysis (products)
- Spill logs
- Process and operations reviews or hazard and operability studies
- Any startup, shutdown, or malfunction plan
- Pollution prevention plan
- Compliance Management System or Environmental Management System background information on previous EPCRA Toxic Release Inventory (TRI) reports and TRI data summaries for similar facilities

VI. Additional Plans and Preparation Needed

- Health and Safety Plan
- Sampling Plan
- Quality Assurance Plan

waste management. Additionally, the strategy should include an overall facility-wide component to evaluate potential site-wide environmental impacts or specific facility-wide regulatory requirements (e.g., storm water control). The strategy should be sufficiently flexible to allow for any needed mid-course corrections.

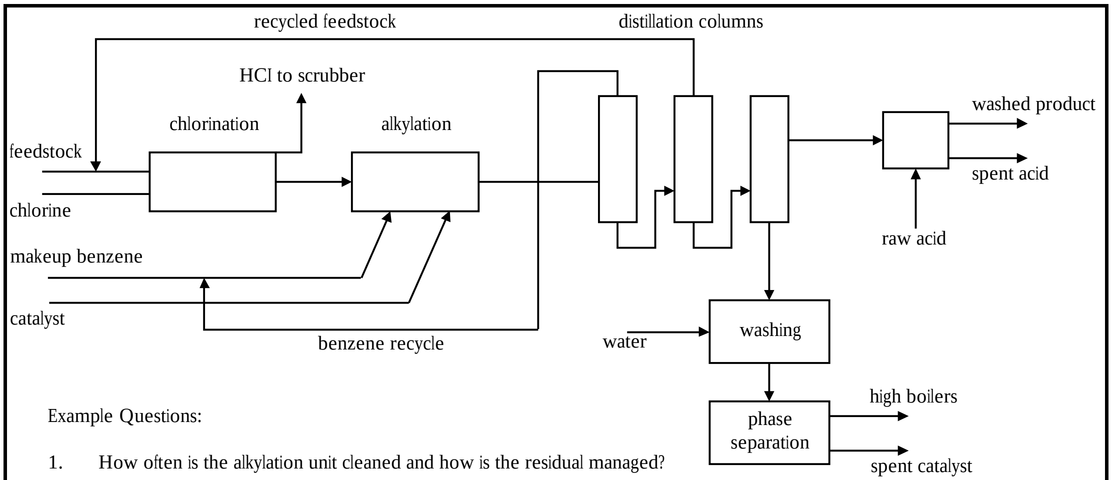
To ensure that the assessment team is familiar with the entire facility, a brief plant orientation tour could be performed, during which each process to be addressed is identified and responsibilities are assigned to each team member. The assessment team should specify any safety equipment (i.e., hearing protection, hard hats, safety boots, or respirators) needed during the assessment. Any areas of the plant, activities, or process or control equipment that present a personal hazard or require special training should be identified. Neither facility staff nor team members should be placed in danger in conducting the assessment.

Preparation of a facility model with plant processes, production unit operations, and associated waste management activities is often useful in clarifying the evaluation strategy. Depending on the scope and objectives of the evaluation and team experience, this model can be general or very detailed. A useful model form is a process block flow diagram. This model should represent documented facility conditions and Standard Operating Procedures (SOPs) that can be evaluated against actual site conditions and operations during the visual assessment phase. Exhibit 1-3 provides an example process model (i.e., a process block flow diagram) with issues to be addressed.

Depending on the assessment objectives and focus, there may be a need for sample collection. Samples might be needed for determining if a particular waste stream is a regulated waste, for identifying sources of contamination, or for demonstrating compliance as part of a specific program reporting requirement. If deemed necessary, the assessment team should ensure that the proper staff are available to collect samples and measures are in place for appropriate sample analysis (e.g., sample plan and quality assurance plan). One distinct advantage that a facility self-assessment has over regulatory inspections conducted by federal, state, or local officials is that it is not necessary for sampling/monitoring opportunities to be identified prior to the on-site assessment. Sampling/monitoring opportunities can be identified as part of the on-site assessment and then scheduled at a convenient time.

Finally, as part of assessment plan preparation, the team should determine if an evaluation checklist is needed for use during the site assessment and records review. The checklist can be general, used more as a means of tracking specific topics to address, or it can be detailed, identifying specific requirements and

Exhibit 1-3. Process Block Flow Diagram



Example Questions:

1. How often is the alkylation unit cleaned and how is the residual managed?

2. Can the amount of acid used for washing product be reduced thereby reducing the amount of spent acid?

3. Can the spent acid be recycled back to process? If not, is the spent acid a marketable product?

Other Concerns:

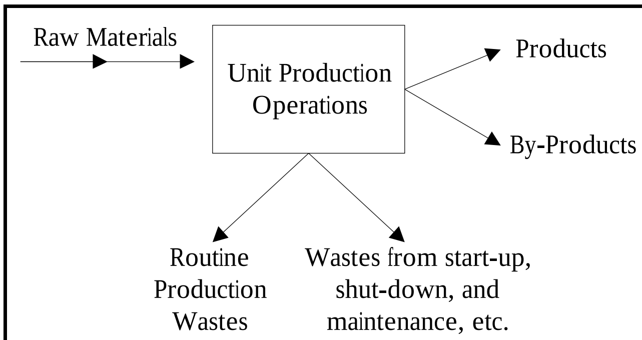
Often, documented operating procedures for a given process are different than the procedures identified by a plant supervisor, both of which may be different than what is actually occurring. Direct observation of actual procedures may be warranted in some instances.

process operations and listing information needs (e.g., regulatory thresholds, control options, or waste discharge standards). A checklist is particularly helpful where the facility is subject to many different regulations and permits.

1.4 CONDUCTING THE SELF-ASSESSMENT

The initial focus and a continuing activity throughout a process-based self-assessment is obtaining a comprehensive understanding of how facility manufacturing processes/facility activities relate to regulated wastes/activities and/or environ-mental issues. **Exhibit 1-4** shows the areas of focus for a process-based evaluation. The most in-depth application of this method is preparation of a material/mass balance for each production unit. This

Exhibit 1-4. Areas of Focus for a Process-Based Evaluation



Multi-media process-based assessments focus on a comprehensive understanding of the facility.

procedure identifies the raw materials entering the production unit and the products, intermediates, and all environmentally significant wastestreams exiting from the system. **Exhibit 1-5** identifies key points that could be addressed in a focused assessment.

Process-based evaluations, like most other types of assessment, can be separated into various onsite evaluation activities, including the following:

- Evaluation of facility processes
- Document review
- Visual assessment.

For simplicity, each of these steps is discussed below individually. However, a process-based assessment is dynamic, commingling these three elements based on site-specific considerations best identified during the actual assessment.

Evaluation of Facility Processes

Evaluation of facility processes is usually accomplished in two steps:

> *Given the amount of interaction among processes, intermediate streams, products, and utilities at organic chemical manufacturers, the need for effective communication among assessment team members is crucial to a successful process-based evaluation.*

1. In-depth discussion of specific plant processes with facility engineers (and other knowledgeable personnel) using process flow diagrams/P&IDs

2. "Fine tuning" of facility knowledge throughout the remaining part of the evaluation through document review, visual assessment, further discussions with facility personnel and assessment team interaction (for relatively simple facilities these steps can be combined).

> *To identify other evaluation procedures, it may be useful to consult outside sources of information. For example, consultation with trade associations may provide insight into the latest pollution prevention opportunities for a given process operation.*

The facility evaluation can be conducted by a complete team or by smaller groups, depending on personnel, assessment objectives, and available resources. The assessment team should ensure that knowledgeable personnel are being interviewed about plant opertations. These personnel are usually the

Exhibit 1-5. Key Points an Evaluator Could Verify for Clean Water Act Compliance

Are the facility's operations properly regulated by a permit?

Are the facility's monitoring results representative of a facility's operations?

- Are the monitoring procedures consistent with 40 CFR Part 136 procedures?
- Have analytical results reported as "Not Detected" been analyzed down to the requisite quantification level?

Have there been changes in the facility's operations?

- If so, was proper notification given to permitting the authority?

Are the flows reported by the facility reasonable?

- Are the reported process and non-process flows accurate?
- Are sound water conservation practices employed throughout the facility, as applicable?
- Are the flows observed consistent with the values used to calculate permit limits?

Are proper Operations and Maintenance (O&M) practices and good housekeeping practices in place to ensure compliance and consistent treatment plant performance?

- Do backup systems or procedures exist for the period when system O&M is being conducted?
- Does the facility have adequate staff to operate and maintain the treatment system?
- Do areas that have a high potential for spills or leaks have spill containment?
- Does the facility need a spill prevention, containment, and countermeasure (SPCC) plan?
- If so, is an SPCC plan on file and is it adequate to meet facility needs?
- Does the facility have any other spill or slug control plans?

Has the facility had any spills of oil or other hazardous substances, and if so, have the following questions been answered:

- What was the material?
- What was the quantity of this material?
- What was the reportable quantity?
- What was the response for containment, cleanup, and notification?
- What were the health and safety issues?
- What is the facility's plan to prevent recurrence?

production unit managers, shift supervisors, production engineers, and unit operators, but they can include environmental staff.

Interview Process. The process evaluation usually begins with interviews of production unit managers, shift supervisors, production engineers, and unit operators. The assessment team members may be knowledgeable about certain areas of the facility and can provide some of the necessary information, but their knowledge should not preclude the assessment team from questioning production unit managers and production engineers on their areas of expertise. Often, the fresh perspective of the assessment team can provide new insight into compliance assurance programs and pollution prevention opportunities. The information obtained during the interview process is later verified by documentation review and visual assessment.

Interview Topics. The initial process interviews are best done in a quiet office or conference room, not in the noisy process area. Block process flow and/or P&ID diagrams are reviewed, starting with raw materials received and continuing with material handling, processing, product/by-product handling, and waste generation to confirm all information and ensure that no products, by-products, co-products, residues, or waste streams have been omitted, eliminated, or misidentified. The generic/specific process information compiled during background information compilation/evaluation should be used during interviews and plant tours to ensure that all facets of the process and resulting waste streams are discussed.

Products and wastestreams under assessment should include all emissions to the atmosphere, liquid discharges, and solid materials generated by or removed from the production unit operations. Throughout this manual, the terms product, co-product, by-product, or waste are used to mean all physical states (i.e., gaseous, liquid, and solid) that apply. This is particularly important to note in discussions on the significant releases and associated regulations for different production units and waste treatment operations discussed in Modules 2 and 3. In this manual, “waste” will be used to describe gaseous, liquid, or solid materials for reuse, treatment, or disposal.

Itemized below are some often overlooked issues/processes and activities:

- Recyclable material streams might be wastes even though they are not disposed of.

- Startup, shutdown, or turnaround operations might generate wastestreams or off-spec products that become wastestreams or off-spec products that become wastes.

- Process equipment cleaning operations might generate cleaning wastes and spent unit production components (e.g., distillation column packing materials).

- Process upsets could result in different waste characteristics than typical wastes generated.

- Facility support activities, such as maintenance, research facilities, and laboratories, might not be considered facility processes, but they usually generate/manage regulated wastes and could be included as part of facility operations evaluations.

The condition and age of plant sewers are of environmental interest, especially at older plants. Leaking sewers can be contaminating the underlying groundwater and can constitute illegal waste disposal. Conversely, infiltration/inflow into old sewers can dilute concentration and confuse compliance status, increase treatment costs, and/or reduce reclamation opportunities. Wastestreams discharged to non-municipal sewer systems can be subject to RCRA hazardous waste and land disposal restriction determinations. Consequently, questions should be asked about sewered wastes, sewer inspection and repair programs, and inspection/repair records.

- Chemical storage areas/mixing rooms often contain many types of substances/raw materials used onsite (material safety data sheets [MSDS] contain valuable information regarding chemicals used onsite) and can be the source of spills and releases.

- Facility utilities, such as boilers, power generators, and water treatment systems, often generate regulated wastes.

- Contractor activities, such as construction/demolition, or maintenance, can result in environmental/noncompliance problems.

The interview process can be time consuming, but needs to be sufficiently detailed and thorough so that all environmentally significant wastestreams are identified within the objectives and scope of the assessment. When the assessment team determines that the unit production operations are adequately understood, the wastestreams have been identified, and waste management practices have been discussed, it is usually time to proceed to other areas of inquiry.

One activity within a process-based assessment should be to develop waste worksheets for wastestreams identified during the assessment. Exhibit 1-6 provides a sample worksheet. These worksheets can be refined through the assessment process.

Each wastestream(s) can then be identified on the model process block flow diagram to provide a comprehensive depiction of facility waste generation and management. The assessment team will need to note that some wastestreams (e.g., gaseous emissions) can be treated at the source, while other wastes (e.g., liquid discharges) can be collected from sources throughout the facility for treatment by one centralized onsite treatment system.

Two statutes, EPCRA and TSCA, are primarily information reporting and record keeping laws. Evaluation of compliance with these statutes can be accomplished almost entirely through the document review process. Specific assessment considerations for organic chemical manufacturers for EPCRA and TSCA are identified in Appendix E and Appendix G, respectively.

Document Review

Document review can be used to supplement process knowledge obtained during the in-depth evaluation of facility. Through this review, the assessment team can verify previously provided information on facility operations and identify actual or potential environmental problems. More specifically, the assessment team may use the documents to verify and quantify the following:

- Wastestreams recycled back to process
- Wastestreams released to the environment (e.g., EPCRA data)
- Wastestreams collected for onsite/offsite treatment/disposal (e.g., Discharge Monitoring Report (DMR))

Document review can also be used to verify compliance with monitoring, record keeping, and reporting requirements as well as to ensure that the records are consistent with actual facility operations.

Visual Assessment

Verifying process information generally involves inspecting and further discussing actual facility operations and waste management areas to ensure nothing has been overlooked during interviews or omitted from the flow diagrams. For facilities that

Exhibit 1-6. Sample Emission Worksheet

EMISSION WORKSHEET NO. 001

1. NAME OF WASTE: Spent aluminum chloride catalyst.

2. TYPE OF WASTE: Liquid waste (by-product sales).

3. PROCESS THAT GENERATED THE WASTE: Alkylation reaction of chlorinated paraffins and benzene.

4. AMOUNT AND FREQUENCY OF WASTE GENERATION: Approximately 6,000 gallons a day, generated continuously during process operations. There is very little deviation in the volume generated.

5. ONSITE MANAGEMENT PRACTICES FOR THE WASTE: Distillation bottoms are water washed and then phase separated into aluminum chloride liquor and a hydrocarbon phase. The aluminum chloride liquor is activated carbon filtered and shipped out to customers in tank trucks. See aluminum chloride activated carbon emission worksheet (No. XX) for waste description.

   Tank truck drivers are instructed to inspect each load of liquor for an oil layer prior to departure. When identified, these loads are discharged into a 20,000 gallon holding pit and then bled into the plant wastewater treatment system.

6. OFFSITE MANAGEMENT PRACTICES FOR THE WASTE: Filtered aluminum chloride liquor (32° Bè) is loaded into tank cars and sent to a customer for a component in roofing granules.

7. LENGTH OF TIME THIS WASTE HAS BEEN GENERATED: This waste has been generated since plant operations began in 1978.

8. CHANGES IN THE GENERATION OF THIS WASTE: In 1988, the washing process was modified to strengthen the solution to generate a 32° Bè aluminum chloride liquor suitable for resale. Prior to that time, a more diluted liquor was sent to the onsite wastewater treatment system and then discharged to the local POTW.

9. APPLICABLE REGULATORY REQUIREMENTS FOR THIS WASTE: As a by-product, this stream is not subject to regulatory requirements. During upsets (i.e., when the liquor contains visible amounts of oil), this waste is commingled with other plant wastewater and is subject to the wastewater discharge permit conditions, as issued by the municipal wastewater treatment plant (WWTP). One special permit condition exists for this waste. Specifically, the WWTP is to be notified in advance, and approval given, prior to bleeding the aluminum chloride solution into the onsite wastewater treatment system.

10. HOW FACILITY IDENTIFIED APPLICABLE REGULATIONS: The WWTP performed an inspection of the plant in 1993 and identified this wastestream as an infrequent discharge. The latest permit from the city, issued in 1995, includes the requirement to notify prior to discharging waste liquor.

11. MONITORING DATA FOR THIS WASTE: The customer that purchases this liquor requires that a semiannual sample be collected and analyzed for specific gravity, total organic carbon (TOC) and metals. Results of these analyses are kept in the waste monitoring data files.

12. CONSISTENCY IN APPEARANCE OF THIS WASTE: This waste has a consistent appearance. Occasionally (i.e., about twice a year), the liquor will have an oily sheen, as discussed in item 5 above.

manufacture only one or two chemicals, the visual assessment can be performed starting at raw materials receiving and proceeding to product shipping and waste treatment/disposal. However, for more complex integrated facilities, the delineation may not be as simple. In these instances, it is still important to maintain an organized process for progressing through facility operations, although it may be specific to a product or product line rather than on a facility-wide basis. Model process block flow diagrams, developed during the assessment planning phase, are ideal for guiding the site assessment. The information should be verified and updated as necessary during the visual assessment. At each specific area, the evaluation team should verify the flow diagram and the process description and should be sure that all incoming materials are properly accounted for as products, intermediates, or wastes (e.g., gas, liquid, solid). Photographs can be valuable for documenting plant operations, and for use in making comparisons during future facility evaluations.

Continuous or Routine Process Operations. For each process operation, gaseous (both vented and fugitive emissions), liquid, and solid waste generation issues should be evaluated. The assessment team should be alert for operations not identified on existing documentation. In particular, all wastestream(s) should be properly identified and characterized. It is possible that wastestreams may have been inadvertently omitted or mislabeled. This is particularly true for wastes generated intermittently (e.g., distillation column bottoms or reactor vessel cleanouts). While in the process area, the assessment team should look at each unit operation shown on process flow diagram(s) to verify or identify points of wastestream generation, including the location of all pits, sumps, piping, vents, and stacks.

The site assessment should include an evaluation of ancillary process areas that may also be subject to environmental regulation or contribute to a environmental compliance problem. These include plant utilities (e.g., water treatment, boilers, and cooling towers), research and development operations, pilot plants, laboratory bench-scale operations, and technical services.

Periodic or Non-routine Process Operations. While in process areas, it is important for the assessment team to ask operators about the types and frequency of upsets and how materials are managed in those situations.

Team members need to be constantly alert for operations, processes, materials, tanks, and waste management activities not previously identified or discussed. These could also include any unusual, unmarked, or unexplained drums, tanks, piping, or ventilation, which could reveal process or waste handling activities not previously discussed. If discovered, the function and purpose should be determined.

Waste Management Operations. All waste treatment systems associated with process or maintenance wastes (gas, liquid, and solid) should be evaluated. Treatment system operators should be asked about upsets, influent and upstream monitoring, alarm locations and types, by-pass capabilities and monitoring, and notification procedures conducted by production staff during periods of upset or malfunction. (The degree to which there is effective communication among the various facility personnel can suggest the likelihood of treatment system upsets.)

Property Line/Storage Areas. The visual assessment should also include a property line assessment to look for stressed vegetation, potentially unregulated emissions, sensory concerns (e.g., visual, audible, or olfactory), and emissions from other facilities that can be affecting the facility under review. Additionally, lagoons, pits, leaks from piping, and materials storage tanks should be included in the property line assessment. This information should be evaluated to determine the applicability of any regulations. Identified below are indicators of potential releases:

- Rusty or deformed drums
- Puddles under and around units
- Leaking valves on tanks
- Strong odors
- Dead vegetation
- Erosion.

Sampling/Monitoring

As with other assessments, sampling or onsite monitoring concurrent with the self-assessment can be useful in correlating information about facility operations, waste generation, and waste management activities. Exhibit 1-7 lists some of the results that may be achieved through sampling and monitoring. The identification of clear objectives, adequate design of a sampling plan, and Quality Assurance/Quality Control (QA/QC) all are dependent upon the nature and scope of the

Laboratories should be aware that each regulatory program specifies applicable sampling and analysis procedures such as:

- *RCRA uses "SW846 Methods,"*
- *CWA uses "methods as specified in 40 CFR Part 136,"*
- *TSCA uses methods specified in 40 CFR Parts 792-799.*

A common phrase on laboratory analytical reports, "samples analyzed using EPA approved methods," does not necessarily demonstrate compliance.

assessment. The assessment team should determine if the routine sampling/monitoring done to fulfill regulatory requirements (i.e., permit requirements , sample collection, transport, and analyses methods) will be part of the multi-media, process-based self-assessment and/or if additional sampling/monitoring will be conducted. While regulatory agencies sometimes collect samples to evaluate compliance, sampling/monitoring as part of a self-assessment can be used to gather information for "beyond compliance" activities, such as to identify sources of contaminants that could lead to process improvements or activities for pollution prevention opportunities. One component of proper sampling/monitoring techniques often overlooked is the calibration of equipment, including documenting the calibration. Monitoring conducted with uncalibrated equipment is invalid for compliance demonstrations. Monitoring may also be invalid if it is conducted with calibrated equipment but no documentation of the calibration exists.

1.5 ASSESSMENT FOLLOW-UP

Similar to regulatory inspectors or a corporate auditing team, the team conducting a process-based self-assessment should prepare a report documenting the findings of the assessment. The team should include as much detail as is reasonably practicable. The report should be addressed to facility management and should also be distributed to supervisors responsible for the processes and areas evaluated, including both unit production operations and waste treatment operations.

Exhibit 1-8. Example Tasks Achieved Through Sampling and Monitoring

Sampling or monitoring may be necessary to do the following:

- Identify the source of fugitive emissions
- Document hazardous waste classifications
- Determine product yield and efficiency
- Identify toxic and hazardous reaction by-products
- Demonstrate compliance with permit limitations
- Identify the contents of unmarked drums and containers
- Identify the makeup of spills and stains
- Classify unpermitted emissions.

The report should include recommendations that address the report findings, prioritized for rapid response to the most urgent needs. Either as part of the report or as immediate follow-up to the report, the team leader should get management to identify a responsible person for each area of concern identified and dates for resolution of each item. Where possible, the report should also identify the root cause for any identified problems. This is useful if similar problems are identified by regulatory inspectors who want an immediate explanation. The ability of facility personnel to provide a ready explanation of the cause of any identified problem and actions taken to correct the problem may help avert enforcement action by the regulatory agency.

Upon the resolution of problems, the facility should include documentation of corrective steps taken, along with the self-assessment report to demonstrate that the facility addressed identified areas of concern in a timely manner. Resolution of the problems identified and documentation of this resolution are important.

On December 18, 1995, the EPA Assistant Administrator for Enforcement and Compliance Assurance signed a policy that affects companies which voluntarily identify, disclose, and promptly correct violations. For such companies, EPA will substantially reduce or eliminate the civil penalties it would normally seek (60 *Federal Register* 66706, December 22, 1995). Effective January 28, 1996, EPA will not seek gravity-based penalties for violations discovered either through environmental audits or the use of compliance systems to prevent, detect, and correct violations provided that all the conditions of the policy are met. This policy does not apply to violations that:

- involve an imminent and substantial endangerment or serious actual harm to public health or the environment
- are repeat violations that have occurred over the past 3 years, or
- are a pattern of Federal, State, or local violations that have occurred within the past 5 years.

EPA reserves the right to collect the economic benefit of noncompliance (i.e., the amount gained as a result of not complying with environmental requirements). In instances where the facility cannot fully meet the conditions of the policy, but where the violations have been voluntarily discovered, promptly disclosed, and corrected, EPA will reduce the gravity-based penalty by 75 percent. EPA can assess penalties reflecting the economic benefit gained while in violation. Additionally, EPA will not recommend criminal prosecution for violations disclosed through voluntary environmental audits. This policy states that EPA will continue with its practice of not requesting a voluntary audit report in order to initiate a civil or criminal investigation.

Finally, when addressing areas of concern, the facility should consider pollution prevention options to resolve the problem. Pollution prevention solutions may be identified by facility personnel, or the facility may want to contact trade associations, industry experts, or state technical assistance provide for assistance. Appendix H identifies some of the pollution prevention resources applicable to the organic chemical manufacturing industry.

1.6 ENVIRONMENTAL MANAGEMENT SYSTEM CASE STUDY: CIBA-GEIGY CORPORATION

Many of the leading businesses, especially within the chemical industry, implement EMSs as a component of the facility's overall management practices to ensure compliance with environmental regulations. To foster implementation of innovative, effective EMSs and to recognize organizations confirmed to be implementing such systems, EPA announced a new initiative entitled the Environmental Leadership Program (ELP) in the *Federal Register* on June 21, 1994.

The first phase of developing and implementing the new program was to conduct a series of ELP pilot projects, to help define "environmental leadership" and determine the components of the long-term leadership program. Through the ELP pilots, EPA, State agencies, and certain facilities have worked together to demonstrate and evaluate systems used to assure compliance within the existing regulatory framework, and environmental initiatives which go beyond minimum requirements. Among the 12 proposals selected for the ELP pilot was one submitted by the Ciba-Geigy Corporation, St. Gabriel Plant, a manufacturer of organic chemicals. The Ciba St. Gabriel Plant proposal demonstrates environmental leadership through environmental management systems including the use of formal and informal self-assessments.

By studying Ciba St. Gabriel's environmental management systems, multimedia compliance assurance and community outreach/employee involvement programs, the ELP Team has worked to identify the essential program elements that constitute model programs. These models can be adopted and implemented by other facilities and agencies to assure compliance with regulations and company policies, and promote continual improvement in overall environmental performance.

Ciba St. Gabriel's philosophy is that to ensure compliance with regulatory requirements, a facility must develop internal programs that go beyond environmental regulations. The Ciba St. Gabriel facility implements both management systems and multimedia compliance assessments. Formal audits ensure compliance with environmental requirements as well as reveal opportunities to go beyond compliance. In addition, Ciba St. Gabriel believes that to be an "environmental leader," a model facility must maintain periodic and routine self-assessment, implemented by committed employees. Ciba St.

Gabriel's compliance assurance system contains multiple self-assessment elements involving a variety of groups at all levels in the site organization.

The following templates have been developed by Ciba St. Gabriel. These templates represent a general self-assessment and management and compliance audit approach that can be applied to a variety of process and activity assessments. In addition, an example application is also included to demonstrate how the general template has been applied to a specific Ciba St. Gabriel activity: waste container inspections.

GENERAL SELF-ASSESSMENT TEMPLATE

Introduction

A self assessment system must include the following aspects in order to:
- be effective;
- ensure compliance; and
- go beyond compliance

Reviews and Inspections

A self-assessment program must consist of both informal & formal reviews & inspection

Of......	By......
DATA	SELF/CO-WORKERS
PROCESS/OPERATIONS	SUPERVISION
OFF-SITE STORAGE FIRMS	NON-SUPERVISORY STAFF GROUPS

Common Self-Assessment Aspects

Elements	
Training	Training on regulatory requirements and self-assessment goals & techniques
Communication	Communication of problems and successes and associated improvements or changes
Feedback	Feedback to management of problems & incorporation into training
Measurement	The item(s) being assessed must be measured in a systematic and quantifiable manner, as applicable
Tracking	The item(s) being measured must be tracked, usually by a plant-site expert
Distribution	Timely distribution of tracking report, including problems, to both management and users
Corrective Action	Immediate correction of problems or development of an action plan that addresses the problems
Accountability	Accountability for results and improvement may be tied to performance process
Action Level	Setting internal action limits at levels that are more conservative than regulations require
Application	Application of specific findings among units and across facility

EXAMPLE TEMPLATE FOR MANAGEMENT & COMPLIANCE AUDIT

Introduction

To be effective, a management and compliance audit, as opposed to an inspection, must have some key components.

Key Components

Use a "Fresh Pair of Eyes"	While other self-assessment elements may be done "internally" by those responsible for compliance, the audit should be "external" from the direct line of responsibility. Examples are a corporate group, such as TRAC [Toxicology and Regulatory Auditing and Compliance]; another site within the company, or a third party, such as an independent ISO [International Standards Organization] auditor.
Systematic Review	Review compliance to both environmental regulatory requirements and corporate policy
“Root Cause” Determination	Investigate and determine cause of a compliance deficiency and attempt to isolate the cause (i.e., training, lack of appropriate management system, unclear responsibilities)
Audit Systems	An audit should go further than compliance. It must look at management systems, including internal policies and procedures. The audit should verify that: 1) systems are in place, 2) systems are understood, 3) systems are implemented, and 4) internal policies & procedures are being followed
Action Plan	Generate an action plan with dates and responsibilities. The action plan should be maintained until all items are complete. The action plan should periodically be reviewed by management.
Apply Specific Findings Broadly	Most, if not all, specific findings should be applied to similar situations in the facility. A problem that occurs in one area is likely to occur in other areas also. For example, if the audit discovers that training records are not readily accessible in one area, at least three items should appear on the action plan. First, the area involved should correct the problem so records are readily accessible. Second, other similar areas in the plant should review their records to verify they are accessible. Third, the management system for training records should be reviewed.
Focus the Audit	Focus on new areas of regulations, areas with rapidly changing regulations, or areas of past problems. For example, 1996 may be a good year to focus on Air with the new Title V regulations coming into effect, which means systems are being developed, or changed in order to implement the Title V program.
	Results of the audit must be made available not only throughout the facility, but throughout the corporation, including top management.

EXAMPLE TEMPLATE APPLIED TO WASTE CONTAINER INSPECTIONS

Introduction

Ciba has a mature waste container inspection program. It includes a formal written procedure and a weekly inspection of all containers and storage areas in the plant by waste management specialists.

	Of.....	By.....
Informal Reviews and Inspections	CONTAINERS	SHIFT CO-WORKERS AND SUPERVISORS (PERIODICALLY)
Formal Reviews and Inspections	CONTAINERS	UNIT WASTE COORDINATOR (DAILY ROUNDS) ENVIRONMENTAL GROUP (WEEKLY)

Self-Assessment Aspects for the Container Management Program

Element	Applied to Container Management
Training	Training requirements are covered in the Plant Environmental Procedure L-7 “Container Management.” The purpose of this management procedure is to ensure compliance with the container management requirements. This training is required for all St. Gabriel personnel.
Communication	Container management issues are communicated among areas so all can learn from other events. Some are reviewed in safety meetings or training sessions as applicable.
Feedback	
Measurement	Containers are reviewed against a checklist of items. Deficiencies noted by the Environmental Group are reported by area and by general cause which may include: ▸ labeling ▸ dating ▸ aisle space
Tracking	The items measured are tracked by the environmental group using spreadsheets and graphs, charts, and statistics. The results are compared between units and to past years' data.
Distribution	The tracking report is distributed weekly to all areas and plant supervisory personnel.
Corrective Action	Any corrective action required is taken immediately. The “inspector” notifies the unit which immediately takes actions to correct the deficiencies. Items that need long-term plans are tracked to completion.
Accountability	Reporting of deficiencies throughout the plant plus emphasis placed by management on inspection results provide individual and unit accountability. Container management may be added as an annual performance objective for some people with improvement measured.

Self-Assessment Aspects for the Container Management Program (Continued)

Element	
Action Level	The report itself tracks deficiencies, using an extremely conservative approach. For example, if a label is fading to the point where any inspector might question if it is completely legible, it would be counted as a deficiency. In addition, items that are not deficiencies but may need attention are listed in the report. For example, a damaged label, a label that was starting to fade, or a drum stored for 70 days in a 90 day storage area may be listed in the report. Including such items in the report will highlight the need to take action to prevent deficiencies.
Application	Plant wide tracking and communication helps ensure that if a deficiency occurs in one area, it is communicated to other areas, so that trends and problem areas can be identified and preventative measures taken before a deficiency occurs.

MODULE 2. ASSESSMENT TOOL FOR PRODUCTION UNIT PROCESSES

INTRODUCTION

This section describes production unit processes that are common to the organic chemical manufacturing industry. Specific unit processes are classified as materials handling, reactions, heat transfer, or separation operations.

This module includes summaries on the following production unit processes:

2.1 Materials Handling
- Pipes, Valves and Connections
- Pumps, Compressors and Steam Jet Ejectors
- Storage Tanks, Containers, and Vessels
- Blending and Milling

2.2 Reactions
- Batch, Continuous and Fluidized Bed Reactors

2.3 Heat Transfer
- Heat Exchangers
- Condensers
- Evaporators

2.4 Separation
- Distillation
- Ion Exchange
- Filtration
- Drying
- Crystallization
- Centrifugation
- Extraction

Potential significant releases/emissions are identified for each of the common production unit processes identified above. Potentially applicable environmental regulations are indicated, by CFR Part and Subpart, for each corresponding release/emission type. The universe of media-specific regulations potentially applicable to organic chemical manufacturing facilities are identified in Exhibit 2-1, the Clean Air Act (CAA); Exhibit 2-2, the Clean Water Act (CWA), and Exhibit 2-3, the Resource Conservation and Recovery Act (RCRA). Note that these potentially applicable regulations do not specify State requirements that may be applicable (and more stringent) to an individual facility, nor do they cite the permitting regulations under which EPA or States issue facility specific permits.

<u>Assessment Tool for Production Unit Processes</u>

Exhibit 2-1
Potentially Applicable CAA Regulations

Subpart D	Steam Generators
Subpart G	Nitric Acid Plants
Subpart H	Sulfuric Acid Plants
Subpart K	Petroleum Storage Vessels
Subpart GG	Stationary Gas Turbines
Subpart VV	VOC Equipment Leaks
Subpart III	Air Oxidation Processes VOC Emissions
Subpart NNN	Distillation Processes VOC Emissions
Subpart RRR	Reactor Processes VOC Emissions
Part 61 - Hazard	
Subpart F	Vinyl Chloride
Subpart J	Equipment Leaks of Benzene
Subpart M	Asbestos
Subpart V	Equipment Leaks
Subpart Y	Benzene Emissions from Benzene Storage Vessels
Subpart BB	Benzene Emissions from Benzene Transfers
Subpart F	Benzene Waste Operations
Part 63 - Source	
Subpart F	Organic HAPs from Synthetic Organic Chemical Manufacturing Industry (SOCMI)
Subpart G	Organic HAPs from SOCMI Process Vents, Storage Vessels, Transfer Operations, and Wastewater
Subpart H	Organic HAPs for Equipment Leaks
Subpart I	Organic HAPs for Equipment Leaks for Certain Processes (Negotiated Regulation)
Subpart Q	HAPs for Industrial Process Cooling Towers

Facilities should refer to their State environmental agency to identify any differences between State and Federal program requirements.

Exhibit 2-2
Potentially Applicable CWA Regulations

Effluent Limitations Guidelines and Standards	
40 CFR Part 414	Organic Chemicals Plastics and Synthetic Fibers
40 CFR Part 439	Pharmaceuticals
40 CFR Part 454	Gum and Wood Chemicals
40 CFR Part 455	Pesticide Chemicals

Exhibit 2-3
Potentially Applicable RCRA Regulations

40 CFR Part 261	Hazardous Waste Identification
40 CFR Part 262	Hazardous Waste Generators
40 CFR Part 263	Hazardous Waste Transporters
40 CFR Part 264	Hazardous Waste Treatment, Storage, and Disposal
40 CFR Part 268	Land Disposal Restrictions
40 CFR Part 280	Underground Storage Tanks

Federal and State permitting regulations and requirements are described in the following sections of 40 CFR:

Statute	Permitting Citation
CAA	Parts 70-72
CWA	Parts 122-125 and 403
RCRA	Parts 270-272

Also note that the potentially applicable regulations cited exclude several regulations that are specific to a very defined subset of the chemical manufacturing industry (i.e., regulations are based on specific processes or products). (See Exhibit 2-4.) Facilities that may fit into any of these categories should refer to the specific regulatory citation to assess specific requirements.

Exhibit 2-4
Additional Regulations That May Apply

CAA Part 60	
Subpart DDD	Standards of Performance for VOC Emissions from the Polymer Manufacturing Industry
CAA Part 60	
Subpart HHH	Standards of Performance for Synthetic Fiber Production Facilities
CAA Part 63	
Subpart W	National Emission Standards for Hazardous Air Pollutants for Epoxy Resins Production and Non-Nylon Polyamides Production
RCRA	
Part 266 Subpart H	Hazardous Waste Burned in Boilers and Industrial Furnaces
Part 279	Standards for the Management of Used Oil
CWA	
Part 415	Inorganic Chemicals
Part 417	Soaps and Detergents
Part 428	Rubber Manufacturing
Part 443	Paving and Roofing Materials
Part 446	Paint Formulating
Part 447	Ink Formulating
Part 457	Explosives Manufacturing
Part 463	Plastics, Molding and Forming

Additional environmental statutes (i.e., the Safe Drinking Water Act (SDWA), Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Emergency Planning and Community Right-to-Know Act (EPCRA), and Toxic Substances Control Act (TSCA)) that apply to organic chemical manufacturing facilities are not summarized or referenced in Module 2 since regulations developed under these statutes are not unit process or waste treatment type specific. Regulations developed pursuant to these statutes that may apply to organic chemical manufacturing facilities are summarized in the Appendices.

2.1 MATERIALS HANDLING

2.1.1 PIPES, VALVES, AND CONNECTIONS

Joint and Valve Head Leaks

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of volatile HAPs
Part 61, Subpart BB for benzene emissions from benzene transfer operations
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart H for hazardous organic NESHAPs from equipment leaks

The most common source of leaks of both gaseous and liquid material occurs at all joints and at valve heads during routine movement of gaseous, liquid or even solid materials. These leaks, particularly for gases, may be too small, or too remotely located, for easy location and repair.

Many plant operations have traditionally accepted "small" leaks as the customary way of operating. Current thinking is to require routine monitoring, such as with field meters or even by dogs, to detect leaking equipment/components and to limit the allowable rate of loss by the use of local secondary containment such as double glands or housings on valves.

Sampling valves may yield additional waste material (gas, liquid or solid) before and after sampling as a means of assuring that material is representative or resulting from pressure changes; the impact of such losses can usually be minimized by collecting the material for reuse or redesigning the sampling system to minimize or eliminate the need for such waste.

Leakage due to incipient failure of piping is usually addressed by plant personnel before it becomes catastrophic, and double walled piping is now required in certain applications to minimize ground and air contamination. Leaks in pipes, at flanges, and at valves are most likely to be discovered during the startup or shutdown of process equipment due to changes in pressure, vibration, and thermal changes.

Equipment Cleanout

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., Part 414 for organic chemicals)

Material trapped in valves and pipes when dismantling equipment for maintenance should be removed by purging and/or decontamination. The use of air or water to accomplish this purging can produce airborne streams and wastewater that escape with no control or contribute to fluctuations in wastewater characteristics.

Maintenance Operations

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart H for hazardous organic NESHAPs for equipment leaks
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., Part 414 for organic chemicals)

Maintenance operations also can generate gaseous, waterborne and solid emissions expected from maintenance activities such as paint stripping, sandblasting, painting, welding and cutting operations, and lubrication. Maintenance operations may result in the disposal of equipment (e.g., valves, gaskets, lengths of pipe, etc.); decontamination is desirable but is often not done since the piece is being discarded. This results in the item being hazardous or contributing to the characterization of other wastes as hazardous.

Failures/Malfunctions

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., Part 414 for organic chemicals)

Catastrophic failure of pipes due to flange/joint failure and corrosive or erosive failure can produce rapid and large volume discharge of the contents. Secondary containment is not usually present, resulting in secondary contamination of the ground and neighboring equipment that also must be cleaned. Even where containment exists, rapid discharge, often under emergency conditions, may overwhelm the capacity of pretreatment facilities.

Air emissions may be immediately hazardous to the health of workers in the vicinity, forcing evacuation until properly equipped personnel can shut equipment and control the problem. Such a delay, which can increase the amount of material discharged into the environment, can be minimized if automatic shutoff controls or suppressive equipment are in place.

2.1.2 PUMPS, COMPRESSORS, AND STEAM JET EJECTORS

Vapor Losses

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of volatile HAPs
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart H for hazardous organic NESHAPs from equipment leaks

As normally used, emissions of the volatile components in the stream being processed may escape around seals in pumps and compressors. Over-pressurization may also cause relief valves to release. The agitation caused by rapid movement of liquids may aerate liquids and "sparge" volatiles into the headspace of the pump/compressor or the process vessel. These vapors may then be emitted through relief valves. Certain high speed pumps may actually cavitate, causing volatile components to vaporize and escape into the gas stream. If heat generated by a pump/compressor is not dissipated by some form of heat exchange fluid, the temperature of the fluid may increase, at least locally, causing vaporization of volatiles.

Liquid Leaks

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., Part 414 for organic chemicals)

In addition to gaseous leaks, liquid leaks may also occur at seals and ports if not properly tightened. Lubricant, liquid seals, and heat exchange fluid may become contaminated with process liquid but will usually remain within the pump/compressor until maintenance work is done. An emulsion stream of lubricant oil and aqueous process liquid may be removed continuously from compressors for separation in an oil/water separator; other process chemicals will also be present, at least in the aqueous phase.

Condensate

> **Part 405-471**, effluent guidelines for process wastewaters (e.g., Part 414 for organic chemicals)

Steam jet ejectors produce condensate contaminated with volatile components of the process fluid. This aqueous wastewater is removed at steam traps and can be collected and treated in a central facility. The water heated to make steam may be pretreated, or a blowdown may be removed to minimize scaling, etc. Steam jet ejectors will produce condensate with low concentrations of process chemicals during startup.

Startup/Shutdown

> **Part 60, Subpart** V V for equipment leaks of VOCs
> **Part 61, Subpart** J for equipment leaks of benzene
> **Part 61, Subpart** V for equipment leaks of volatile HAPs (page A-39)
> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart H** for hazardous organic NESHAPs from equipment leaks

Leaks of volatiles during startup and shutdown will usually be small compared to those generated during normal operation; such leaks may be found during startup. Initial or final purging of a pump/compressor and associated processing system may produce vapor emissions from vents and relief valves, particularly when conditions deviate from operating conditions.

Maintenance Operations

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

The first step in servicing pumps and compressors would usually be a purge with clean fluid (inert gas, water, etc.) to remove residual process liquid. These fluids will become contaminated and require treatment and disposal. Lubricant fluids drained from pumps and compressors will usually be contaminated with process fluid and require treatment and/or disposal.

Just as during normal operation, emulsions of oil and aqueous streams may not separate fully and may require the addition of emulsion-breakers such as acid, salt, etc. before the oil can be disposed; if process chemicals are hazardous, the oil may also be hazardous. The water would be contaminated with the emulsion breakers as well as aqueous process chemicals. Any gaskets, mechanical seals, etc. removed during maintenance may require decontamination before they can be disposed.

Failures/Malfunctions

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., Part 414 for organic chemicals)

Failure of pump or compressor seals can cause the rapid emission of vapors, usually through relief vents. Loss of vacuum, as from the failure of a compressor or a steam jet ejector, could allow air to mix with process liquid and vapor. If the material is oxygen sensitive, emission of decomposition products could occur, presumably through relief valves installed for this purpose. Failure of diaphragms and mechanical seals in pumps can cause process liquid and lubricant to mix, necessitating disposal of one or both fluids. Mechanical or electrical failure of pumps or compressors could subject process fluid to excess heat, resulting in decomposition.

2.1.3 STORAGE TANKS, CONTAINERS, AND VESSELS

Vapor Losses

Part 61, Subpart Y for benzene emissions from benzene storage vessels
Part 60, Subpart K, K_a and K_b for VOC storage vessels
Part 63, Subpart G for hazardous organic NESHAPs from storage vessels

The primary environmental impacts under normal operating conditions would include volatile organics (VOC) and inorganic emissions (e.g., hydrogen chloride, sulfur oxides, etc.). Emissions may be lost during normal operation by diurnal "breathing" of tanks. As temperatures (and barometric pressure) change, liquid contents and the vapors in the tanks will expand/contract. Vapors may be vented from closed tanks to a collection/treatment system such as a scrubber/ absorber, a flare, or other control device. Recovered vapors may be recycled to the tank, discarded as liquid or hazardous waste, or destroyed.

Floating roofs used on tanks storing volatile organics have a seal to prevent the loss of the vapor. Seals are most likely to release vapors through vents or floating roof seals when contents are added or removed. Air used to maintain a seal or internal pressure frequently must be pretreated, at least to remove water vapor, which could then be considered a waste.

Inert Gases

Occasionally, inert gas blankets are used to prevent contamination of tanks and to minimize fire/explosion risk.

> **Part 60, Subpart K, K_a K_b** for VOC storage vessels
> **Part 61, Subpart Y** for benzene emissions from benzene storage vessels
> **Part 63, Subpart G** for hazardous organic NESHAPs from storage vessels

Leaks/Spills

Liquid wastes are largely limited to tank contents that may leak or spill into secondary containment, particularly during filling or draining of tanks. Contaminated rainwater collected in secondary containment is always a disposal problem and usually requires treatment as contaminated water.

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g. 40 CFR Part 414 for organic chemicals)

Solid Waste

Solid and/or hazardous wastes may include contaminated soil from secondary containment after a spill or ongoing leaks and, less frequently, vent condensate, absorber solids, or scrubber solutions that are not recycled.

> **Part 262** for listed and characteristic hazardous waste generators

Tank Filling

During the filling of tanks, etc., as the uncontaminated gas in the tank space is replaced by the liquid and vapor, gaseous losses (both VOCs and inorganics) through vents and valves can be significant, particularly immediately following a period of filling as the tank approaches equilibration. Leaks at valves, flanges, etc. are most likely to be found during these periods.

> **Part 61, Subpart Y** for benzene emissions from benzene storage vessels
> **Part 60, Subpart K, K_a, and K_b** for VOC storage vessels
> **Part 63, Subpart G** for hazardous organic NESHAPs from storage vessels

Tank Draining

> **Part 61, Subpart Y** for benzene emissions from benzene storage vessels
> **Part 60, Subpart K, K_a, and K_b** for VOC storage vessels
> **Part 63, Subpart G** for hazardous organic NESHAPs from storage vessels
> **Part 405-471**, effluent guidelines for process wastewaters (e.g.,40 CFR 414 for organic chemicals)

There is less opportunity for contaminants to leave the system when tanks are being drained, except at valves/flanges. One exception might be the floating roof, where a residual thin film of liquid may remain above the descending roof and might escape if not properly collected and/or treated. Vent control systems will also be in flux during filling and draining and would be subject to upset during these periods.

Venting

> **Part 61, Subpart Y** for benzene emissions from benzene storage vessels
> **Part 60, Subpart K, K_a and K_b** for VOC storage vessels
> **Part 63, Subpart G** for hazardous organic NESHAPs from storage vessels

During maintenance of tanks, etc. additional sources of wastes will be generated. Tanks will require venting with air or inert gas before entry can be made safely; these emissions will contain vapors of the contents and will require collection/treatment. As with other unit operations, when valves and piping are disconnected, residual contents may vaporize or leak and require collection/treatment.

Maintenance Operations

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Sand blasting, paint removal and repainting will each generate wastes, specifically blasting media, old paint, metal from the tank surface, and VOCs from the new paint. Because of the solvent properties of many organics that are stored in such tanks, special paints (e.g., urethanes) often must be used and will generate different and unique VOC emissions until new, water-based paints become common. The use of welding and cutting torches is often necessary to gain access or to assure tank integrity; in addition to metal oxide fumes, residuals from the tank may volatilize and/or decompose when in contact with the elevated temperatures.

Because of the special hazards of working inside a tank (confined space entry, etc.), special personal protective gear is needed during maintenance; this becomes solid/hazardous waste requiring disposal. Gaskets, packing, piping, etc.

and even sections of the tank walls also may be contaminated and require disposal as waste that may be hazardous, depending on the nature of the contents. Smaller tanks (e.g., drums) may have improper or incomplete labeling and require extensive testing before they can be classified and appropriately disposed.

Tank Bottoms

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Removal of "bottoms" and cleaning of the interior of tanks often requires steam, water and special detergents/solvents; the mixture of these and any residual contents of the tank will require treatment/disposal.

Failures/Malfunctions

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

The major emergency situations that can be experienced with tanks are overfilling, leaking (usually from unattended valves) and catastrophic ruptures. Properly designed secondary containment will usually minimize the environmental impact of all of these situations, at least in the immediate vicinity of the tank. Fire and fire suppressants are another source of potential environmental contamination.

2.1.4 BLENDING AND MILLING

Particulate

> **Part 262** for listed and characteristic hazardous waste generators

The major environmental problem usually associated with milling, mixing and even blending is the emission of particulates at all stages of the operation, particularly when material is transferred from storage piles, bags, or bins and the solids are “dropped” into a reactor or other form of mixing chamber. With large operations, the escape of such emissions often can be minimized by the use of automated delivery conveyances (e.g., screws, closed hoppers, vacuum feed systems, etc.) and various particulate control/collection systems (e.g., baghouses, electrostatic precipitators, scrubbers, venturis, etc.). However, such control systems are often not practical for small or non-routine operations, and solids may be transferred manually from bags and boxes with little or no control. Similarly, the particulate captured in various environmental control systems, if not recycled, may have to be discarded as solid or hazardous waste.

Empty Containers

Part 262 for listed and characteristic hazardous waste generators

Disposal of empty containers also can create secondary particulate emissions when they are moved to a disposal area and the containers may have to be disposed of as hazardous waste.

Scrubber Water

Part 262 for listed and characteristic hazardous waste generators
Part 405-471 effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

If water scrubbing is used, then there are both wastewater and noise problems from the crushing and vibrating equipment used to reduce particle size, separate grades, etc.; milling wet material can reduce noise and dust but will increase water pollution concerns.

Mists/Vapors

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of volatile HAPs
Part 63, Subpart F for organic HAPs
Part 63, Subpart G for organic HAPs from process vents

The mixing of liquids, with other liquids or with solids, can product mists or vapors, depending on volatility of the liquids, but the particulate problem tends to be lessened. Containers would require conventional cleanup between uses. Depending on the nature of the chemistry involved, the mixing of gases with liquids may be free of environmental impact, as when the addition is carried out in a closed system under pressure or vacuum. However, if the system is open to the atmosphere, incomplete absorption of the gas can result in gaseous emissions as well as mist and vapor of the liquid material from vents, safety releases, etc.; in rarer cases, fine particulate matter may also be produced and carried out of the chamber. Milling and mixing accompanied by heating may increase all of the problems noted above and add the possibility of decomposition products from material adhering to heated surfaces. Fine, dry solids have one other unique characteristic that needs to be considered carefully during these operations: fine particulates can become charged with static electricity.

Static discharges (sparks) can ignite flammable vapors and certain dust clouds can detonate.

Spills

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471** effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

One type of mixing that deserves separate attention is the mixing of solid (and liquid ingredients) on exposed mixing rollers such as Brabender rollers. While the actual mixing and milling usually creates minimal emissions, material running off the sides of the rollers can become waste and heating, either intentionally or due to friction, can cause material decomposition, escape of volatiles, and even fires. Where runaway heating is a problem, fire suppression systems are usually employed. While these will help to protect the facility, they may produce additional wastewater and thermally damaged product usually must be discarded.

Maintenance Operations

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of volatile HAPs
> **Part 63, Subpart F** for organic HAPs
> **Part 63, Subpart G** for organic HAPs from process vents
> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g.,40 CFR 414 for organic chemicals)

Maintenance of milling and mixing equipment can create significant environmental needs. Abrasive material and the resulting dust in the air can require frequent maintenance. Replacement of seals, gaskets and lubricants will usually be required and will contribute significant solid waste contaminated with the materials being processed. When mixing liquids or gases, the problems should be less serious, and normal maintenance requirements probably can be anticipated.

Failures

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of volatile HAPs (A-39)
> **Part 63, Subpart F** for organic HAPs
> **Part 63, Subpart G** for organic HAPs from process vents
> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g.,40 CFR 414 for organic chemicals)

Failure of solid milling and mixing equipment can result in dispersal of dust over an area larger than the normal handling area and require cleanup of other equipment, particularly where moving parts (e.g., gears, bearings, etc.) May have become coated. While this can adversely affect equipment and can be visually unattractive, such dusts can usually be removed from the environment with little impact. Obviously, the major failure mode that must be considered is potential dust explosions, with resulting fire, equipment destruction and widespread contamination of equipment with decomposed material. Failure of mixing equipment containing liquids would normally result in spills or leaks in the process area that should be anticipated with containment and/or cleanup equipment. Captured material could then be recovered or safely evaluated and properly discarded.

2.2 REACTIONS

2.2.1 BATCH, CONTINUOUS, AND FLUIDIZED BED REACTORS

Vapor Losses

Part 60, Subpart III for VOC emissions from SOCMI Air Oxidation Unit Processes
Part 60, Subpart RRR for VOC emissions from SOCMI Reactor Processes
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators

The primary environmental impacts under normal operating conditions are the loss of solvent, reagent, product and byproduct vapors, both organic and inorganic. This usually occurs through controlled vents where necessary collection/treatment/adsorption of the vapors can be carried out to protect the work environment. Fugitive leaks of these chemicals, as both liquid and gas, can also occur around head and port seals, stirrer glands, pump and valve packings, and piping flanges. Although these have been an accepted part of operation and may even be factored into process calculations, newer facilities have means of collecting such leaking material and either recirculating them or disposing of them where there is a risk of contamination. Secondary containment is not widely used around reactors.

Leaks

Part 60, Subpart III for VOC emissions from SOCMI Air Oxidation Unit Processes
Part 60, Subpart V V for equipment leaks of VOCs
Part 60, Subpart RRR for VOC emissions from SOCMI Reactor Processes
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of volatile HAPs (page A-39)
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g.,40 CFR 414 for organic chemicals)

Steam, water, oils and silicone fluids, and brine solutions may be used to heat or cool the reactor, either directly (steam) or indirectly. Leaks into a reactor are rare (except for steam injection); leaks into non-contact heating or cooling coils/pipes are more common. If contaminated, these streams require treatment before the heat transfer liquid/gas can be reused or discarded.

Sampling and Analysis

Discharges can also occur during sampling and analysis. Liquid waste may be generated by leaking sampling valves, lines may need to be drained before and after sampling to remove holdup, and excess sample may be collected. Such material may require disposal if it cannot be returned to the reactor. Sampling may also disturb the reactor equilibrium and cause "breathing" losses as re-equilibration occurs.

Part 60, Subpart III for VOC emissions from SOCMI Air Oxidation Unit Processes
Part 60, Subpart RRR for VOC emissions from SOCMI Reactor Processes
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g.,40 CFR 414 for organic chemicals)

Fluidizing Gas

Continuous reactors, including fluidized bed reactors, are usually closed systems, often operating under elevated pressure. They present minimal sources of vapor or liquid leaks during operation except for the fluidizing gas, which may be a process chemical, air or an inert gas that may become an emission when discharged.

Part 60, Subpart III for VOC emissions from SOCMI Air Oxidation Unit Processes
Part 60, Subpart RRR for VOC emissions from SOCMI Reactor Processes
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

Startup

During startup of a batch reactor, contamination would usually be limited to emission of volatiles and particulates as materials are charged and the reaction mass is heated. Gas streams (air, inert gas, steam) contaminated with solvent or reagent vapors may escape while the reactor is being charged and as temperature increases. Leaks of liquids and gases at valves, vents, joints, etc. are most apt to be discovered during startup; thermal expansion may create additional leaks.

Part 60, Subpart V V for equipment leaks of VOCs
Part 60, Subpart III for VOC emissions from SOCMI Air Oxidation Unit Processes
Part 60, Subpart RRR for VOC emissions from SOCMI Reactor Processes
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V fpr equipment leaks of HAPs
Part 63, Subpart F for hazardous organic NESHAPs

Off-Spec Product

> **Part 262** for listed and characteristic hazardous waste generators

Off-spec material (startup and shutdown) may be reprocessed or discarded as wastes. With continuous and fluidized bed reactors, the materials initially charged may not meet product specifications due to incorrect flow ratios, low temperature or pressure, incorrect pH, etc. and must be recirculated (if possible) or discarded as startup wastes. Product generated during shutdown of a continuous reactor will often be off-spec and require reprocessing or disposal.

Spills

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Liquid and solid spills may occur during charging; transfer of fine solids from bags and tote bins is notorious for dust emissions.

Shutdown

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 60, Subpart III** for VOC emissions from SOCMI Air Oxidation Unit Processes
> **Part 60, Subpart RRR** for VOC emissions from SOCMI Reactor Processes
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of HAPs
> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

When the use of a batch reactor is complete (shutdown), additional vapor losses occur as the reactor is opened or vented. The physical transfer of liquid product from a batch reactor may result in spills and solvent vapor losses, such as at valves, particularly if the transfer is made while material is still warm. It is difficult to capture the vapors in the head space of a reactor. Residual non-volatile material, possible containing byproducts (e.g., salts), will often remain in the reactor as "stickage" after the initial draining and require tedious removal; this material may be added to the transferred material, discarded as a waste, or incorporated in succeeding batches if compatible.

Separation

Part 262 for listed and characteristic hazardous waste generators

Separation of liquid products from solid materials (catalysts, salts, filter aids, etc.) will leave reactant/product-contaminated solids that require further processing (e.g., solvent extraction), reactivation, or disposal as solid/hazardous wastes.

Reactivation

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Ultimately, the material (e.g., catalyst, sand, glass powder, etc.) in a fluidized bed becomes contaminated and must be cleaned or replaced. Thermal reactivation may release new gaseous pollutants; chemical reactivation/cleaning may produce a liquid waste stream of undefined character. Discarded spent media will be a solid waste and may exhibit hazardous waste characteristics.

Equipment Flushing

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Flushing with purge gas, steam, or aqueous streams (detergents, neutralizing agents, etc.) may be necessary to facilitate safe handling or as part of decontamination. These streams, contaminated with the contents of the system, will require disposal, usually as hazardous wastes.

Gaskets, Packing, Piping, Filters, etc.

Part 262 for listed and characteristic hazardous waste generators

Gaskets, packing, piping, filters, etc. may be contaminated and need to be disposed of as waste that may be hazardous.

Maintenance Operations

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Operations such as paint stripping, painting, welding, lubrication, etc. will generate additional airborne emissions, liquid contamination, or solid wastes that must be removed. As a reactor and associated equipment (e.g., pumps, vents, flanges, piping, stirrers) are dismantled, vapor and liquid holdup must be captured and disposed of as wastes.

Failures/Malfunctions

Part 60, Subpart III for VOC emissions from SOCMI Air Oxidation Unit Processes
Part 60, Subpart RRR for VOC emissions from SOCMI Reactor Processes
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Emergency situations may make it necessary to discard the reaction mixture at almost any point in the process. It may be possible to rework off-spec product generated by incorrect operating conditions, but disposal as a waste is another possibility. In the event of "run-away" conditions or a major failure in a reactor system, it may be necessary to "dump" an entire batch of material at any point in the reaction sequence. Materials from a runaway reaction are usually not suitable for reprocessing, although certain ingredients (e.g., catalysts, solvents) may be recoverable. Various materials also may be used to control ("kill") run-away reactions; addition of such materials (e.g., water, acid, base, etc.) will usually make the reaction mixture unsuitable for reuse, thereby generating a larger volume of a liquid waste <u>of indefinite character</u>. In failure situations there can be sudden and LARGE releases of steam, volatile organic compounds (e.g., solvents), inorganic gases or particulates and fluidizing media, and unidentifiable secondary products (e.g., tars, polymers) from thermal and/or oxidative degradation. Backup into heat exchange systems (e.g., checkvalve failure, coil failure) could occur and generate large volumes of contaminated heat exchange fluid. Large-scale contamination of the area around equipment is also likely to occur during an emergency; with little or no containment in most cases this is likely to require the use of large quantities of adsorbent materials and subsequent disposal. In the case of major failures, the process equipment and the facility may be damaged and require extensive maintenance or disposal.

2.3 HEAT TRANSFER

2.3.1 HEAT EXCHANGERS

Blowdown

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

Under normal operating conditions of most exchangers there is no contamination of the heat exchange fluid by the process fluid or visa versa. Blowdown of heat exchange fluid (water or steam) to minimize corrosion and/or buildup of solids on the barrier surface is the only discharge. Where heat exchange liquid is pretreated to reduce corrosion, fouling, scaling, etc., blowdown of heat exchange fluid could contain such additives.

Venting

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

Venting of heat exchange gases (air, steam, ammonia) may also occur to control pressure or contaminant buildup.

Leaks

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of volatile HAPs (page A-39)
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

Depending on the pressures on the two sides of the barrier, leaks from corrosion or erosion can cause either the process fluid or the heat exchange fluid to flow across the barrier and contaminate the other fluid. This could result in gaseous emissions (air exchangers), contaminated water (water or steam exchangers) or water/organic streams where organic heat transfer fluids are used (e.g., oils, silicones, etc.). In-line sensors can be used to detect such leaks. Leaks can also occur at flanges, valves, and, particularly, at compressors used to move process or heat exchange fluid. Even today, organic heat transfer fluids may still contain hazardous components such as PCBs.

Cooling Towers

Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Cooling towers are a unique form of air to liquid heat exchangers used primarily to cool water or certain aqueous solutions. A major additional wastestream is the vapor and mist discharged to the atmosphere; it may contain any volatile or dispersible components of the process fluid, ranging from ammonia (coke plant) and metallic corrosion inhibitors (water cooling) to bacteria. Another unique impact of cooling towers is the production of local fog that can affect visibility and safety due to icing. Cooling towers are not usually suitable for process fluids where hazardous contaminants would be emitted to the atmosphere.

Startup/Shutdown

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

During startup and shutdown of a heat exchanger, potential or very minor leaks may become exaggerated as a result of thermal changes in piping and vessels. Compressors may leak excessively until seals and gaskets seat into place.

Equipment Cleanout

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewater (e.g., 40 CFR Part 414 for organic chemicals)

During maintenance operations, scale and other sediments are removed from the heat exchanger, generating either a solid waste or a waste sludge containing metals and other contaminants, such as carbonized process chemicals. If high pressure water or steam is used to accomplish this, a wastewater is generated. Cleaning solvents may first be used to remove organic heat exchange fluids, thus generating either non-aqueous, emulsion or aqueous waste streams that would require treatment. Organic cleaning agents (e.g., chelating agents) used in place of or in addition to mechanical means to remove the solids from heat exchangers will also be present in the wastewater and require treatment and disposal. These may also change the nature of the material removed from the exchanger.

Maintenance Operations

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Replacement of damaged sections of a heat exchanger (e.g., tubes) may generate a waste of flush water containing the process fluid and/or any chemicals used to treat the exchange fluid. In addition, plant maintenance will generate the normal sand blasting, paint stripping, painting, welding and cutting emissions (particulates, VOCs, metallic fumes, etc.) when a unit is refurbished.

Failures/Malfunctions

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Failure within a heat exchanger can result in the gross contamination of one fluid with the other, as opposed to minor contamination that might occur from small leaks. If the leak is into a heat exchange gas, uncontrolled venting to the atmosphere would probably result since control or collection systems are not common. With water as the heat exchange fluid, the facility may be able to contain the contaminated fluid and gradually feed it into a central treatment system. Because of their cost, organic fluid systems are often equipped with separation/recovery systems. Leaks of heat exchange fluid into process fluid may only dilute the process fluid or may contaminate it or thermally degrade it so that it is off-grade and must be discarded as waste. Obviously, PCB contamination would require disposal in accordance with stringent regulations. Failure of any part of a heat exchanger system (e.g, relief valve) could discharge hot gas or liquid into the local environment. The impact of venting hot air or steam would be minor unless significant contamination was present. Similarly, the impact of a aqueous discharge to the ground surface would be dependent on the hazards of the process chemicals present.

2.3.2 CONDENSERS

Heat Exchange Fluids

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

"Direct" implies that the heat exchange fluid and the process fluid are in intimate contact; consequently, any process liquid will mix with the heat exchange fluid. The water, steam or other heat exchange liquid leaving the system will be contaminated with volatiles from the process fluid. The cooled heat exchange fluid will condense and may become part of the bulk process liquid. Where it cannot be incorporated because of product quality, conditions can be controlled so that the heat exchange fluid evaporates and is either exhausted to the atmosphere (e.g., as steam) or is condensed in a secondary heat exchanger. The steam will be contaminated with process volatiles and/or process liquid mist.

Blowdown

Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Any recirculation of the heat exchange fluid, such as by the use of a secondary heat exchanger used to recover heat, may require a blowdown to control contaminant [and temperature] buildup. The blowdown will be a liquid waste that may or may not be suitable for recycle.

Leaks

"Indirect" contact means that a barrier, usually a glass or metal tube wall, separates the two fluids. With an indirect or "non-contact" condenser, the most common environmental problem occurs when vapors from the process fluid are drawn into leaks in the barrier and are removed with the heat exchange fluid. Because gaseous heat exchange is relatively inefficient, large volumes of air are normally used, diluting any process components and making capture and treatment of any contaminants less attractive. A monitoring device (e.g., a PID) is often used to alert operators to the unexpected presence of contaminants in the gas stream. To an extent, the same problem exists during normal operation when using a liquid heat exchange fluid such as water. The direction in which leaks will travel is dependent on which side of the barrier is at higher pressure. If the process fluid cannot tolerate contamination with the heat exchange fluid, then any leaks would be into the heat exchanger/ condenser. Vapors of the process liquid leak into the heat exchange fluid and get discharged with the fluid. Monitoring (e.g., PID, pH meter) is often used to detect such leaks. If heat exchange fluid leaks into the process fluid, it will, at a minimum, dilute the liquid and retard removal of volatiles; at the extreme, unacceptable contamination of the process liquid could result, requiring disposal of the process material. In a related sense, where the water is recirculated (e.g., a holding basin or a cooling tower), the blowdown that would eventually be necessary will be at least as badly contaminated with any process components, plus any impurities that were in the incoming water. Any pumps or compressors used to circulate the heat exchange fluid will experience similar contamination.

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Startup/Shutdown

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

During startup, high flow of the heat exchange fluid will dilute any contamination with process fluid. However, the low concentrations may make recovery or recycle unattractive; discharge is often more cost-effective and simpler. Leaks into the condenser also may not be easily detectable during startup because of low concentrations. Similar conditions will exist at shutdown as the process fluid temperature is decreased if the flow of the heat exchange fluid is maintained.

Equipment Flushing

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewater (e.g., 40 CFR Part 414 for organic chemicals)

Gas purging or washing with solvent or water on the process side of the condenser will usually be carried out to assure safe handling during maintenance. The heat exchange fluid side will usually require decontamination when using fluids other than steam/water (e.g., when using ammonia, brine, Freons or other organic liquids) and disposal of contaminated heat exchange fluids may then be necessary. Any pumps or compressors handling hazardous liquids would also need to be decontaminated, generating additional emissions or liquid wastes.

Piping, Tubes, etc.

Part 262 for listed and characteristic hazardous waste generators

Any piping, heat exchanger tubes, or compressor/pump parts that are being replaced may need to be disposed of as hazardous waste, particularly if the process liquid is hazardous.

Failures/Malfunctions

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Sudden failure during operation of pumps, compressors or heat exchange fluid piping, valves, etc. can allow relatively concentrated vapors to escape from the condenser unless there are appropriate scrubbers or other secondary collection systems. Less frequently, a major leak of heat exchange fluid into the process liquid will occur. This could make the process liquid unsuitable for further use, requiring disposal as concentrated liquid waste. Catastrophic failure of the process system can occur if solids crystallize (e.g., sublimation, decomposition, freezing) and plug narrow passages. Without proper controls, the pressure within the system can continue to increase until hot, concentrated vapor is rapidly discharged through either a pressure relief valve or through a rupture, if it does not first melt the plugging material. If the plug melts suddenly, excess hot vapors will suddenly impinge on the condenser. It may simply exceed the cooling capacity of the condenser and escape through vents, but it also may damage the heat exchanger and create leaks.

2.3.3 EVAPORATORS

Exit Gases

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

During normal operations, an evaporator is usually under reduced pressure and the major loss is VOC (and inorganic) emissions (and mist) drawn off in the exit gas. If steam or water jets are used to generate that vacuum, they will become contaminated with those contaminants and may require treatment; if mechanical pumps are used, any lubricant or compressor oil also may become contaminated and require disposal.

Vapor Losses

Ambient pressure evaporation of solvents will produce relatively large volumes of gas (e.g., air, inert gas) contaminated with low concentrations of VOCs. Capture of these VOCs from the dilute stream tends to be more difficult and more costly.

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of HAPs
> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

Off-spec Product

> **Part 262** for listed and characteristic hazardous waste generators

External heating sources (steam, hot oil, etc.) would normally leak into an evacuated evaporator and not create a new contaminated stream; however, the product may become contaminated if such a leak occurs and require disposal or reprocessing.

Startup

During startup, volatile components will be lost, usually at a low rate, into the exiting gas stream or into ejector steam or water until operating conditions are achieved. Transfer pipes, valves, etc. may leak as material is introduced into the evaporator if these portions of the system are not under reduced pressure.

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of HAPs
> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents
> **Part 405-471,** effluent guidelines for process wastewater (e.g., 40 CFR Part 414 for organic chemicals)

Inert Gases

When evaporation is complete, inert gas may be introduced to avoid thermal decontamination, but this should not create any emission sources.

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

Equipment Flushing

When maintenance is being carried out on an evaporator system, gas and water will often be used to purge the system. These streams will be contaminated with the process fluids and, depending on the nature and concentrations, may require treatment for disposal. With proper planning, it may be possible to recycle such wastewaters into future batches.

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Maintenance Operations

Normal maintenance wastes could include sandblast solids, paint strippers, paints, lubricants, welding and cutting fumes, etc. in addition to gaskets, pipes, etc. that are replaced.

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Failures/Malfunctions

Emergency situations could arise if an evaporator were overheated or became involved in a fire. In either case, thermally damaged process fluid would probably be discarded as waste. Particularly with temperature- or oxygen-sensitive materials, failure of vacuum seals during operation may require premature shutdown and the need to discard or even dilute exposed process fluid to minimize further reaction.

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

2.4 SEPARATION

2.4.1 DISTILLATION

Cooling/condensation contamination

Part 60, Subpart NNN, for VOC emissions from distillation operations
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

The primary environmental impacts under normal operating conditions relate to cooling and condensation, including overhead vapor (organic or inorganic) contamination of contact or non-contact cooling water and steam jet condensate, water jet discharge, or vacuum pump discharge where vacuum is used. Water used for cooling or steam heat may also require pre-treatment and may produce concentrate wastes requiring treatment; antifoulants, corrosion protection agents, etc. may all be present in these waters.

Leaks

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart H for hazardous organic NESHAPS from equipment leaks

All valves, flanges, sampling points, vents, and circulating pump seals are also potential sources of airborne emission of the liquid and/or vapor components of the material being distilled. Leaks of liquids and gases at valves, vents, joints, etc. are most apt to be discovered during startup; thermal expansion may create additional, unanticipated leaks.

Inert Gas

Part 262 for listed and characteristic hazardous waste generators

Inert gas blankets used for some distillations may become contaminated with volatile materials, and vents bearing these materials may require treatment/control.

Cooling/Heating During Startup

Contact cooling water may initially become contaminated with "light ends" of the chemicals being processed. Excess steam may condense until process temperature is attained and may be contaminated with the chemicals being processed.

Part 60, Subpart NNN, for VOC emissions from distillation operations
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Off-Spec Product

Off-spec material (e.g., contaminated with light ends, cleaning agents, etc.) may have to be recirculated or discarded as wastes.

Part 262 for listed and characteristic hazardous waste generators

Heavy Ends/Still Bottoms

During shutdown, heavy ends and still bottoms will be present, may require manual discharge, and will frequently require disposal. These wastes may be listed or characteristic hazardous wastes (e.g., still bottoms from distillation of chlorinated organics will be listed hazardous wastes).

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Equipment Cleanout

Any equipment being dismantled, (e.g., pumps, vents, piping) containing gaseous or liquid material can produce wastes requiring special handling for environmental and safety reasons.

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Equipment Flushing

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Equipment will also require flushing with gaseous (purge gas) or aqueous streams (detergents, neutralizing agents, etc.) to facilitate handling or as part of decontamination. These streams, contaminated with the contents of the system, will require further management.

Gaskets, Packing, Piping, etc.

Part 262 for listed and characteristic hazardous waste generators

Gaskets, packing, piping, etc. may be contaminated and require disposal as waste that may be hazardous.

Maintenance Operations

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Maintenance operations such as paint stripping, painting, welding, lubrication, etc. will also generate additional airborne emissions or liquid contamination that must be removed as part of a final cleaning or during the re-startup of the distillation operation.

Failures/Malfunctions

Part 61, Subpart V for equipment leaks of volatile HAPs
Part 63, Subpart F for hazardous organic NESHAPs
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

In failure or similar situations there can be sudden and LARGE releases of steam, volatile organic and/or inorganic materials being distilled/processed, and even secondary products from thermal and/or oxidative degradation of heated materials in the unit. Without proper check valves, backup into cooling water systems and processing equipment could occur and require more extensive control and cleanup outside the distillation unit. Similarly, contamination of the area around equipment is likely to occur during an emergency, but may also occur to a smaller extent during maintenance and even normal operations.

2.4.2 ION EXCHANGE

Vapor Losses

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

During routine operation of an ion exchange system, emissions of VOCs and inorganic gases are limited to those escaping from any tank or transfer system.

Liquid Process Wastes

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

The major discharges are aqueous streams, including process liquid, regenerant solution, rinse water, and backwash water; i.e., those streams passing through the system during operation or during the regeneration cycle.

Small amounts of resin fines may also be swept into any of the aqueous streams. Other, smaller sources of wastewater include leaks at pipe flanges, pump seals, and valves, that would be present in any containment/transfer operation.

Off-Spec Product

Part 262 for listed and characteristic hazardous waste generators

Make-up of regenerant solution, often from stored concentrate (e.g., acid, alkali), could also produce off-spec or excess regenerant that would require disposal.

Leaks

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart H for hazardous organic NESHAPs from equipment leaks

The transfer of regenerant from storage would itself be a source of leaks from pipes, flanges, or valves.

Regeneration

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Depending on the nature of the process solution being exchanged, the wastewater from regeneration might require secondary treatment, such as neutralization/ precipitation, that would produce a sludge or solid waste requiring disposal. Changes in the character and concentration of the process solution undergoing ion exchange usually lead to more frequent cycling (i.e., more rapid consumption of exchange sites) rather than a need to discontinue operations and discard the resin; however, increased cycling will lead to more frequent resin replacement. Powdered resins are something of an exception in that single use, followed by separation from the treated process liquid and disposal, is the standard approach. The increase in solids disposal requirements is compensated for by the elimination of all regenerant wastewater streams. Wastewater streams generated during ion exchange at a chemical manufacturing facility are transported to a central facility for treatment along with other plant-generated wastewaters or are pretreated in the process area before discharge to the central facility.

Startup

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 63, Subpart H for hazardous organic NESHAPs from equipment leaks
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals

Leaks in pipes, at flanges, valves, and pumps are most likely to be discovered during the startup or shutdown of an ion exchange process due to changes in pressure, vibration, and thermal changes. Changes in headspace volume and pressure as a exchanger vessel is filled or emptied may produce vapor emissions for a short duration. Although resins are usually shipped and used in a water-wetted state, minor temperature changes may occur as a result of resin solvation with solutes in the process solution, activation, and regeneration. This could increase volatilization of any VOCs present in the solution. Resin fines are removed during the initial charging and startup of an exchanger and these become solid waste if they cannot be recycled. The fines may be quite slow to settle.

Equipment Flushing

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Process and regenerant solutions and wash water trapped in valves and pipes when dismantling equipment for maintenance may be wasted during shutdown for maintenance. These are usually diluted with water used to flush the system. All streams are expected to contain some amount of resin and resin fines. It is during maintenance operations that resin may be replaced. If this large volume of solid material, contaminated with process chemicals, cannot be returned to the vendor for processing it must be discarded. Depending on the characteristics of the resin at that point, disposal may range from landfilling to incineration. The latter approach may be used to recover valuable metals or simply to recover the energy value of the resin.

Maintenance Operations

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Maintenance operations also can generate all of the normal gaseous, waterborne and solid emissions expected from area and equipment washdown, paint stripping, sandblasting, painting, welding and cutting operations, and lubrication.

Failures/Malfunctions

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Catastrophic failure of ion exchange vessels and pipes due to flange/joint failure and corrosive or erosive failure can produce rapid discharge of large volumes of the process liquid together with the resin. Secondary containment is not usually present, resulting in contamination of the immediate process area. It is common practice to washdown such spills, as well as more minor leaks, into a central wastewater collection system unless precluded by specific hazardous aspects. Overfilling and overflow from the ion exchange vessel, due either to operator inattention or to instrument failure, would be a source of relatively large volumes of wastewater, although this would be expected to occur with low frequency.

2.4.3 FILTRATION

Vapor Losses

Many filtrations are carried out in essentially open systems, consequently vapors can be lost to the work environment. With vacuum filtration, loss of volatiles into the vacuum stream may be greater.

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

Liquid Leaks

Many filters, such as filter presses, will leak around seals, producing a liquid waste. While this waste may be the same as the feedstream, it often will be disposed as waste. Compressor seal fluids and steam jet ejector condensate will also become contaminated.

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of HAPs
> **Part 63, Subpart H** for hazardous organic NESHAPs from equipment leaks
> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Backflushing

During backflushing of filters to prevent blinding, the process liquid will become contaminated with solids; this slurry may be discarded as waste.

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Liquid Process Wastes

If the solid is the desired product, the liquid filtrate, containing essentially all of the process chemicals, will be a waste requiring disposal. Additional contaminated liquid will usually be produced while washing the filter cake.

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Solid Process Wastes

Part 262 for listed and characteristic hazardous waste generators

If the filter cake is not the desired product, it will need to be treated as waste since it will contain process chemicals and may also contain filter aids. The decision as to whether to wash the filter cake will depend on the value of the liquid material and the impact of the liquid on the characterization of the cake.

Startup

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 63, Subpart H for hazardous organic NESHAPs from equipment leaks
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

During startup volatiles may be lost to the vacuum system. Liquid passing through the filter before a proper blanket is developed may be wasted, although it often can be recirculated.

Equipment Flushing

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Purging of a filter with air or inert gas or washing with water or solvent to remove hazardous (toxic, corrosive, flammable) vapors or liquids is good practice to protect workers involved in maintenance. Pumps, compressors, valves and pipes should be similarly decontaminated before they are handled.

US EPA ARCHIVE DOCUMENT

Maintenance Operations

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

In addition to any residual solids in or on the filter supports, fabrics, blankets or membranes may be disposed during maintenance, along with lubricants and pump or compressor fluids.

Failures/Malfunctions

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents
> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Fires can occur on filters when air passes through a filter containing organic liquids. This usually results in the need to dispose of all material as waste and may produce excess, uncontrolled volatile emissions. In other failures, such as a torn filter, liquid and solid may enter the vacuum system, contaminating pump fluids and steam jet ejector condensate. If the slurry is captured, it usually can be recycled.

2.4.4 DRYING

Vapor Losses

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

Products and byproducts are often dried as intermediate or final stages in processing. Indirect heating (steam or electric) may be used to remove organic solvents and/or water during these operations. Vapors exiting the dryer can be captured by a condenser, absorber, or scrubber. Ambient temperature drying may be used for temperature-sensitive material; volatiles lost in these operations may be more difficult to capture because of the low temperature and high air flow. Freeze drying and vacuum drying are two versions of low temperature drying that minimize the volume of offgases. Drying with direct heating, such as by radiant heating (e.g., IR lamps) may also produce dilute VOC/air emissions.

Liquid Process Wastes

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

The displaced solvent (usually water) would be discharged as part of the vacuum system and may contain any volatile contaminants present in the wet solid. Where water is the solvent removed, or steam is used for direct heating, even non-volatile organics may be distilled or carried over as mist into the exiting gas stream. These emissions can be captured by condensation.

Solid Process Wastes

> **Part 262** for listed and characteristic hazardous waste generators

Solids adhering to the walls of the dryer may be discarded as waste at the completion of batch drying operations if they cannot be used in subsequent batches.

Leaks

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart** J for equipment leaks of benzene
> **Part 61, Subpart** V for equipment leaks of HAPs
> **Part 63, Subpart H** for hazardous organic NESHAPs from equipment leaks
> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Where steam or hot fluid is used to provide heat indirectly, contamination with soluble process chemicals could occur due to leaks, although it is more likely that leaks would contaminate the process material being dried.

Particulates

> **Part 262** for listed and characteristic hazardous waste generators

Some solids and certain drying procedures (e.g, spray drying and freeze drying) produce fine particulates that can become airborne; filters, scrubbers, venturis, and precipitators may be used to collect the particulates. They are usually discarded, along with contaminated filters, bags, etc.; recycling is a waste minimization possibility.

Off-spec Product

Part 262 for listed and characteristic hazardous waste generators

Dried solid product also may be discarded as waste if it becomes contaminated, such as by falling on the floor during transfer operations. The nature of the solid will determine whether it is hazardous or not.

Startup

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Leaks in pipe flanges, valves, pumps and dust collection systems are most likely to be discovered during the startup of a dryer due to vibration and thermal changes. Elevated temperature will increase volatilization of VOCs in the solids.

Equipment Cleanout

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Cleaning of a dryer usually generates air or waterborne streams containing the solids being dried. Depending on the nature of the solid, these may be blown out into the air or sluiced to the plant wastewater treatment facility as solids-contaminated wastewater. Solids trapped at joints and bends may be manually removed and discarded as solid waste; their presumed long residence time in the dryer may have altered their properties so that they are no longer recyclable as product.

Maintenance Operations

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Maintenance operations can generate all of the normal gaseous, waterborne and solid emissions expected from paint stripping, sandblasting, painting, welding and cutting operations, and lubrication.

Failures/Malfunctions

> **Part 262** for listed and characteristic hazardous waste generators

Fires are one of the more common causes for catastrophic failure of dryers. Product remaining is usually unsuitable for recovery and is discarded as solid or hazardous waste, depending on the characteristics. Decomposition products may escape into the air during the fire. Water used to extinguish fires would be contaminated with the solid and its degradation products. Ideally, such water would be collected and treated on-site. Equipment damaged by fire or overheating could require disposal f it cannot be reconditioned.

2.4.5 CRYSTALLIZATION

Vapor Losses

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

Volatile components of the process liquid (e.g., volatile organic solvents) will volatilize into the crystallizer head space as material is introduced and while the temperature of the unit is changing, particularly when the crystallization is brought about by heating to evaporate excess solvent. Where crystallization is caused by cooling the process liquid, volatilization will be less significant.

Solid Process Wastes

> **Part 262** for listed and characteristic hazardous waste generators

When the solid is the desired product, the major liquid waste generated from a crystallizer would be the concentrated mother liquor remaining after the desired solid material has crystallized and been separated. This liquor may be discharged as a strong waste, but it also may be used in other process sequences or recycled as saturated solvent for succeeding batches of product.

US EPA ARCHIVE DOCUMENT

Liquid Process Wastes

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

When the solid material is not the desired product, decolorizing agents (e.g., carbon) and filter aids may be present in the liquid and be removed at the same time, producing a solid waste contaminated with the mother liquor. Solids that become contaminated (e.g., by falling outside the crystallizer) will be solid waste unless they can be recycled.

Leaks

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart H for hazardous organic NESHAPs from equipment leaks
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Leaks into or out of heat exchanger fluid are possible. Cooling fluids such as brine or ammonia are corrosive to heat exchangers and could result in frequent leaks. When heating or cooling using an heat exchanger, cross-contamination of process and heat exchanger fluids may occur, depending on the relative pressure in the heat exchanger.

Startup

Part 60, Subpart V V for equipment leaks of VOCs
Part 61, Subpart J for equipment leaks of benzene
Part 61, Subpart V for equipment leaks of HAPs
Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

During the startup of a crystallizer, introduction of liquid into a vessel, evaporation of excess solvent or cooling of the process fluid from elevated temperatures will allow vapors to escape into the head space of the vessel; they will be vented with any exhaust air moving through the system for worker or product safety. Heat exchanger leaks also may be detected during the startup. Depending on the heat exchange fluid, such leaks could require entire batches of product liquor to be dumped as contaminated.

Separation

Part 405-471 effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

On completion of the crystallization stage, separation of the solid from the liquid is accomplished by settling, centrifugation, or filtration. Inefficient separation need not generate a waste, since it should be practical to recycle the material to a succeeding batch or recirculate it through the separator.

Equipment Flushing

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

During maintenance the major waste is washwater (or solvent) used to clean the crystallizer; however, with good planning such waste liquids often can be reused in subsequent runs. Pumps and compressors used to transfer process fluid or heat exchange fluid also may need to be decontaminated, resulting in additional liquid waste which may not be suitable for reuse. Residual solids adhering to the walls often are scraped off and, depending on the value, either recycled or disposed of as waste. As with all heat exchanger applications, maintenance often includes the removal of scale and the replacement of damaged or worn tubes, which then become solid or hazardous wastes.

Failures/Malfunctions

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Sudden failures of crystallizer walls, piping, valves, pumps, etc. certainly can occur and would allow process liquid to spill outside the crystallizer, making cleanup/washdown of the area necessary. Except for cross-contamination of the process liquid, such as with incompatible heat exchange fluid, it often is practical to recycle any process liquid that does not undergo the desired solid/liquid separation. Plugging of ports, valves, or piping with solids can cause shutdown of a crystallizer until the solids can be melted or forced out. However, except for upstream damage to the system by pressure buildup, or the contamination of solids by fluids used to dislodge such plugs (e.g., steam), it would normally be possible to recover and recycle the process liquid.

2.4.6 CENTRIFUGATION

Vapor Losses

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents

High turbulence of liquid streams entering a centrifuge, coupled with relatively large and fluctuating headspace, can increase the loss of volatile materials; these losses can be partially controlled by appropriate capture hoods on or over the centrifuge.

Leaks

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart** J for equipment leaks of benzene
> **Part 61, Subpart** V for equipment leaks of HAPs
> **Part 63, Subpart H** for hazardous organic NESHAPs from equipment leaks
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Leaks of liquids and gases may also occur around valves, pumps and piping flanges due to vibration.

Liquid Process Wastes

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

If the solid is the product, the liquid discharged will contain relatively high levels of suspended solids and all dissolved species in the liquid. Disposal or recycling will depend on constituents present. A wash cycle, commonly used to remove residual solvent and soluble species from the solid, will produce secondary, more dilute waste liquid.

Solid Process Wastes

> **Part 262** for listed and characteristic hazardous waste generators

If the liquid is the desired product, then the solid "cake" is a waste and will usually retain significant quantities of the liquid phase.

Cooling Water/Fluids

Any cooling water or steam will usually be in the centrifuge jacket and is not likely to be contaminated, although monitoring of the discharge may be desirable.

> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Cooling Fluids

Fluids may be used to cool bearings, and these may be contaminated with the process liquid and will usually be considered waste because of undefined contamination.

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Startup/Shutdown

During startup and shutdown, liquid streams may be discharged or recycled until proper speed or solids blanket are achieved. The liquid will contain the soluble ingredients and relatively high levels of solids. Ideally, this liquid is recirculated rather than discarded. Washing and removal of the solid cake will often generate an additional liquid waste containing lower concentrations of solids and solutes present in the liquid phase. Vibration while coming to speed may produce leaks of liquids and gases at valves, vents, flanges, etc.

> **Part 63, Subpart F** for hazardous organic NESHAPs
> **Part 63, Subpart G** for hazardous organic NESHAPs from process vents
> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Equipment Dismantling

Minor sources of gaseous or liquid wastes may be created when equipment is dismantled, (e.g., housing, pumps, vents, piping).

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Equipment Flushing

Flushing with purge gas or aqueous streams (detergents, neutralizing agents, etc.) to facilitate handling or as part of decontamination will produce relatively minor streams contaminated with the contents of the system; collection and/or treatment may be necessary.

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents
Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Gaskets, Packing, Piping, etc.

Contaminated gaskets, packing, piping, etc. will require disposal.

Part 262 for listed and characteristic hazardous waste generators

Maintenance Operations

Paint stripping, painting, welding, lubrication, etc. will generate additional airborne or liquid emissions.

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Failures/Malfunctions

In failure situations there can be sudden and LARGE releases of the material being centrifuged if it becomes necessary to stop the centrifuge rapidly. Usually this material can be reprocessed, although there often is some discharge until the situation is brought under control. Damaged parts can usually be decontaminated by washing and then discarded as scrap.

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

2.4.7 EXTRACTION

Vapor Losses

Part 63, Subpart F for hazardous organic NESHAPs
Part 63, Subpart G for hazardous organic NESHAPs from process vents

Volatiles, primarily organic vapors, may be lost during normal extraction operations from the headspace over an extraction. If heat is applied, the loss of vapors will increase, even if a condenser is used. Vapors can be directed through a vent and captured by a scrubber or adsorbent. Vapors removed during ambient temperature extraction with air or inert gas, such as to remove dissolved volatile organics, may be more difficult to control because the vapors are present at low vapor pressures. When, at some point in the extraction cycle, the pressure is released, some of the extractant (solvent) may be lost as a gas (e.g., propane, carbon dioxide) and some of the extract may be lost as mist, leaving a liquid or solid that may be product or waste.

Liquid Process Wastes

Part 262 for listed and characteristic hazardous waste generators
Part 405-471, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

With either water or organic fluids as the extractant, the extract will become increasingly rich during processing. If the extract (aqueous or organic) is not the desired product or coproduct, then it will be waste that must be treated as part of disposal.

Solid Process Wastes

Part 262 for listed and characteristic hazardous waste generators

If the solution of the extracted material is the product, then the residual material containing residual extracting solvent and reagents will be a waste liquid or solid requiring disposal. On completion of an extraction cycle, the non-product phase, extract or residue (liquid or solid), will contain process chemicals and require disposal. Recovery and recycling of solvent extractants is commonly practiced

Leaks

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

When using a heat exchanger to provide or remove heat, leaks into the heat exchange fluid could make monitoring, treatment and disposal necessary.

Startup

> **Part 60, Subpart V V** for equipment leaks of VOCs
> **Part 61, Subpart J** for equipment leaks of benzene
> **Part 61, Subpart V** for equipment leaks of HAPs
> **Part 63, Subpart H** for hazardous organic NESHAPs from equipment leaks
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

The initial filling of a vessel with process material and extractant can allow volatiles to escape from the headspace through a vent, an open reactor, or a pressure relief valve. Valves, pump seals, and pipe flanges also may leak vapors or liquid.

Equipment Flushing

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

A process vessel and associated equipment (e.g., pipes, pumps, valves) would normally be purged to remove volatile materials and washed with water and/or solvent before maintenance is undertaken. These streams would be contaminated with both the extractant and the process chemicals.

Packings, Seals, Gaskets

> **Part 262** for listed and characteristic hazardous waste generators

Valve packings, pump seals and any gasket material being replaced probably contains some contamination and proper disposal requires some consideration.

Failures/Malfunctions

> **Part 262** for listed and characteristic hazardous waste generators
> **Part 405-471**, effluent guidelines for process wastewaters (e.g., 40 CFR Part 414 for organic chemicals)

Overpressurization or excessive temperatures might cause pressure relief valves to activate, discharging vapors or even liquid. Oxygen or heat sensitive material may be damaged under such failures and require disposal as off-spec material. Heat exchanger leaks could result in contamination of the process fluid that would make it unusable or contamination of the heat exchange fluid. System parts damaged in a failure need to be decontaminated (e.g., with steam, water, or solvent) before they are discarded.

MODULE 3. ASSESSMENT TOOL FOR WASTE TREATMENT OPERATIONS

INTRODUCTION

This section describes waste treatment operations that are common to the organic chemical manufacturing industry. Specific operations are classified as air, water and solid waste treatment. Potential significant releases are indicated for each waste treatment operation and are linked to the applicable regulatory requirements. It should be noted that these materials do not specify permit requirements that may be applicable to an individual facility. Nor do they cite the permitting regulations under which EPA or States issue facility specific permits (e.g., 40 CFR Part 122 for direct discharges to waters of the U.S.). The information focuses on specific effluent/emission standards and requirements that would be incorporated, and as appropriate, tailored in a facility permit.

This module includes summaries on the following operations:

3.1 Air Emission Treatment Processes/Equipment
- Baghouses
- Wet Scrubbers
- Thermal Incinerators
- Flares
- Adsorption
- Boilers
- Cyclones
- Electrostatic Precipitators

3.2 Wastewater Treatment Residuals and Applicable Regulations
- Primary Treatment Technologies
- Secondary Treatment Technologies
- Polishing or Tertiary Treatment Technologies

3.3 Solid Waste Treatment and Disposal Processes/Equipment
- On-Site Solid Waste Landfill
- Sludge Incineratoration
- Halogen Acid Furnace
- Surface Impoundment

Assessment Tool for Waste Treatment Operations

3.1 AIR EMISSION TREATMENT PROCESSES/EQUIPMENT

3.1.1 BAGHOUSES

Process Description

Baghouses, or fabric filters, typically consist of woven or felted fabric in the form of tubes or bags that are suspended in a supporting structure (baghouse). Particles are removed from a gas stream by pushing gases through the system (pressurized baghouse) by an upstream fan, or by pulling gases through the system (induced draft). Particles are deposited on the fabric and are removed by three major methods: mechanical shaking, reverse air cleaning, and pulse jet cleaning. The particles are collected at the bottom of the devices in hoppers, removed by screw feeders or extracted by pneumatic conveying equipment, and transported to storage. The operating parameter usually monitored at baghouses is the pressure drop of the gas stream across the system. Pressure drop across the baghouse is directly related to the depth of the collected particle cake on the collection filter, and is used to indicate when the cleaning cycle is initiated. Pressure drop can also serve as an indication that the bags are not cleaning completely, or that the bags are not collecting sufficient filter cake because the particles are penetrating through worn or ruptured fabric. Many baghouses also employ broken bag detectors or opacity monitors which are optical devices that can detect particles in the exhaust gas stream. Many facilities have permitted emissions opacity limits.

Applications

This control device is one of the most efficient devices for removing particulate matter from dry gas streams. Baghouses contain fabric filters capable of maintaining control efficiencies of >99% for particle sizes down to 0.3 microns. Three factors that affect the feasibility of using a baghouse to control particulate emissions are the flue gas temperature, the gas stream composition, and the particle characteristics. The temperature of the waste stream must be above the dewpoint of any condensibles in the stream, but below the maximum temperature of the fabric. Condensible gas stream constituents such as acid gases and moisture will wet the filter cake and make cleaning difficult. Condensation also contributes to corrosion of the baghouse structure and attacks the structural integrity of the filter bag material. Highly adhesive particles are difficult to remove from the bags through the cleaning mechanisms. The presence of such “sticky” particles will preclude the use of a baghouse. Baghouses are sometimes highly effective for removal of heavy metals when used in conjunction with sorbent injection technology upstream of the baghouse.

Equipment Description

The basic configuration of a baghouse is either forced draft (positive pressure) or induced draft (negative pressure). Many types of natural and synthetic fibers are used in baghouse systems. Natural fibers include cotton and wool, and synthetic fibers include nylon, acrylic, polyester, polypropylene, fiberglass, and ceramic. Often filter fabric selection is application-specific; for example, a high temperature acid or corrosive stream may require ceramic filters. The most common material used for the housing structure is corrosion resistant steel such as corten steel. In extremely corrosive applications, anti-corrosive liners or stainless steel is used.

The particles collected on the bags are removed by mechanical cleaning techniques. Physical shaking devices operated by electric motors and camshafts are used in older baghouse designs. Large volume gas streams are treated by reverse air cleaning baghouses. Reverse air baghouses comprise separate compartments that are closed from the gas stream individually for cleaning. Treated gas or heated ambient air is forced through the segregated compartments in the reverse direction of the dirty gas flow, and pushes the collected particles from the fabric surface. In pulse jet baghouses, a high pressure pulse of air is blown down the inside of each bag which causes a deflection of the bag to travel down the length of the bag and shakes the collected material from the filter surface.

Pollutant Phase	Type of Emissions/ Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Particulate matter, i.e., ash from combustion or dust from process operations and uncontrolled fraction	In pressurized baghouses, visually check for fugitive leaks. What is the basic configuration? If the baghouse is removing a HAP, the baghouse should be of the negative pressure type (induced draft). Using the most recent stack test results, determine the measured collection efficiency and emission rate. Does this information match the permitted values? Check if pressure drop across the baghouse is monitored and verify that this meets the requirements stated in any applicable permits or equipment vendor specification. Review broken bag detector or opacity monitor measurements to determine if broken bags have been observed and repaired, or to determine if emissions opacity limits have been exceeded.	There are no regulations that are applied specifically to baghouses; however, State Implementation Plan (SIP) requirements, state regulations, state permit conditions and Federal regulations may apply the process or operating unit governing their emission rates, monitoring, record keeping, reporting, operation and maintenance.
Liquids	Typically none		
Solids	Collected solids	Are the collected solids a hazardous or characteristic waste? This determination is made based on process knowledge or laboratory testing as specified in 40 CFR Part 261.	Reference RCRA and solid waste regulations (summarized in Appendix D).

3.1.2 WET SCRUBBERS

Process Description

Wet scrubbers are collection devices that can remove particles or gases separately or together. Particle scrubbers introduce water to wet particles and increase their size and weight in order to remove them from gas streams using their increased inertia in centrifugal separators. The absorption of gases is achieved by dissolution in water or chemical reaction with reagent, or scrubbing liquor. An example of chemical absorption is HCl reacting with a base to form a salt.

Applications

Wet scrubbing is most widely applied to flue gas treatment for the control of acid gases, particulate matter, heavy metals and trace organic compounds. The particulate matter removal efficiency of a wet scrubber is usually not as high as that of a baghouse or ESP, and is particularly lower for smaller (<10 micron) particles. Wet scrubbers are air pollution control devices, however, water usage and wastewater disposal requirements are two important factors to consider in evaluation of a scrubber application.

Equipment Description

The major types of wet scrubbers used for pollutant gas removal include 1) spray scrubbers used primarily for gas absorption, 2) packed tower scrubbers used primarily for gas absorption, 3) spray drier absorbers (used in conjunction with a particle control device), and 4) tray scrubbers. Particulate matter wet scrubbers include 1) venturi scrubbers, and 2) ionizing wet scrubbers. Combinations of gas and particulate matter wet scrubbers are often used for combined pollutant treatment and are referred to as hybrid wet scrubbers. The primary design features of wet scrubbers are the gas stream pressure drop across the device and the liquid to gas (l/g) ratio. A higher pressure drop usually results in greater particulate matter removal efficiency, and a higher liquid to gas ratio can cause increased pollutant gas absorption rate.

Pollutant Phase	Type of Emissions/ Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Cleaned gas streams	Depending on the function of the unit (control vs. recovery), certain parameters, such as gas stream flow rate, pressure drop and temperature, as well as scrubber liquor pH, solids content, flow rate and pressure drop, may have to be monitored. Check requirements against permit requirements. Continuous emission monitoring system (CEMS) recordings of pollutant gas concentration or mass emission rate should be reviewed for compliance with permit conditions and to identify conditions which depart from normal operation. In wet gas scrubbers, the flue gas temperature is cooled to its saturation temperature. This will lower the dispersion characteristics of the released flue gas and can result in a visible plume of condensed liquid.	There are no regulation that are applied specifically to scrubbers; however, State Implementation Plan (SIP) requirements, state regulations, state permit conditions and Federal regulations may apply to the process or operating unit governing emission rates, monitoring, record keeping, reporting, operation and maintenance. If the scrubber is used as a control or recovery device for a regulated unit operation listed in Section 2.5 (e.g., reactor), then regulations which apply to the unit operation may have monitoring, record keeping and reporting requirements which apply to the scrubber operations (e.g., 40 CFR 60.613).
Liquids	Scrubbing liquors	Absorbed acid gas may cause the water leaving the scrubber to have a low pH and high solids or dissolved metals content which may require treatment.	NPDES permit requirements or pretreatment permit and General Pretreatment Regulations at 40 CFR 403 requirements.
Solids	Particulate matter, precipitates from scrubbing liquors (sludge)	Depending on the component being scrubbed from the gaseous stream, the liquid stream exiting the scrubber may have high solids levels which require additional treatment such as settling or filtration. Sodium based scrubbing liquors cause less scale formation than calcium based scrubbing liquors. However, sodium based solids are typically harder to dispose than calcium based solids because the higher solubility of sodium salts makes leaching more of a problem from such waste streams. Sludges may require characterization to determine if they are hazardous or solid wastes.	Reference RCRA and solid waste regulations (summarized in Appendix D).

3.1.3 THERMAL INCINERATORS

Process Description

Thermal incinerators, also known as afterburners, are widely used in the chemical industry to destroy organic vapors by heating the waste gases to a high temperature where the organic contaminants are burned in the presence of oxygen to form carbon dioxide and water. Some chemicals are oxidized at temperatures much lower than others. Therefore, operating conditions are based on the chemical(s) being destroyed, residence time, mixing and temperature.

Application

Incineration is considered the ultimate disposal method for most SOCMI vent streams because contaminants are destroyed rather than collected or transferred to another medium. Virtually any gaseous organic stream can be incinerated provided that proper design, installation, operation, and maintenance issues are addressed. Incineration can be applied to process off gases as well as to remediation wastes, such as air stripper effluent gases or soil vapor extraction off gases. Incineration of halogenated VOCs or compounds containing sulfur may require additional control equipment to remove corrosive combustion products.

Incinerators are best applied to streams with minor fluctuations in flows such as reactors and distillation operations. Streams subject to excessive fluctuations in flow (process upsets) may be better handled using flares.

Incinerators are also used for odor control. For example, resin manufacturers control glycol emissions using incinerators.

Equipment Description

Direct incineration systems include a fuel feed system, open flame burners, combustion zone, and exhaust system. Fuel feed rate, treated gas stream flow rate, combustion zone temperature and residence time are usually monitored continuously. Thermal destruction efficiency can range from 90% to >99%. Fuel to gas ratio, temperature and residence time are the critical parameters that influence thermal destruction efficiency.

Catalytic incineration operates at a lower temperature than direct incineration and has a lower fuel demand. Destruction efficiency usually ranges between 90% and 95%. Catalytic incinerators are sensitive to inlet VOC stream flow conditions, thus reducing their applicability in the SOCMI industry. Some catalysts can be deactivated by compounds containing sulfur, bismuth, phosphorous, arsenic, antimony, mercury, lead, zinc, tin, or halogens. Accumulations of particulate matter, condensed VOC, or polymerized hydrocarbons on the catalyst can reduce effectiveness. These systems pass the preheated gas stream through a catalyst bed to oxidize the combustible emissions.

Pollutant Phase	Type of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Products of incomplete combustion of fuels and process vent gas.	If the incinerator is used to control organic emissions from a regulated unit operation as described in Section 2.5, verify that the following monitoring devices are used: - temperature monitoring device with continuous recorder - flow indicator which records vent stream flow Verify that incineration of process off gases meets the required destruction efficiency of 98% or 20 ppmv compound exit concentration. Verify that the facility has conducted an initial performance test which demonstrates the above compliance requirements.	If the scrubber is used as a control or recovery device for a regulated unit operation listed in Section 2.5 (e.g., reactor), then regulations which apply to the unit operation may have monitoring, record keeping and reporting requirements which apply to the scrubber operations (e.g., 40 CFR 60.612). 40 CFR 60.8
	Products of combustion of other non-hazardous organic containing streams.	Check for air permits. Check for state record keeping, monitoring, and reporting requirements. Are halogenated gases being burned? If so, how much? The unit may be a major source of HAP if annual potential emissions exceed 10 tons of any single HAP or 25 tons of combined HAPs. Off gas controls (scrubber) may be necessary. Do corrosive byproducts cause a health and safety issue?	Federally unregulated emissions may be regulated by state rule.
	Particulate matter emissions.	Check emission levels against permitted value.	Regulated at state level.
Liquids	Typically none. However, a scrubber may be used as a supplementary control device. For example, destruction of chlorinated organics would generate HCl which may require a scrubber.	See discussion on wet scrubbers.	
Solids	Typically none.		

3.1.4 FLARES

Process Description

Open flames used for disposing of waste gases during normal operation and emergencies are called flares. They are typically applied when gases are not economical to recover or are the result of intermittent or uncertain process operations. The most common types of flares are steam-assisted, air-assisted, and pressure head. Flare operations can be classified as “smokeless,” “non-smokeless,” and “fired.”

Application

To destroy organics that are heavier than methane usually requires the use of steam or air to provide efficient mixing for complete combustion. This type of flaring is classified as smokeless. Fired flaring requires additional energy to ensure complete combustion and is used for such waste streams as sulfur tail gas and ammonia wastes. Flares can be used for almost any VOC stream and can handle fluctuation in VOC concentration, flow rate, and inert compounds content. Streams containing high concentrations of halogenated or sulfur containing compounds are not usually flared due to formation of corrosion causing compounds or the formation of secondary pollutants such as sulfur dioxide.

Equipment Description

The most common type of flare used in the chemical industry is the elevated flare. In this system the vent stream is sent to the flare through the collection header. A knock-out drum is used to remove water or hydrocarbon droplets that could create problems with combustion. The vent stream is also typically routed through a water seal to prevent possible flame flashbacks caused when the stream flow rate is too low. The VOC stream enters at the base of the flame where it is heated by already burning fuel and pilot burners.

Pollutant Phase	Type of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Combusted gases	The flare must be operated with no visible emissions and with a flame present. In addition, a 98% destruction efficiency (DE) is required. If the flare is used as a control device for a regulated process unit listed in Section 2.5 (e.g., reactor vents), verify that the following monitoring, devices are present: - heat sensing device at the pilot light - flow indicator which records vent stream flow Relief gases having heating values less than 300 Btu/scf are not assured of achieving 98% DE; therefore, the first step in the evaluation of flare design is to check the heat content of the emission stream and determine if additional fuel is needed.	40 CFR 60.18 If the scrubber is used as a control or recovery device for a regulated unit operation listed in Section 2.5 (e.g., reactor), then regulations which apply to the unit operation may have monitoring, record keeping and reporting requirements which apply to the flare (e.g., 40 CFR 60.613).
Liquids	None		
Solids	None		

3.1.5 ADSORPTION

Process Description

Adsorption utilizes a mass transfer operation in which gaseous phase components are transferred to a solid phase component. Activated carbon is the most widely used adsorbent encountered in the chemical industry. Carbon can also be used to remove organics from liquid streams; however, only gaseous phase removal is discussed in this section. Oxygenated adsorbents, such as silica gels, diatomaceous earth, and zeolites have a greater affinity for water vapor rather than gases. Thus their application is of limited use in the high moisture gas streams characteristic of some SOCMI vents.

Application

Carbon adsorption is an excellent method for recovering some valuable process chemicals. It is used for recovery of reactor fugitive solvent emissions, such as toluene, methyl ethyl ketone, tetrahydrofuran, etc. It is not recommended in streams with high VOC concentrations, compounds with very high or low molecular weights, or mixtures of high and low boiling point VOCs. Adsorption units may range in size from 55 gallon drums used to control emissions from storage tanks to units that can handle greater than 400,000 SCFM units which recycle up to 10,000 lbs/hr of solvent.

Carbon adsorption is most effective with homogenous offgas streams rather than with streams containing mixtures of light and heavy hydrocarbons.

Process Equipment

The design of an adsorption system depends on the physical properties of the offgas stream (such as temperature, concentration, volumetric flow rate). Process offgases are typically filtered and cooled before entering the bed. Prefiltering is conducted to remove unwanted contamination. Adsorption is best accomplished at temperatures of 130°F or less. When the bed is saturated, it is regenerated by heating the bed (usually with steam) or by applying a vacuum to remove the adsorbed gases. The desorbed gases are then condensed, separated from the condensed steam. The solvent is usually recycled and the water is discharged or sent to an air stripper which removes residual solvent so the water can also be reused in the plant. Carbon in regenerative systems has a life ranging from 5 to 20 years. Therefore, few solids are generated using this control or recovery system.

In some applications, such as site remediation, carbon is used to remove contaminants from a waste stream so the gas can be vented to the atmosphere. In these cases recovery of adsorbed components is not usually cost effective and the carbon is disposed as waste or sent to a waste hauler for regeneration.

Pollutant Phase	Type of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Stripped vent gases	If the carbon absorber is used as a control device for a regulated process unit listed in Section 2.5 (e.g., an air oxidation unit), verify that the following monitoring, devices are present: - steam flow rate - carbon bed temperature - concentration of organic compound exiting recovery device	If the carbon absorber is used as a control or recovery device for a regulated unit operation listed in Section 2.5 (e.g., an air oxidation unit), then regulations which apply to the unit operation may have monitoring, record keeping and reporting requirements which apply to the flare (e.g., 40 CFR 60.615).
Liquids	Condensed vapors, regenerated material	If carbon absorbers are regenerated on site, check for leaks and spills of collected regenerant.	If a hazardous substance spills, Emergency Planning and Community Right-To-Know Act requirements apply if a reportable quantity is released. Reference EPCRA regulations.
Solids	Spent carbon	Spent carbon will either be solid or hazardous waste, depending on waste characteristics. Evaluate how spent carbon is characterized and documented, the conditions of removal, and how the carbon is stored and disposed.	Reference RCRA and solid waste regulations (summarized in Appendix D).

3.1.6 BOILERS

Process Description

Industrial boilers and process heaters can be used to control VOCs by incorporating the vent stream with the inlet fuel or by feeding the stream into the boiler or heater through a separate burner.

Application

Effluent gases from reactors and distillation processes can be directed to boilers to produce steam at high temperature or to raise the temperature of process streams. Boilers are most applicable to vent streams which have high BTU contents. Performance could be impacted by the presence of corrosive products such as halogenated or sulfur-containing products in the vent stream.

Equipment Description

The majority of industrial boilers are of watertube design. Furthermore, more than half of these boilers use natural gas as a fuel. Other fuels used include refinery offgases and fuel oil. Refinery gases often contain sulfur compounds, and emissions of SO_2 are a consideration. In a water tube boiler, heat from the combustion of gases is transferred to the outside of heat transfer tubes, which contain hot water and steam that is applied to process operations.

Pollutant Phase	Type of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Products of combustion of gaseous or liquid wastes	If boilers are used to control organic emissions for a regulated unit operation listed in Section 2.5, verify that: - a flow indicator monitors vent stream flow - a temperature monitoring device with a continuous recorder us used (for boilers of greater than 150 million BTU/hr) - period of operation records are kept (for boilers of greater than 150 million BTU/hr). Verify that the vent stream is introduced into the unit's flame zone. Refinery gas hydrogen sulfide monitoring may be conducted. Review records of analysis.	If boiler is controlling emissions from a unit operation listed in Section 2.5, then regulation which apply to these unit operation may have monitoring, record keeping, reporting requirements for boiler operations (e.g., 40 CFR 60.613.). If boiler is used to destroy hazardous waste, ensure compliance with Boiler and Industrial Furnace Rule, 40 CFR 266 and 279.
Liquids	Boiler blowdown	Blowdown water can contribute to the solids content of plant wastewater discharges. Its impact on overall solids content of a waste stream is dependent upon the volume percent of the total effluent that this waste stream represents. Total dissolved solids in boiler blowdown can range from 4000 to 5000 mmhos and pH ranges from 10.5 - 12.	NPDES permit requirements or pretreatment permit requirements and General Pretreatment Standards at 40 CFR Part 403.
Solids	Typically none		

3.1.7 CYCLONES

Process Description

A cyclone separates particles from a gas stream without the use of moving parts. A vortex is created by injecting gas into a cylinder equipped with tangential inlets and inertial separation removes the particles from the gas stream. Most cyclones have a double vortex path of the gas which expels particles along the cylinder walls and at the point the vortex changes direction. Particles drop into a hopper for removal.

Application

Cyclone separators are often used to remove heavier particles before further treatment. They are widely used collection devices for particles larger than 15 microns.

Equipment Description

The basic configuration for a cyclone is the tangential inlet, axial outlet, and axial dust outlet type unit. The performance of cyclone separators is primarily dependent on particle size. The collection efficiency increases with higher pressure drops. Higher pressure drops can be achieved with higher inlet gas velocities and unit features such as cyclone body length.

Pollutant Phase	Type of Emissions/Releases	Assessment Considerations (look at, look for, think about)	Regulations with which Unit/Process Must Comply
Gases/ vapors	Particulate matter; i.e., fugitive dust and uncontrolled fraction	Visually check for fugitive leaks. What is the collection efficiency? Does this match the permitted value?	There are no regulations that are applied specifically to baghouses; however, some states have State Implementation Plan (SIP) requirements governing their operation and maintenance.
Liquids	Typically none		
Solids	Collected particulate matter	Are the collected solids a hazardous or characteristic waste? This determination is made based on process knowledge or laboratory testing as described in 40 CFR Part 261.	Reference RCRA and solid waste regulations (summarized in Appendix D).

3.1.8 ELECTROSTATIC PRECIPITATORS

Process Description

Electrostatic precipitators (ESPs) use an electrostatic field to charge particulate matter contained in a gas stream. The charged particles then migrate to a grounded collecting surface. The collected particles are dislodged from the collection surface by vibrating or rapping the collector surface.

Application

ESPs are capable of >99% collection efficiency for very small particles (1 micron to 70 micron diameter particles). ESPs can treat dry or wet particles. ESP control efficiency is sensitive to variable gas stream conditions, such as dust loading, dust size, flow rate, humidity and temperature. ESP control efficiency is also sensitive to ESP design and operating parameters such as gas volumetric flow rate to collection plate surface area ratio, discharge wire to collection plate voltage and current, collection plate rapping frequency and intensity, and collection plate and wire alignment.

Equipment Description

ESPs can be classified as single stage and two stage and/or as wet or dry systems. Plate-wire precipitators are used to treat high volumes of gases. The predominant type of system in industrial applications is the dry, single stage system. In wet systems the particles are removed by washing the sides of the ESP with water. A potential disadvantage to wet ESPs is that the collected waste stream may present a solids and liquid handling problem. Two stage systems were developed to clean air in conjunction with institutional, commercial, and industrial air conditioning systems and are not widely used in the SOCMI.

Pollutant Phase	Type of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gases/ vapors	Particulate matter; i.e., fugitive dust and uncontrolled fraction	Visually check for fugitive leaks. Review recent emission measurement tests to determine the collection efficiency and emission rate for comparison to match the permitted value? Compare discharge voltage and current to conditions during emissions testing and permitted conditions. Verify that all discharge transformers are in operation. Review opacity monitoring measurement records (if applicable) for conformance with permitted limits. Confirm operation and maintenance of device. Follow the procedures outlined in the applicable operation and maintenance plan.	There are no regulations that are applied specifically to ESPs; however, State Implementation Plan (SIP) requirements, state regulations, state permit conditions and Federal regulations may apply to the process or operating unit governing their emission rates, monitoring, record keeping, reporting, operation and maintenance. Operation and maintenance plans may be required by state regulations.
Liquids	Liquids from the operation of a wet ESP	Liquids generated by wet ESPs are typically sent to a separation device where solids are separated out and the liquid is then recycled to the ESP.	Typically, no liquid discharges.
Solids	Collected solids	Are the collected solids a hazardous or characteristic waste? This determination is made based on process knowledge or laboratory testing as described in 40 CFR Part 261.	Reference RCRA and solid waste regulations (summarized in Appendix D).

3.2 WASTEWATER TREATMENT RESIDUALS AND APPLICABLE REGULATIONS

Treated Effluent

The primary goal of wastewater treatment is to remove unwanted pollutants such that the treated final effluent complies with wastewater discharge permit limitations. Federal wastewater regulations (e.g., 40 CFR Part 414 effluent limitations guidelines and categorical pretreatment standards for organic chemicals, plastics, and synthetic fibers manufacturers) are not specific to treatment units. That is, all things being equal, two facilities treating identical wastestreams using different treatment technologies are both required to meet the same effluent limitations. Similarly, wastewater regulations do not specify the type of treatment technology required. It is the facility's responsibility to determine how it will comply with its discharge limitations. As such, applicable wastewater regulations described here are independent of the specific wastewater treatment units described later in this section.

There are local differences in permitting that will alter effluent limitations between facilities. For discharges to streams, NPDES permits (pursuant to 40 CFR Part 122) should account for any Federal effluent limitations guidelines (40 CFR Part 414 for organic chemical manufacturers), water quality concerns for the receiving stream, and any facility specific conditions not already addressed (i.e., permit writer's best professional judgement). For discharges to sewers, permits typically include Federal categorical pretreatment standards (similarly, 40 CFR Part 414 for organic chemical manufacturers), general and specific prohibitions of the General Pretreatment Regulations (40 CFR Part 403), and any local discharge limitations imposed by the sewerage authority as identified in a sewer use ordinance or similar authority. In some instances, dischargers to local sewer authorities may not be issued a wastewater discharge permit. These facilities are required to comply with the applicable categorical pretreatment standards, General Pretreatment Regulations, and any local sewer use ordinance requirements.

Often, wastewater discharge permits will include multiple requirements for different wastewater streams and outfalls, even to the point that internal outfalls may be regulated. The basic premise of this approach is that the complexities and variations of the requirements for different facility operations (both process and non-process) often can be simplified by applying the requirements at various locations throughout the facility. Since 40 CFR Part 414 requirements only apply to process wastestreams, discharge requirements for outfalls that include both process and non-process wastewater must be adjusted to account for these nonprocess "dilution" streams.

Liquid Residuals

Typically, liquid residuals (other than treated effluent) are generated as a result of tertiary treatment operations. The primary exception to this is the removal of oil using separation techniques. Liquid treatment residuals can be characterized as either aqueous or organic in nature.

Aqueous residuals are typically high solids streams generated as a result of cleaning or backwashing of treatment units. Two common sources of aqueous residuals are backwashes from carbon adsorption and filtration units. If discharged, backwash, as with any other aqueous residual, must meet applicable effluent limitations. Since the intent of tertiary treatment is to remove these unwanted pollutants, these streams are not discharged directly. Typically, these streams are processed further (e.g., settled to remove solids) with the resultant effluent returned to the treatment process. In some instances, the backwash or cleaning water may be hauled offsite for treatment or disposal. These wastes, including any residual solids, must be characterized to determine if hazardous waste regulations (40 CFR Parts 261-266) or land disposal restrictions (40 CFR Part 268) apply, and managed accordingly. In addition, state hazardous and solid waste regulations may further regulate the management and disposal of these wastes.

Organic residuals are generated from two main treatment technologies, oil separation and steam stripping. These wastes are often incinerated on-site, recycled, or sent off-site for reprocessing or disposal. Applicability of the hazardous waste regulations should be made for all organic wastes for both characteristic (e.g., ignitability) and listed (e.g., spent non-halogenated solvents) hazardous wastes. A determination of the applicability of the hazardous waste regulations for recycled streams is also necessary. Note that specific requirements exist for hazardous wastes burned in boilers and industrial furnaces (40 CFR Part 266, Subpart H). Facilities that use oil separation techniques for wastewater treatment should determine whether the Part 279 used oil regulations apply, particularly where used oil is reprocessed or burned on-site for energy recovery. Additionally, storage of used oil or recovered organic liquids in underground storage tanks (USTs) may be subject to 40 CFR Part 280 UST requirements.

Solids and Sludges

Treatment of wastewater can generate a variety of solid wastes and sludges. Generation of these solids typically occur for one of two reasons: solids are generated continuously as a result of the physical separation from the wastewater as intended by the treatment process (e.g., grit removal and clarification) or solids accumulate in the treatment unit over time, requiring periodic removal (e.g., lagoons and neutralization). In most instances, solid waste is treated onsite to reduce its volume and render it inoffensive before disposal. Sludge treatment techniques include thickening, stabilization, conditioning, and dewatering. In any instance, the facility should assess whether the solid residual is a hazardous waste as defined in 40 CFR Part 261, and if so, manage accordingly pursuant to 40 CFR Parts 262-266 and 268. Some of the common solid hazardous wastes generated from wastewater treatment in the organic chemical industry include metal hydroxide sludges from chemical precipitation and spent carbon from activated carbon adsorption.

Air Emissions

Volatile organic compounds are emitted from wastewater beginning at the first point that wastewater comes in contact with air. Sources of emissions to the air include flumes, sumps, sewers, junction boxes, open storage tanks, screens, settling basins, equalization basins, pH adjustment stations, nutrient addition stations, biological treatment systems, air or steam strippers lacking overhead or product recovery, and any other units in contact with the air. Air emissions tend to be greatest where wastewater is turbulent (i.e., aeration, mixing, pumping, and bends in collection systems).

For facilities that have benzene in its wastes, 40 CFR Part 61, Subpart FF NESHAPs (National Emission Standards for Benzene Waste Operations) may apply. These requirements regulate both the design and allowable emissions from various wastewater treatment units, including surface impoundments, containers, tanks, individual drain systems (e.g., junction boxes and flumes), and oil-water separators. In addition, 40 CFR Part 63, Subpart F sets procedural requirements for facilities that generate maintenance wastewaters (e.g., heat exchanger descaling and reactor cleaning) containing organic HAPs. These procedures should include a description of wastewater generation and management activities to control the emissions from these wastes. The hazardous organic NESHAPs (HON) rule, as codified at 40 CFR Part 63, Subpart F, regulates organic Hazardous Air Pollutants (HAP) emissions from process wastewaters. Similar to the benzene waste operations, specific requirements are outlined for wastewater from tanks, surface impoundments, containers, individual drain systems, oil-water separators, treatment processes, and control devices. For most organic chemical facilities, these regulations will be applied through a state-issued permit.

3.2.1 PRIMARY TREATMENT TECHNOLOGIES

Equalization

Process Description: Flow equalization is a preliminary process used to control the characteristics of wastewater influent through a treatment process. Industrial operations typically generate a wide variation of wastewater flowrates and strengths during a work day. Equalization facilities are structures designed to provide sufficient retention time to allow these fluctuations in wastewater flow and characteristics to be dampened before subsequent treatment processes.

Application: Depending on the nature of the industrial operation, wastewater flows may be generated as batches or in cyclical periods during the work day. Equalization is best suited to facilities that have a high peak flow to average flow ratio. The peak flows can be high volume or high strength contributions. Additionally, wastes with potentially toxic or inhibitory compounds are more in need of equalization prior to biological treatment to minimize negative effects on subsequent treatment units.

Equipment Description: Equalization is typically performed in either steel or concrete tanks or lined basins. The size of the unit is based on the variation of the peak conditions from the average flowrates and characteristics. Equalization equipment can either be located in-line with or off-line from the other treatment system components. In-line systems provide a dampening effect on the instantaneous flows before the component effluent is conveyed to subsequent components. Off-line units provide storage for excess flows and meter the wastewater into the treatment system. Equalization units may include mechanical mixing, aeration, or baffles to keep solids from settling or to prevent wastestreams from separating. Additionally, facilities for removing solids and oils that tend to adhere to the walls should be provided.

Types of Releases: Residual solids carried into the equalization system may build up on the bottom and have to be removed periodically. Solids or oils may cling to the walls of the unit and have to be physically removed. Also, wastewaters at elevated temperatures entering the system may emit volatile compounds to the atmosphere.

Assessment Areas: Determine if storm water flows discharge to equalization and, if so, whether the basin is properly sized to handle these flows.

- Verify equalization is suitable to handle fluctuations in both wastewater flow and concentration of pollutants of concern.
- Evaluate areas around floating aerators for erosion.
- Evaluate for signs of overlapping of liquids over edge of tank or basin (i.e., adequate freeboard).
- Are there septic odors emanating from equalization? If so, determine if unit receives adequate aeration and mixing.
- Evaluate influent and effluent monitoring data (e.g., pH, flow, and TOC) to verify effectiveness of equalization.

Neutralization

Process Description: Neutralization involves the addition of an acid or base to wastewater to alter the pH of a wastewater stream.

Application: Neutralization of highly acidic or basic wastewaters is necessary for several reasons: 1) to precipitate heavy metals, 2) to prevent corrosion of subsequent equipment, 3) to improve treatment efficiency, 4) to provide a recyclable wastestream, and 5) to reduce the detrimental effects on the receiving stream or collection system. For example, biological treatment systems operate most effectively at a pH near 7 (neutral). Small deviations from this value can have large impacts on the treatment effectiveness. As such, acidic or alkaline wastewaters often have to be neutralized as a preliminary treatment step prior to biological treatment. Similarly, treated effluents typically are required to meet pH limitations at the discharge point, often requiring neutralization to comply with these limits.

Equipment Description: Neutralization typically occurs in a collection tank(s) or rapid mix tank(s) where a neutralizing agent (commonly sulfuric acid or lime) is introduced. The process typically occurs in one, two, or three stages (i.e., tanks). The selection of neutralizing agent is dependent on cost, availability, ease of use, reaction by-products, reaction rates, and quantities of sludge formed. A pH controller is installed in the tank to control the rate that the waste is neutralized. Storage facilities are required for the acids and bases as these are often used in large quantities. Often, facilities are able to use waste acids or bases to neutralize other wastestreams.

To maximize pH control, the influent and effluent points should be at opposite sides of the reaction tank, preferably with one at the top of the tank and one at the bottom. Also, baffles in the tank can improve mixing and, hence, pH control.

Neutralization can be highly reliable if proper monitoring, control, and pretreatment to control interfering substances (buffering agents) are provided. Additionally, because of the harsh environment, maintenance of pH equipment is of utmost importance in consistent neutralization.

Types of Releases: Residual solids carried into the equalization system may build up on the bottom and have to be removed periodically. Solids or oils may cling to the walls of the unit and have to be physically removed. Also, wastewaters at elevated temperatures entering the system may emit volatile compounds to the atmosphere during mixing. Finally, neutralizing chemicals, such as lime, can generate dust during handling and mixing activities.

Assessment Areas: Verify that the pH is measured at the influent and effluent of the neutralizing unit at points representative of the influent and effluent.

- Is the system able to handle all routine discharges, including batch dumps?

- Verify that maintenance/calibration schedules are available and adhered to for cleaning, replacing, and calibrating pH probes. Are these schedules consistent with those recommended by the probe manufacturer?

- Does the neutralization process generate solids that must be removed from the process? If so, what is the process for removing these solids?

- Is the final effluent pH monitored continuously and if so, is this consistent with any permit requirements?

Screening

Process Description: Screening is a preliminary treatment process to remove large solids from wastewater before subsequent treatment processes. Screenings are removed at the front end of the treatment train to prevent this material from clogging or damaging pumping systems, piping, etc.

Applications: Screening units are utilized on wastewater streams that contain coarse organic or inorganic solids.

Equipment Description: Screening units are mechanical drum or disk-type systems that allow wastewater to pass through selected openings. Objects larger than the openings (typically 6-20 mm) are retained on the screening unit and removed by a manual or automatic scraper mechanism. Fine screens may have openings smaller than 6 mm. Screenings are removed from the liquid through rotation of the screen and collected in hoppers or tanks for disposal.

Types of Releases: Screened solids are generated from the screening process that are removed from the process using a water spray. Therefore, these solids will contain some amount of free liquid. Also, screening of wastewaters containing VOCs will generate air emissions of these volatile compounds.

Assessment Areas: Are solids/oils building up on the screen that cannot be removed by the mechanical scraper or spray nozzles?

- Is the solid loading rate to the screening device consistent with the unit design specifications?
- Are there tears in the screen?
- Are spray nozzles directed at the screens such that the entire screen area is being cleared of solids?
- Are solids removed from the screening unit hazardous? If so, how are these solids managed?

Grit Removal

Process Description: Grit removal is a process of separating heavy inorganic solids from a wastewater stream. Grit removal facilities are in-line units of various size and shapes designed to slow down the velocity of the wastewater stream to allow the heavier particles to settle out. Removal of this material enhances the performance of the remaining treatment components and protects equipment from damage as a result of abrasion or from formation of heavy deposits within the system. Grit removal chambers are located at the front of the treatment train with the screening unit.

Application: Grit chambers are used for wastewater streams that convey heavy inorganic material that may be flushed into the collection system and conveyed to the treatment process. This is particularly common in older collection systems.

Equipment Description: Grit chambers are typically large concrete tanks designed to slow the flow of the wastewater to detention time of about 1-3 minutes. The units should be designed to provide for a uniform cross-sectional velocity. Heavy inorganic solids are separated from the wastewater by creating a quiescent zone for the solids to settle or by the addition of air to reduce the buoyancy of the liquid. Characteristics of the wastewater and the removal goals determine the configuration of the grit facilities. The units contain hoppers or channels in the bottom to collect settled solids. Solids are removed by hydrostatic pressure or mechanical equipment.

Types of Releases: Grit from the bottom of the chamber will contain free liquid. Air emissions of volatiles will also be generated from the process, although these emissions are expected to be less than in other treatment operations. There may be air emissions from subsequent grit washing, if applicable.

Assessment Areas: Does the scraper mechanism cause turbulence in the water as it rotates through the chamber?

- Is operation of grit collection manual or automatic? If manual, is there a schedule, with log, documenting grit removal?

- Are chain tensions, scraper flights, guide vanes, etc. inspected and maintained on a regular basis? Are records available?

Oil Separation

Process Description: An oil separation system is used to remove oils and grease from wastewater. Oil may be present as free or emulsified oil. The separation of free oils occurs by gravity and normally occurs by allowing oils to float to the surface of the water where the oil is skimmed off by mechanical means. Emulsified oil must first be "broken" using chemicals (typically acid) and/or heat to generate free oil. The free oil can then be removed using skimming techniques.

Application: Oil separation is used to recover oil for use as a fuel supplement or for recycle, or to reduce the concentration of oils in the wastewater (either to comply with effluent limitations or to prevent deleterious effects on the treatment system or environment). Oil removal may also remove toxic organic chemicals that tend to concentrate in oils and grease.

Equipment Description: The principal design considerations for an oil removal system include; 1) the amount of oil to be removed, 2) the oil droplet distribution, 3) the presence of emulsifiers, 4) the specific gravity of the oil, 5) wastewater temperature, and 6) suspended solids concentration.

The separation of free oils and grease typically occur in a concrete holding tank and allow the oils to float to the surface. The oil is skimmed off the surface mechanically with a rotating drum- or belt-type skimmer. Typically, emulsified oils are pretreated with acid and/or polymer at an elevated temperature in an enclosed steel tank to break the emulsion and free the oil.

API separators and parallel plate interceptors are two of the most common types of gravity type oil removal systems. API separators allow for retention of oily wastewater in a tank for a specified period of time to allow the oils to rise to the surface where they can be skimmed off. Parallel plate interceptors consists of a series of parallel plates in a tank that act to calm the flow and reduce the distance that the oil particle has to travel to be removed. Use of plates allow for more efficient use of space.

Types of Releases: Oil removed from the separator may be able to be reprocessed, used as a fuel supplement, or disposed of. Vapors (especially for heated emulsion breaking processes) will be emitted from the oil removal process. In addition, it is possible that sediment buildup in the separator may have to be removed periodically.

Assessment Areas: Look for noticeable floating oils discharging from the separator.

- Determine if recovered oil is considered a hazardous waste and if so, managed appropriately.

- Evaluate oil separator efficiency during peak flows to verify proper sizing of unit (i.e., no overflow of oil into the effluent).

- For emulsion breaking oil removal, compare bench scale treatability testing results with plant processes to verify consistent oil removal.

- Addition of heat to the emulsion breaking process will likely generate excess emissions to the atmosphere. Since toxic organics may be dissolved in the oil phase, the need for emission control should be seriously considered.

Flotation

Process Description: Flotation is the process of removing suspended matter from wastewater by introducing fine gas bubbles that adhere to the particles, reducing their specific gravity, and thus carrying these particles to the surface of the wastewater. Flotation is effective on suspended matter since this material has a specific gravity comparable to water (i.e., neither floats to the surface or settles to the bottom). Often chemicals are added to enhance the removal process. The three most common flotation methods are dissolved air flotation (DAF), air flotation, and vacuum flotation. By far, DAF is the most frequently used of the three. DAF operates by injecting air into pressurized wastewater (supersaturated with air) causing fine bubbles to form as the pressure is reduced. Air flotation occurs through simple aeration, typically through a diffuser. Vacuum flotation indicates the process where wastewater is saturated with air prior to application of a vacuum to the wastewater, causing the release of air bubbles.

Application: Flotation is used to remove suspended solids that have poor settling characteristics, to remove suspended oils and greases, or to concentrate wastewater treatment sludges. Flotation is also appropriate for application during peak loads, such as during storm events.

Equipment Description: Flotation equipment includes an external contact tank within which air is introduced into the wastewater under pressure. This super-saturated wastewater then passes through a pressure relief valve where the pressure dissipates. As the wastewater equalizes to atmospheric, fine air bubbles form and rise to the surface of the tank. As these bubbles rise, they attach to the suspended particles and oils, increasing their buoyancy and causing them to rise to the surface.

In DAF, air is introduced into one of three streams, the total influent, partial influent, or recycled effluent. Recycled effluent (20-50 percent of total flow) is the most common with chemical added to the influent stream. This prevents the floc from being destroyed by the pressurizing and depressurizing of the wastewater. Mixing of the recycled effluent, chemicals, and influent typically occurs in-line just prior to being introduced to the inlet well. Multi-cell DAF units are common, where a portion of final effluent is removed, re-saturated with air, and introduced into each of a number of serial DAF chambers within the DAF unit. This provides multiple passes of air through the wastewater, thereby increasing contaminant removal.

A skimmer at the surface collects the floating oily solids while settled solids are removed from the bottom of the flotation unit.

A DAF unit thus consists of the following pieces of equipment: a pressurizing pump, an air-injection system, a saturation vessel, a pressure relief valve, a chemical addition system, and a flotation chamber.

Types of Releases: Vapors (including odors) are emitted from the flotation process, and depending on the constituents in the wastewater, these emissions may have to be controlled. Skimmed aerated sludge from the flotation process is generated and must be disposed. In addition, solids will settle on the bottom of the flotation unit and likely must also be managed as a waste.

Assessment Areas: Compare bench scale treatability testing results with plant processes to verify consistent removals. Overuse and underuse of chemicals can reduce the effectiveness of the system.

- Evaluate mechanical scrapers and drive mechanisms for wear and replace as necessary.
- Verify that skimmer is level and removing froth from flotation unit.
- Evaluate flotation unit for signs of short circuiting that may reduce its efficiency.

Chemical Precipitation

Process Description: Chemical precipitation is a chemical process by which soluble metal ions and certain anions are converted to insoluble form for subsequent removal. The process is accomplished through pH adjustment of the wastestream to form metal hydroxides that are relatively insoluble at elevated pH levels. Chemical precipitation is the primary method for removing metals from wastewater. Most metals are relatively insoluble as hydroxides, sulfides, and carbonates, and can be precipitated in one of these forms by chemical addition. Hydroxide precipitation (through addition of caustic soda or lime) is the most common of the techniques. By adding the proper amount of chemical to adjust the pH to the level where metal hydroxides are the least soluble, these metal hydroxides can be precipitated and removed. Sulfide precipitation, through the addition of hydrogen sulfide, sodium sulfide, or ferrous sulfide, is also effective for removal of metals from wastewater. Chemical precipitation may be preceded by cyanide destruction or hexavalent chromium reduction where these pollutants are also of concern.

Application: Chemical precipitation is a proven technique for removing heavy metals from wastewater. It is suitable for automatic control and can remove a large variety of metals down to near trace concentrations. Depending on the volume and generation rate of the wastestream to be treated, this process can be either batch or continuous. Chemical precipitation may be limited in the organic chemical industry because of the presence of chelating agents and complexed metals ions. In these circumstances, additional pretreatment to destabilize the complex may be necessary. One of the effective techniques for removal of complexed metals is sulfide precipitation (using ferrous sulfide).

Equipment Description: Chemical precipitation is typically carried out in four phases; 1) chemical addition, 2) rapid mixing, 3) slow stirring to promote particle growth, and 4) clarification to remove the flocculated solid particles. Treatment chemicals are added to raise pH (along with polymers that promote floc growth) in a rapid mix tank. Often, pH adjustment occurs in a two stage process to allow for closer control of pH. In line baffles, blenders, and pumps may be used to improve mixing. After the rapid mix, the wastewater flows to a clarifier (often a lamella inclined plate type clarifier) where the solids are settled and removed.

Types of Releases: Chemical precipitation will generate a hydroxide or sulfide sludge that must be disposed. Often, this sludge is passed through a filter press to remove excess water. Filtrate should be returned to the chemical precipitation process for further treatment. Also, the addition of lime to wastewater can generate lime dust around the rapid mix tank.

Assessment Areas: Verify that chemical addition occurs in a well mixed environment.

- Ensure that pH is adjusted to a point that promotes the greatest removal for the contaminants of concern in the waste.

- For continuous systems, compare fluctuations in flow and concentration (e.g., during batch dumps to the system) with actual treatment performance data to ensure that the system is capable of handling the increased loads.

- Are the acids and bases used in the treatment process stored behind berms or in locations that will minimize danger from spills or ruptures?

- Are solids overflowing the clarifier, indicative of improper design, operation, or maintenance of the treatment system?

- Are laboratory study results available demonstrating appropriate quantities of polymers to add to improve flocculation?

- Are any non-metal bearing wastestreams being treated by chemical precipitation that could be segregated from this system?

- Are pH probes maintained and calibrated on a regular schedule?

3.2.2 SECONDARY TREATMENT TECHNOLOGIES

Activated Sludge

Process Description: The activated sludge process is a biological treatment process whereby microorganisms use the organic content and oxygen in the wastewater to grow, leaving an end product of carbon dioxide and water. The process is characterized by suspended aerobic and facultative microorganisms maintained in a homogeneous state by mixing (either mechanical or diffused air). The microorganisms oxidize soluble organics and agglomerate colloidal and particulate solids in the presence of dissolved oxygen. The aeration process occurs in an aeration basin that is followed by sedimentation to settle the biological sludge from the wastewater. The majority of the waste sludge is recycled back to the head of the activated sludge process where it is mixed with influent and fed back into the aeration basins. A small percentage of the waste sludge is removed and sent to sludge processing.

Application: The activated sludge process is extremely versatile and can be adapted for a wide variety of organic wastewaters. It is the most widely used biological treatment process for wastewater. The key design variables include organic loading (i.e., food to microorganism ratio), sludge retention time, hydraulic or aeration detention time, oxygen content, and a temperature dependent reaction rate constant (K). Modifications to the process are common and have been identified by the major characteristics that distinguish their configuration. These include; conventional, complete mix, tapered aeration, step aeration, high rate activated sludge, pure oxygen, extended aeration, contact stabilization, and oxidation ditch activated sludge. Each of these options provide unique opportunities for maximizing the process efficiency for any given organic wastewater.

Equipment Description: The conventional activated sludge treatment process consists of one or more long rectangular concrete tanks with air diffusers on one side of the tank bottom (for mixing and aeration). Raw wastewater and return activated sludge (i.e., recycled from the end of the process) enter one end of the tank and flow in a spiral flow through the tank. More air is added at the head of the tank where biological activity is greatest. Modifications to the conventional process affect where raw influent enters the system, where sludge is returned to the system, and how the wastewater is aerated. In addition, some systems use high-purity oxygen rather than air, which reduces the size of the tanks necessary for treatment.

Types of Releases: Volatile emissions are generated from the aeration process. No other emissions will be generated in this process.

Assessment Areas: Is dissolved oxygen maintained at 1-3 mg/l, and preferably at least 2 mg/l?

- Verify that sludge blanket thickness is consistent with design specifications (e.g., less than one-fourth the clarifier sidewall water depth).

- Does a microscopic examination of mixed liquor identify undesirable organisms such as filamentous bacteria?

- Verify that all underwater instrumentation is checked, calibrated, and cleaned on a regular basis.

- Is foam in activated sludge system a medium colored tan? Too light (mixed liquor suspended solids too low) or too dark (sludge retention time too long) is indicative of poorly operated systems.

Lagoons

Process Description: Lagoons are earthen ponds designed for biological treatment of wastewater. While in the pond, wastewater is biologically degraded to reduce organics and reduce suspended solids by sedimentation. The biological process may be aerobic, anaerobic, or both depending on pond design.

Application: Low construction and operating costs make lagoons a common treatment method in locations where sufficient land is available at a reasonable cost. Lagoons are used for stabilization of suspended, dissolved, and colloidal organics and may be aerobic, anaerobic, facultative, or aerated. A pond system may consist of some combination of these pond types. For example, high strength wastes may be treated in an anaerobic pond, then a facultative pond, and finally an aerated pond.

Equipment Design: Lagoons are typically clay-lined earthen ponds with a surrounding earthen dike. Design commonly includes three ponds in series with effluent discharged to a concrete splash pad. Often, lagoons will be baffled to separate a single pond into multiple functional units. Lagoon performance is dependent upon detention time, temperature, and nature of the waste.

Aerobic lagoons are shallow ponds (less than 1 foot deep), usually lined, that contain dissolved oxygen throughout the pond. Organic degradation occurs from aerobic bacterial oxidation and algal photosynthesis. Aerobic lagoons are most applicable to wastewaters with a low suspended solids content and are often used after another type of biological treatment process.

Anaerobic lagoons are relatively deep (up to 20 feet) with steep sides. This provides for maximum volume to surface area ratio. By maintaining an elevated organic load in the lagoon, an almost completely deoxygenated environment is achieved. Floating material on the surface of the pond (e.g., algae) may allow for more complete anaerobic conditions. Anaerobic lagoons are more resistant to shock loads and can handle elevated organic and suspended solids loadings. Typical organic removal rates are in the 70-80 percent range. Typically, anaerobic lagoons are designed with influent entering the bottom (usually in the center of the lagoon), where it mixes with the active mass in the sludge blanket. Discharge occurs out the side through a submerged effluent point. Additional treatment operations are often performed on the anaerobic lagoon effluent.

Facultative lagoons are the most common type of biological treatment lagoon and are typically 3-8 feet deep, with a flat bottom, and have a retention time of 50-150 days. These types of lagoons remove about 75-95 percent of the incoming organic load. Small facultative lagoons may be designed for zero discharge of wastewater, other than by evaporation. The anaerobic condition of the bottom layer of facultative ponds provides for digestion of settled solids. Influent enters the center of the pond and effluent overflows in a corner (windward side). Operating several ponds in series helps to improve organics removal, most notably by minimizing short circuiting through the system. Pond levels are typically raised and lowered with the changing seasons to maximize efficiency and minimize problems (e.g., freezing, emergent vegetation).

Aerated lagoons are medium depth (8-12 feet) where oxygen is supplied through mechanical (e.g., surface aerators) or diffused air units. Aerobic units are designed to maintain complete mixing; therefore, subsequent solids settling and removal units are necessary. Overloaded aerated lagoons may become facultative if inadequate mixing is provided. Similarly, poorly mixed lagoons may also provide for anaerobic conditions.

Types of Releases: Volatile emissions from ponds may be an odor problem or, depending on process operations, may emit noxious fumes. These emissions are greatest in aerated systems and anaerobic systems (producing methane gas).

Some lagoons may accumulate solids over time and will have to be dredged, dewatered and disposed.

Assessment Areas: Examine effluent quality for turbidity, algal blooms, etc.

- For aerated lagoons, make certain that all aerators are functioning properly.
- Are there plants growing in the lagoon, indicative of low liquid levels or poor circulation of wastewater?
- Are there any signs of erosion, burrowing animals, etc. in dikes that may weaken the structure?
- Are storm flows drained to the lagoons, and if so, do these flows impact the overall performance of the lagoons?
- Are there offensive odors from aerobic or aerated lagoons that may be indicative of anaerobic conditions? If so, evaluate mixing and aeration systems for potential dead spots or short circuiting.
- Evaluate organic loading to lagoon and detention time of wastewater in the lagoon and compare with expected design criteria to identify potential design shortcomings.

Secondary Clarification

Process Description: Secondary clarifiers follow biological treatment, and in most instances are intended solely for removal of solids through settling. Secondary clarifiers are very similar in design to primary clarifiers, except that secondary clarification is intended to remove biological solids. For activated sludge systems, clarifiers must also provide a concentrated source of return activated sludge for process control. These tanks may be designed for natural settling or chemically aided settling.

Application: Secondary clarification is an integral part of the activated sludge process. As such, treatment systems utilizing activated sludge typically operate secondary clarification systems. In addition, biological systems such as lagoons may also require use of secondary clarification for solids removal.

Equipment Description: Secondary clarification basins are typically circular or rectangular of concrete construction. They are equipped with scrapers or suction type sludge removal units on the bottom of the basin. The scrapers are typically installed on smaller tanks (less than 50 feet in diameter) while the vacuum systems are used for larger tanks. Surface skimmers are also used to remove floating solids. Clarification basins are sized based on the overflow rate, taking into account peak flows. For secondary clarification following activated sludge, solids loading rate is also an important design consideration. Also, since secondary clarifiers are sensitive to variations in flow, the use of multispeed pumps for in-plant wastewater lift stations is often used where flow equalization is inadequate.

Types of Releases: The major release from secondary clarifiers is settled sludge. In settled sludge from clarifiers following activated sludge systems, a portion of this sludge is recycled back to the activated sludge process. Sludge that is not returned is disposed. Settled solids tend to attract organic constituents that can be emitted to the atmosphere where the settled sludge is dried prior to disposal. Also, scum removal from the surface of the clarifier must be disposed.

Assessment Areas: Are controls in place to regulate sludge blanket thickness?

- Is a relatively steady flow discharged to the clarifier?
- Look for signs of sludge floating to the surface of the clarifiers, indicative of improperly operated system.
- Examine secondary clarifier overflow for evidence of pin floc, indicative of excessive turbulence, toxic shocks, short-circuiting, etc.
- Examine weirs for fouling and verify that a routine cleaning and maintenance schedule exists and is adhered to.

3.2.3 POLISHING AND TERTIARY TREATMENT TECHNOLOGIES

Polishing Ponds

Process Description: Polishing ponds are shallow bodies of wastewater (usually 2 to 3 feet deep), used for the removal of residual suspended solids by sedimentation, typically used as tertiary treatment. Some biodegradation of organic material also occurs.

Application: Many facilities use ponds as the final treatment step in a series of operations. Often the ponds are not used as polishing ponds; rather, these ponds are used as equalization basins, where some level of dilution occurs prior to discharge, or as reaeration basins, to increase dissolved oxygen levels.

Equipment Description: Depending on the quality of influent and desired effluent, polishing systems can consist of one to several units in series. Polishing ponds are lined or unlined earthen basins with wastewater entering one end and discharging from the other.

Types of Releases: Some polishing ponds may accumulate solids over time which will have to be dredged, dewatered and disposed.

Assessment Areas: Examine pond influent and effluent structures for solids buildup that may act to channel flows through the system.

Determine whether storm water contributions (i.e., runoff) contribute to reduced retention time (i.e., reduced treatment efficiency) of treated wastewater.

Filtration

Process Description: Filtration is the process of removing suspended solids from a wastewater stream by passing the water through a granular media filter bed, a membrane, or, less commonly, through a wire mesh. The removal of solids occurs as the result of one or more mechanisms, such as straining, sedimentation, interception, impaction, and adsorption.

Application: Filtration is usually the final treatment step when requirements exist for consistently low suspended solids or metals levels in the treatment plant effluent. Filtration may also be used as a pretreatment for suspended solids reduction prior to other treatment processes, such as carbon adsorption, that may be adversely affected by suspended solids.

Equipment Description: Granular media filters consist of various media, such as sand, garnet, coal, or diatomaceous earth, placed in a contactor which allows the wastewater to flow through the media. One or more types of granular media may be used in concert; if more than one type is used, the types may be stratified or mixed. Flow through the contactor may be up, down, or bi-directional (with the effluent port in the middle of the contactor and influent introduced at the top and bottom). Filters may be gravitational- or pressure-driven. Periodic backwashing is necessary to remove the collected suspended solids. Spent backwash water, high in suspended solids, is typically routed to a process where settling may occur.

Membrane filters (such as those used in reverse osmosis and ultrafiltration) hare pore sizes small enough to remove not only suspended solids but also dissolved organic and inorganic impurities. Wastewater streams must be pretreated by pH adjustment and for removal of high suspended solids and certain organic and inorganic compounds to prevent rapid fouling or degradation of the membrane.

Types of Releases: Backwashing of filter media generates a concentrated wastewater that is approximately 1-5 percent of the volume of wastewater treated. Typically, this stream is discharged to a settling tank for solids removal with supernatant returned to the treatment process. Occasionally, all backwash is recycled back through the treatment process.

Assessment Areas: Examine effluent turbidity for signs of residual solids, which are indicative of inadequate chemical coagulation or the need for backwashing.

Review head loss of system over time for indication of bed plugging or inoperative surface wash or air scouring system.

If head loss rapidly increases after backwashing, evaluate adequacy of previous treatment steps and filter aid addition.

Examine backwash water for signs of filter media being removed from the system, indicative of excessive backwash flowrates or excessive turbulence in system causing air bubbles to form in system.

Examine records of length of filter runs to determine past surface clogging or excessive solids loadings that may be overloading the system.

Activated Carbon Adsorption

Process Description: Activated carbon adsorption is a physical separation process in which inorganic and organic materials are adsorbed onto the surface of the activated carbon media. Activated carbon is a specially prepared media that contains a very high surface area per unit volume. Carbon adsorption fixed bed systems also provide a second removal benefit as the result of the filtering effect of the granular carbon.

Application: Carbon adsorption systems have been shown to be practical and efficient for treatment of organics in wastewater. Carbon adsorption systems are most effective because of their ability to remove a large variety of organic chemicals. Compounds that are readily removed by activated carbon include aromatics, phenolics, chlorinated hydrocarbons, surfactants, organic dyes, organic acids, higher molecular weight alcohols, and amines. Activated carbon has also been effective for the removal of some metals and cyanide.

Equipment Description: There are two forms of activated carbon in widespread use, granular and powdered. Granular is used most often for wastewater treatment because of its ease of regeneration. Granular activated carbon is about 0.1 to 1 mm in diameter and is loaded into columns or beds. Wastewater either flows down or is forced up through the column or bed. There are many different design configurations of carbon contact columns and beds, including gravity or pressure flow, fixed or moving beds, and single or multi-stage arrangements. Typical operations consist of two or more columns in series with a spare column. As the first column reaches breakthrough (i.e., the concentration of the effluent exceeds the desired concentration), this column is taken off-line, the partially exhausted second column becomes the first column and the spare column becomes the second column. The column taken off-line can be cleaned and readied for use. When exhausted, carbon must be replenished, either through replacement or thermal regeneration. Regeneration systems are used at many larger facilities and consist of multiple-hearth furnaces to burn off organics and make the interstitial surface sites available for further treatment.

Powdered activated carbon is smaller than granular carbon (50-70 microns) and is usually mixed with wastewater to be treated. The carbon and wastewater is then mixed to allow adequate contact, and then settled or filtered. Typically countercurrent processes are used to maximize carbon efficiency.

Types of Releases: Granular activated carbon systems will produce a spent carbon that will either have to be hauled offsite for regeneration or disposal or may be regenerated onsite.

Assessment Areas: Verify that spent carbon is managed appropriately (i.e., hazardous waste, if applicable). Document rationale for hazardous waste determination.

- For granular activated carbon systems, determine procedures for identifying column breakthrough and verify that procedure ensures column replacement prior to actual breakthrough concentrations exist.

- For granular activate carbon systems, is pressure head loss monitored continuously and if so, are there demonstrated losses that may be indicative of column plugging?

- For powdered activated carbon systems, visually examine effluent for signs of carbon fines in the effluent that may go untreated.

- Are there indications of solids or oils in the influent stream to the carbon system that could hinder its performance?

Steam Stripping

Process Description: Steam stripping is a fractional distillation process used to remove volatile compounds from a wastewater stream. Stripping occurs because organics vaporize into the steam until its concentration in vapor and liquid is in equilibrium.

Application: Steam stripping is designed to remove individual volatile pollutants based on Henry's Law Constants (the higher the constant, the more easily stripped). The volatile component may be a gas or an organic compound that is soluble in the wastewater. Additionally, removal of immiscible compounds (chlorinated hydrocarbons) is performed via steam stripping. Steam stripping can be used as an in-plant process to recover organics from concentrated aqueous streams or as an end-of-pipe treatment for removal of organics in dilute wastestreams. Steam stripping is particularly effective for compounds that are required to meet trace levels.

Equipment Description: Steam stripping is typically performed in packed towers or conventional fractionating distillation columns (bubble cap or sieve tray) with multiple vapor/liquid contact stages. While packed towers are less expensive, tray towers are typically used in the chemical industry because of increased efficiency and ease of access for cleaning. Preheated wastewater enters around the top of the column and flows down through superheated steam rising up from the bottom of the column. The contact reduces the concentration of VOCs or gases in the wastewater as it flows down to the bottom of the column. Heat from the treated wastewater is used to preheat the feed to the top of the column. The height of the column and the amount of packing material and/or the number of metal trays along with steam pressure in the column generally determine the amounts of volatiles that can be removed. Steam exiting the top of the column is condensed and forms two layers of generally immiscible liquids. The aqueous layer is typically recycled back to the stripper influent with the volatiles recycled to the process, or disposed. For soluble organics, the condensed stream will likely have to be disposed.

Types of Releases: Stripping columns will have similar emissions as those described for distillation columns. The most obvious emission is the overhead waste stream of concentrated organic pollutants that have been stripped from the wastewater (approximately one percent of the volume of the untreated wastestream). This wastestream must be disposed, often by onsite incineration. Also, cleaning of the columns (for scaling or fouling problems) will generate waste solids and liquids.

Assessment Areas: Emission control should be provided for noncondensibles from the stripper.

- Check column efficiency over time for potential scaling/fouling problems.
- Evaluate temperature/pressure fluctuations over time for potential operational problems.
- For excessive scaling in column, evaluate pretreatment techniques that may reduce these problems.
- Determine whether the condensed overhead stream is a hazardous waste.

3.3 SOLID WASTE TREATMENT AND DISPOSAL PROCESSES/ EQUIPMENT

3.3.1 ON-SITE SOLID WASTE LANDFILL

Unit Description

A solid waste landfill is an area of land or an excavation in which unwanted residual solid or semisolid wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile. Solid waste landfills require a permit to be installed and operated from the state in which they are located. A landfill is distinguished from an open dump in that an open dump is a facility for the disposal of solid waste that does not comply with the requirements of 40 CFR Part 257.

Many states have regulations specific to on-site solid waste landfills that exist exclusively for disposal of materials from the on-site facility.

Application

Solid waste landfills are used for disposal of solid waste. Solid waste generally includes any garbage, refuse, sludge and other discarded material, including solid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations. Solid waste generally does not include waste regulated under the Clean Water Act, such as solid or dissolved materials in domestic sewage, or solid or dissolved material in irrigation return flows, or industrial discharges which are point sources subject to NPDES permits. Solid waste also does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954.

Solid waste is produced by many processes in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). For example, sludges removed from tank bottoms during periodic cleaning; spent catalysts discarded as solid wastes from reactors; scale and settled solids from condensers, evaporators, pipes, valves and connectors; and filter cakes from the filtration process are all solid waste.

Equipment Description

Solid waste landfills can be natural attenuation type landfills or containment type landfills. Natural attenuation type landfills are older landfills that were developed before implementation of design standards currently established under federal and state requirements. They have no liner, and minimum design requirements, if any exist, are usually a minimum allowable thickness of unsaturated zone, a minimum depth to bedrock, and a minimum distance to the nearest well.

Containment type landfills usually have at least a single liner, leachate collection system, and extensive geologic location restrictions.

Natural attenuation landfills are currently prohibited from use in many areas by state or local regulations or geographic restrictions.

Elements of containment type landfills that need to be considered during design and operation include leachate collection systems, synthetic membranes, berms and berm design, stormwater routing, stability of waste slope, access to the landill, landfill cover, gas venting system, and geographic location/restrictions.

Pollutant Phase	Potential Sources of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gas/vapor	Methane gas from decomposition of organic material; hazardous air pollutants; criteria air pollutants; odor	At least quarterly monitoring for methane gas State SIP provisions must not be violated - check monitoring reports against limits established in individual permits to operate; open burning is prohibited - look for signs of open burning At least six inches of cover must be placed over fill daily at a minimum or at more frequent intervals as necessary to control odor	40 CFR 258.23 and -.24 - explosive gas control and air criteria 40 CFR 258.21 - cover requirements
Liquid	Surface water run-off during a storm; leachate outbreaks; leachate management; groundwater migration	Proper operation and maintenance of landfill to prevent run-on to the active portion of the facility during peak discharge from a 25-year storm Proper operation and maintenance of system to collect and control run-off from active portion of the facility for the water volume of at least a 24-hour, 25-year storm That no seeps, liquids, or areas of soil discoloration are present on graded or completed surfaces of the landfill That run-off is discharged in accordance with NPDES permit requirements and Clean Water Act requirements for wetlands and water quality management plans That no liquid waste is placed into the landfill Proper operation and maintenance of liner and leachate collection system designed to maintain less than a 30 cm depth of leachate over the liner (new landfills or as specified in permit to install or operate) Proper implementation of groundwater monitoring requirements as specified for the individual facility in its permit or license	40 CFR 258.26 - surface water run-on and run-off control 40 CFR 258.28 - liquids restriction 40 CFR 258.40(a)(2) - leaschate collection system 40 CFR 258.40 - liner requirements 40 CFR Part 258 Subpart E - groundwater monitoring requirements and corrective action

Pollutant Phase	Potential Sources of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Solid	Litter; disease vectors; dumping of waste outside of active portion of landfill	At least six inches of cover must be placed over fill daily at a minimum or at more frequent intervals as necessary to control litter and disease vectors Access is appropriately restricted so that no illegal dumping can occur Confirm that procedures are in place for detecting and preventing the disposal of regulated hazardous wastes (assessment records, training) Review daily log; assessment records; training procedures; notification procedures; gas monitoring results and any remediation plans; leachate arrangements; groundwater monitoring records and plans as required; closure and post-closure plans; evidence of financial responsibility; and information demonstrating compliance with small community exemption	40 CFR 258.21 - cover 40 CFR 258.40 - liner requirements 40 CFR 258.25 - access requirements 40 CFR 258.20 - procedures for excluding receipt of hazardous wastes 40 CFR 258.29 - record keeping requirements

3.3.2 SLUDGE INCINERATION

Process Description

Any of several types of incinerators can be used to treat either RCRA hazardous or nonhazardous sludge, among which are liquid injection systems, stationary and mobile rotary kilns, or fluidized-bed thermal oxidizers (circulating-bed combustors). The basic sludge incineration process is the same for each: sludge feed is placed into an incinerator, along with air and auxiliary fuel, that then produces ash and gases and combustion products. Scrubbers may be used to clean gases formed in the incinerator, generating wastewater that requires proper treatment and discharge. Baghouses for the reduction of particulates in off gases from sludge incineration may also be employed. During sludge incineration the organics are fully oxidized, which is the goal of sludge incineration.

Some drawbacks occur with thermal treatment. Sometimes dangerous gases are formed, such as hydrochloric acid from polyvinyl chloride plastics. Some materials only burn at extremely high temperatures. Also, toxic air emissions may create air quality problems and health concerns.

Application

Use of liquid injection incinerators for sludge incineration is limited to sludge that can be pumped (properties of sludge and equipment design determine percent solids content that can be handled by incinerator), although the liquid injection technology is the most extensively used incineration method. Liquid injection incinerators are useful for handling various liquid waste streams generated by the chemical process industries.

Rotary kiln incinerators are more versatile than liquid injection incinerators, in that rotary kiln incinerators can simultaneously burn liquids, slurries and solid wastes.

The fluidized-bed thermal oxidation process allows gas-solid contact, consistent temperature control, and control of residence time. It is used extensively for calcining, catalytic cracking of heavy oils, cooling, coal gasification, drying, and combustion. This technology also can handle solids, liquids and sludges.

Equipment Description

Generally, for organic waste incineration, waste characteristics determine incinerator design. Wastes occur in nonaqueous organic, aqueous organic with ash (salt), and aqueous organic without ash forms. Aqueous organic wastes can be mixed with inorganic wastes. However, inorganics are not destroyed during incineration. Factors determining whether the organics are oxidized per waste stream are temperature, time, and atomization or mixing.

Different components of a thermal treatment system are: a system for handling materials and feeding them into the incinerator, along with controls for fugitive emissions and spills; a combustor with an emergency vent system; a system for managing ash, along with fugitive emission controls; a system for cleaning gas that collects small particles and acids; a wastewater treatment and disposal system; a process control system; and a continuous emission monitoring system.

Thermal treatment is a two stage process. Solids and other wastes are treated in the primary stage. Gases produced in the primary stage are treated in the secondary stage, along with other liquid wastes.

During the primary stage a wide range of operating conditions can be employed. The primary stage can be performed in an oxidative mode, a pyrolytic mode, or a desorption mode. The oxidative mode uses excess air conditions to combust the organics and volatilize the inorganics at 760 to 980 degrees C (1400 to 1800 degrees F). The pyrolytic mode uses a carefully controlled air supply to evaporate and partially combust the volatiles, and the residuals are thermally decomposed at 500 to 760 degrees C (1000 to 1400 degrees F). The desorption mode supplies heat to the chamber from an external source, which keeps air from entering the chamber, reaching 250 to 450 degrees C (500 to 850 degrees F). Combustion does not occur in this method; volatile constituents are evaporated and separated from the nonvolatile constituents.

Secondary stage treatment of gases generated in the primary stage depends on organic content and method used during the primary stage. In the secondary stage, gases are combined with air and combusted in a separate chamber. Secondary treatment can also be performed by condensing organic vapors to the liquid form, then treating them with chemicals rather than heat.

Pollutant Phase	Potential Sources of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Gases/vapors	Particulates and gas leaks from the materials handling and feed system ; dust and particulates from ash handling system; gas cleaning system (scrubbing)	Review documentation for incinerator - the conditions specified in the permit to operate, the daily incinerator plant log, records for calibration of pressure and temperature gauges, stack testing records, records on maintenance repair of incinerator facilities, and the general correspondence file on incinerator operations. Confirm that monitoring equipment is properly maintained. Confirm that incinerator operations are maintained at correct temperature requirements and charging rates.	Hazardous waste incinerators must comply with 40 CFR Part 264 Subparts A through H, *Treatment, Storage and Disposal Facility Standards*, and Subpart O, *Incinerators*. Incinerators must meet air emission requirements for carbon monoxide, hydrocarbon, and nitrogen oxides.
Liquids	Aqueous portion of sludges from the material handling feed system, wastewater discharge from scrubber may spill or leak; wastewater from the scrubber may contain heavy metals or suspended solids or require pH adjustment	Visually observe equipment and adjacent soils for evidence of spills or leaks, or evidence of previous problems. Evaluate records of any spill volumes. If volumes exceed reportable quantities, request copy of spill report and associated correspondence. Review existing NPDES permit for requirement of additional reports such as a Storm Water Pollution Prevention Plan or Best Management Plan Document. Inspect documents to be sure they are up to date and assessments are being conducted as planned. Review site maps showing locations of floor drains and storm and sanitary sewer connections to determine possibility of improper discharge of process wastes. Review any Notice of Violations on wastewater discharges.	40 CFR Parts 116 and 117, *Designation of Hazardous Substances* and *Determination of Reportable Quantities for Hazardous Substances*, designate hazardous substances and reportable quantities of those hazardous substances. See CWA regulations. If a hazardous substance leaks or spills, Emergency Planning and Community Right-to-Know Act (EPCRA) requirements apply if reportable quantity is released. See EPCRA regulations. If scrubber wastewater goes to wastewater treatment system: NPDES permit requirements or General Pretreatment Standards at 40 CFR Part 403. Source effluent limits or categorical pretreatment standards at 40 CFR 414, 439, 454, or 455 may apply.

Pollutant Phase	Potential Sources of Emissions/Releases	Assessment Considerations (look at, look for, think about)	
Solids	Sludges from treatment of scrubber wastewater treatment and from filtering; ash as residue from the thermal stage; salts from acid gases produced during combustion; particulates from baghouse operations	Confirm that ash and sludges are properly characterized as either hazardous or nonhazardous, as determined by whether process materials are listed under RCRA, by process knowledge, and by actual waste characteristics based on testing. Evaluate how waste is characterized and documented. Observe waste management procedures and practices for sludge, salt and baghouse operations residue; the conditions and areas of removal, and how the wastes are stored and disposed. Visually observe areas of waste handling/removal to ensure wastes have not been spilled. For hazardous waste facilities, examine assessment records for malfunctions or deterioration of process equipment that may cause a release.	If RCRA hazardous waste is generated, owners/operators must comply with the generator requirements. See Appendix E-3-1 and E-3-2. Waste analysis and record keeping requirements of 40 CFR Part 268.7 (b) and (c) apply. Treatment, storage and disposal requirements of 40 CFR Part 264 Subparts A through H apply. See RCRA regulations. If the waste tests out to be solid waste, it must be managed in accordance with both Federal rules at 40 CFR Part 258 and individual state rules. If hazardous substance spills, Emergency Planning and Community Right-to-Know Act (EPCRA) requirements apply if a reportable quantity is released. See EPCRA regulations.

3.3.3 HALOGEN ACID FURNACE

<u>Process Description</u>

A halogen acid furnace is a type of liquid-injection incineration. In liquid-injection incineration, aqueous waste material is used as a fuel, which is burned directly in a combustor or injected into a flame zone or combustion zone of a furnace through a nozzle. Factors that affect whether the waste stream is properly oxidized are the method of injecting the liquid into the furnace or combustor, the right combination of air and liquid in order to obtain maximum combustion with minimum formation of byproducts such as soot, and the heating or caloric value of the waste fuel. The method of injecting the liquid into the furnace or combustor is important in that it disperses the liquid as a mist or vapor in such a way that the fuel is evenly distributed and has sufficient kinetic energy to burn efficiently, and it controls the flow of material into the combustor or chamber. When a maximal combination of air and liquid is attained, the internal heat energy of the system assists in the combustion, increasing the efficiency of the system. Fuels with solids or ash content will have a lower caloric value. In addition, these fuels may have solids that agglomerate, so the system must be designed in a way that prevents or minimizes agglomeration and allows the particulate matter to pass out with the gas stream or, as appropriate, allows ash to pass through to the quench zone. Scrubbers may be used to clean gases formed in the furnace, generating a wastewater that requires proper treatment and discharge.

In a halogen acid furnace, halogenated waste materials are injected into the combustor or furnace, where the chlorine content is converted to hydrochloric acid, which can be recycled. Caloric value of the halogenated wastes depends on chlorine content, with higher caloric values for materials with greater chlorine content, such as wastes produced in the vinyl chloride monomer process. These waste fuels tend to burn at higher temperatures and can therefore be injected directly into the combustor or burner. Lower caloric value chlorinated waste materials form significant amounts of soot when combusted. To reduce soot formation, these fuels are mixed with large amounts of air. Large amounts of air will cause the temperature to drop, so lower caloric value waste material is often used with auxiliary fuel.

With higher caloric value wastes, higher temperatures are generated during combustion, so refractory material must be chosen that will withstand the high temperatures. Temperature control is often achieved through the use of water and steam cooling.

Choice of refractory material is also important when the waste fuel has a high ash content, as the ash will interact with the refractory material.

Higher caloric value wastes produce more hydrochloric acid, while lower caloric value wastes produce more soot and free chlorine. More free chlorine requires greater pollution control capabilities, as the scrubber system must have caustic in the final tails tower to trap the free chlorine.

Application

Halogen acid furnaces are used to incinerate halogenated waste materials produced in large volumes in the plastics industry, such as in the vinyl chloride monomer, polyvinyl chloride, propylene glycol, and chlorinated elastomers processes. In halogen acid incineration, the goal is to convert as much of the chlorine content as possible to hydrogen chloride, which is then absorbed in water and can be recycled. The pharmaceutical industry and the agricultural process industries that manufacture pesticides and herbicides tend to produce aqueous waste fuels with high ash (salts) and solids content.

Equipment Description

In general, liquid injection incinerators are composed of a horizontal or vertical cylindrical chamber lined with refractory material and a primary combustor and often a secondary combustor or injection nozzle that can atomize the fuel.

The complete incinerator system is comprised of the following equipment as well: storage tanks, mixers, pumps, control valves, piping, heat recovery, quench system and air pollution control equipment.

Mixing of the fuel occurs in the storage tank, to prevent waste fuel from layering. Gases that build up in the tank are usually exhausted to the incinerator chamber. Sometimes filters are used to filter out inorganic solids from the feed mix before it enters the incinerator.

Pumps are often used to pump the feed mix through the fuel lines into the incinerator.

Pollutant Phase	Potential Sources of Emissions/Outputs	Assessment Considerations (look at, look for, think about)	
Gases/vapors	Particulates and gas leaks from the materials handling and feed system; dust and particulates from ash handling system; gas cleaning system (scrubbing)	Review documentation for incinerator: conditions specified in the permit to operate, the daily incinerator plant log, records for calibration of pressure and temperature gauges, stack testing records, records on maintenance repair of incinerator facilities, and the general correspondence file on incinerator operations. Confirm that monitoring equipment is properly maintained. Confirm that incinerator operations are maintained at correct temperature requirements and charging rates to meet applicable permit or regulatory requirements.	Hazardous waste incinerators must comply with 40 CFR Part 264 Subparts B through H, *Treatment, Storage and Disposal Facility Standards,* and Subpart O, *Incinerators.* Incinerators must meet air emission requirements for carbon monoxide, hydrocarbon, and nitrogen oxides.
Liquids	Wastewater discharge from scrubber may spill or leak; wastewater from the scrubber may contain heavy metals or suspected solids or adequate pH adjustment	Visually observe equipment and adjacent soils for evidence of spills or leaks, or evidence of previous problems. Evaluate records of any spill volumes. If volumes exceed reportable quantities, request copy of spill report and associated correspondence. Scrubber wastewater discharge should be delivered to plant wastewater treatment system. Review existing NPDES permit for requirement of additional reports such as a Best Management Document. Inspect documents to be sure they are up to date and assessments are being conducted as planned.	40 CFR Parts 116 and 117, *Designation of Hazardous Substances* and *Determination of Reportable Quantities for Hazardous Substances*, designate hazardous substances and reportable quantities of those hazardous substances. If a hazardous substance leaks or spills, Emergency Planning and Community Right-to-Know Act (EPCRA) requirements apply if reportable quantity is released. Depending on how process wastewater is managed: NPDES permit requirements or General Pretreatment Standards at 40 CFR Part 403 and if applicable, source effluent limits or categorical pretreatment standards at 40 CFR 414, 439, 454, or 455.

Pollutant Phase	Potential Sources of Emissions/Outputs	Assessment Considerations (look at, look for, think about)	
Liquids (continued)	Wastewater discharge from scrubber may spill or leak; wastewater from the scrubber that may contain heavy metals or suspended solids or require pH adjustment	Review site maps showing locations of floor drains and sanitary and storm sewer connections to determine the possibility of improper discharge of process waters. Review any Notice of Violations on wastewater discharges	(Note: process wastewater would have to be treated. It could be treated at the plant WWTP or it may be able to be discharged to the POTW to be treated. If treated at the plant WWTP, it will probably be discharged to surface water under an NPDES and must meet source effluent limits, if they apply. If discharged to a POTW, it would have to be pretreated to meet categorical pretreatment standards, if they apply.)
Solids	Sludges from treatment of scrubber wastewater and from filtering; ash as residue from the thermal stage; salts from acid gases produced during combustion; particulates from baghouse operations	Confirm that ash and sludges are properly characterized as either hazardous or nonhazardous, as determined by whether process materials are listed under RCRA, by process knowledge, and by actual waste characteristics based on testing. Evaluate how waste is characterized and documented. Observe waste management procedures and practices for sludge, salt and baghouse operations residue; the conditions and areas of removal, and how the wastes are stored and disposed. Visually observe areas of waste handling/removal to ensure wastes have not been spilled. For hazardous waste facilities, examine assessment records for malfunctions or deterioration of process equipment that may cause a release.	If RCRA hazardous waste is generated, owners/operators must comply with the generator requirements. Waste analysis and record keeping requirements of 40 CFR Part 268.7(b) and (c) apply. Treatment, storage and disposal requirements of 40 CFR Part 264 Subparts B through H apply. If the waste tests out to be solid waste, it must be managed in accordance with both Federal rules at 40 CFR Part 258 and individual state rules. If hazardous substance spills, Emergency Planning and Community Right-to-Know Act (EPCRA) requirements apply if report-able quantity is released. See EPCRA regulations.

3.3.4 SURFACE IMPOUNDMENT

Process Description

A surface impoundment is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials, although it may be lined with man-made materials. It is designed to hold an accumulation of liquid wastes or wastes containing free liquids, is exposed to the atmosphere, and is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, lagoons, open-top tanks, and wastewater treatment systems.

Surface impoundments may be operated in either a quiescent or an aerated mode. Aerated mode operation is used for solar evaporation or, more often, biological treatment. Quiescent mode operations include clarification, settling, equalization, storage, biological treatment, and disposal.

Air emissions of concern from operating surface impoundments are volatile organic compounds (VOCs). The emission rate of VOCs from operating surface impoundments depends on the fate of the hazardous components in the surface impoundment. Three possible fates for VOCs in the surface impoundment are volatilization, biological or chemical degradation, and adsorption.

Measuring emissions from surface impoundments is difficult as emissions come from a wide area and not a point source. Emissions can be controlled by removing the VOCs before placing the liquids in the impoundment; by special design or operating conditions, such as lowering the temperature of incoming liquids or designing a smaller impoundment surface area; by cleaning less frequently; or by installing covers and vapor barriers.

During closure of surface impoundments, both particulates and VOC emissions are of concern.

Application

Surface impoundments can be used to treat, store or dispose of liquid hazardous or nonhazardous waste. Federal and state regulations exist for surface impoundments managing liquid hazardous waste.

Equipment Description

Surface impoundments used for disposal of hazardous waste are required to have two liners with a leachate collection and removal system between the liners. The liners function to contain the liquid and minimize migration of liquid into the groundwater. The top liner is required to be a geomembrane, or flexible membrane liner (FML), while the bottom liner is required to be a composite system, with a minimum 3-foot thick compacted soil component.

Associated equipment with surface impoundments can include emissions measuring equipment and covers along with gas treatment systems, if necessary.

Pollutant Phase	Potential Sources of Emissions/Outputs	Assessment Considerations (look at, look for, think about)	
Gases/vapors	Evaporation of VOCs into atmosphere; vents in covers; particulates during closure	Review records to confirm volatile organic concentration of waste materials in surface impoundment. If applicable, review records and observe cover to ensure proper design, construction, operation and maintenance. Ensure that the appropriate cover type is used for the treatment method. Confirm that exhaust gases are properly managed.	Surface impoundments that contain volatile organic compounds (VOCs) must comply with 40 CFR Part 264 Subpart CC, *Air Emission Standards for Tanks, Surface Impoundments, and Containers.*
Liquids	Leaks; overflows; stormwater run-on and run-off; groundwater contamination	If RCRA impoundment, ensure that design and operation requirements are met, including leachate collection and removal system, leak detection system and liner system. Determine if action leakage rate has ever been exceeded and if appropriate response actions have been taken if exceeded. Determine if monitoring and weekly and post storm assessments have been conducted to examine for leaks or problems. Determine if groundwater monitoring program exists and is being followed. Ask for records of any spill or overflow volumes. If volumes exceed reportable quantities, ask for copy of spill report and associated correspondence. Observe operating conditions to ensure that overfilling is not occurring. Observe integrity of dikes. Visually observe for leaks. Review assessment records to ensure that weekly assessments are conducted, and other assessments as required.	40 CFR Parts 116 and 117, *Designation of Hazardous Substances* and *Determination of Reportable Quantities for Hazardous Substances*, designate hazardous substances and reportable quantities of those hazardous substances. See CWA regulations. If hazardous substance leaks or spills, Emergency Planning and Community Right-to-Know Act (EPCRA) requirements apply if reportable quantity is released. See EPCRA regulations. Hazardous waste surface impoundments must comply with 40 CFR Part 264 Subpart K, *Surface Impoundments*. See Appendix E-3-6. This rule requires storm water run-on and run-off controls and prescribes groundwater monitoring requirements. If applicable, NPDES storm water permit requirements at 40 CFR 122.26, *Storm Water Discharges*. Storm water permit requirement for industrial activities depends on the kind of industry.

Pollutant Phase	Potential Sources of Emissions/Outputs	Assessment Considerations (look at, look for, think about)	
Liquids (continued)	Leaks; overflows; stormwater run-on and run-off; groundwater contamination	Review existing NPDES permit for storm water discharge requirements. Inspect documents to be sure they are up to date and assessments are being conducted as planned. Review site maps showing locations of storm sewers; review storm water sampling results.	
Solids	Sludges/solids from cleaning operations	Sludges/solids will be either solid waste or hazardous waste, as determined by whether waste materials in surface impoundment are listed under RCRA, are known by process knowledge to be RCRA regulated and/or by actual waste characteristics based on testing. Evaluate how sludge is characterized and documented. Visually observe areas of sludge handling/removal to ensure sludge has not been spilled.	If RCRA hazardous waste is generated, owners/operators must comply with the generator requirements. Treatment, storage and disposal requirements of 40 CFR Part 264 Subparts a through H apply. Land disposal restrictions of 40 CFR Part 268 may apply. If the waste tests out to be solid waste, it must be managed in accordance with both Federal rules at 40 CFR Part 258 and individual state rules. If hazardous substance spills, Emergency Planning and Community Right-to-Know Act (EPCRA) requirements apply if reportable quantity is released. See EPCRA requirements.

Appendix A Clean Air Act (CAA)

The Clean Air Act (CAA), with its 1990 amendments, sets the framework for air pollution control as it affects the organic chemical manufacturing industry. This framework has several elements based upon individual titles in the CAA. The applicable CAA titles and the regulations and guidelines developed pursuant to the CAA are illustrated in **Exhibit A-1** and are discussed below.

Exhibit A-1. CAA Statutes and Regulatory Requirements for Organic Chemical Facilities

Clean Air Act	
Title I	Attainment and Maintenance of National Air Ambient Quality Standards
Title III	Air Toxics
Title V	Permitting of Title I and III Sources
Title VI	Stratospheric Ozone Sources

Title 1	Title III	Title V	Title VI
40 CFR Part 50 NAAQS 40 CFR Part 60 New Source Performance Standards New Source Review (NSR) Reasonable Available Control Technology (RACT) Guidelines	40 CFR Part 61 NESHAP 40 CFR Part 63 NESHAP Maximum Achievable Control Technology (MACT) Standards	40 CFR Part 68 Chemical Accident Prevention Provisions 40 CFR Part 70 or 40 CFR Part 71	40 CFR Part 82

Clean Air Act

Several portions of Title I of the CAA address requirements for the attainment and maintenance of National Ambient Air Quality Standards (NAAQS). The central components of the regulatory scheme of the Act may be said to include the following:

- Section 107 pertaining to Air Quality Control Regions;

- Section 109 pertaining to National Ambient Air Quality Standards;
- Section 110 pertaining to State Implementation Plans;
- Section 111 pertaining to New Source Performance Standards; and
- Section 112 pertaining to National Emission Standards for Hazardous Air Pollutants.

Title V Permits will apply to major sources covered under Title I, as well as sources covered under other Title of the Act.

Title VI of the CAA deals with ozone-depleting chemicals. Several solvents used in the organic chemical industry are affected by this law. Regulations under Title VI which affect the organic chemical industry are discussed in a section of the appendix.

Finally, the specific regulatory requirements developed pursuant to the CAA are described in the last section of this appendix.

National Primary and Secondary Ambient Air Quality Standards

Title I of the CAA establishes the statutory authority for EPA's National Ambient Air Quality Standards (NAAQS) that are to be applied uniformly throughout regions in the United States. The Air Quality Act of 1967 required the designation of air quality control regions (AQCRs) based on "jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric area necessary to provide adequate implementation of air quality standards" [Section 107(a) (1967)]. Today, the United States is divided into 247 AQCRs. Many AQCRs are sub-divided into smaller areas based on municipal boundaries, latitudes and longitudes, and other boundaries. A complete list of AQCRs (and their attainment status) is codified at 40 CFR Part 81. An air quality control region is classified as a "nonattainment" area if an NAAQS is violated anywhere in the region. (In the case of ozone, a violation occurs if the 4th highest reading over any 24-hour period in the past 3 years exceeds the NAAQS for ozone.) Two types of NAAQS are set:

(1) Primary standards that define the level of air quality necessary to prevent any adverse impact on human health, and

(2) Secondary standards that define the level of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

These standards, promulgated in 40 CFR Part 50, recognize that the severity of the adverse health effects associated with exposure often depends on the duration of exposure. Accordingly, "short-term" standards set limits for a 1-hour, an 8-hour, or a 24-hour period, while "long-term" standards are established on an annual basis.

The EPA has set NAAQS for ozone, carbon monoxide, particulate matter of 10 microns or less (PM-10), sulfur dioxide (SO_x), nitrogen dioxide (NO_x), and lead. These standards are used as a foundation for the regulatory framework discussed in this section. Of the six pollutants, the NAAQS for ozone, NO_x, CO, SO_x and particulate matter are likely to have a significant impact on the organic chemicals industry.

Existing Sources of Emissions

Ozone Non-attainment Areas

The "design value" shown in the third column of **Exhibit A-2** is compared to the 4th highest reading taken over any 24-hour period during 3 concurrent years in a nonattainment area. Based on this value, a nonattainment area is classified as Marginal, Moderate, Serious, Severe, or Extreme. As shown in Exhibit A-2, attainment deadlines are based on a sliding scale that reflects the severity of the pollution, where the trigger date is the date when an area is designated as nonattainment.

Exhibit A-2. Classification of Ozone Nonattainment Areas

Classification	Deadlines to Attain (from November 15, 1990)	Design Value (ppm)
Marginal	3 Years	0.121 - 0.138
Moderate	6 Years	0.138 - 0.160
Serious	9 Years	0.160 - 0.180
Severe	15 Years 17 Years	0.180 - 0.190 0.190 - 0.280
Extreme	20 Years	Above 0.280

A major source is defined both by the size of the source's **facility-wide** emissions and the category of the nonattainment area. These conditions are presented in **Exhibit A-3**. In addition, if a firm has the potential to emit more than 100 tons per year (TPY), it is also considered to be a major source. The statement "potential to emit" means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Thus operating below capacity does not exclude a plant from being defined as a major source. Any physical or operational limitations on the capacity of the source to emit a pollutant, provided the limitation or its effect on emissions is federally-enforceable, are treated as part of its design and therefore, could mean exclusion from the major category.

Each State is required to develop a State Implementation Plan (SIP) for all nonattainment areas. SIPs contain a range of requirements that are designed to decrease ambient ozone concentrations. Part D of Title I of the CAA provides the authority for implementation of Reasonably Available Control Technology (RACT). A source defined as "major" in a nonattainment area must install the RACT as prescribed in the applicable SIP.

Exhibit A-3. Major Source Classifications

Category of Nonattainment Area	Size of VOC or NOX Sources Affected (Tons/Year)
Extreme	10
Severe	25
Serious	50
Moderate and Marginal	100

EPA has defined RACT as the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility. RACT for a particular source is determined on a case-by-case basis, considering the technological and economic circumstances of the individual source. Further guidance for RACT is provided in the General Preamble published on April 16, 1992, in 57 *FR* 13498-13570.

EPA regulations provide that less stringent emission limitations than those achievable with RACT are acceptable only if the State plan shows that the less stringent limitations are sufficient to attain and maintain NAAQS, and show reasonable further progress during the interim before attainment.

A single ozone transport region exists for eleven states and the District of Columbia (the northeast ozone transport region). States included in an ozone transport region must submit SIPs to the EPA with special requirements pertaining to enhanced vehicle inspection and maintenance programs and implementation of RACT with respect to all sources of volatile organic compounds in the States. In addition, **a stationary source in an ozone transport region that emits or has the potential to emit at least 50 TPY of VOCs or NO_xs** is **considered a major source** and is subject to the requirements which would be applicable to major stationary sources if the area were classified as a Moderate nonattainment area.

A determination of the applicable RACT requirements for major sources is usually made by a State on the basis of a case-by-case review of each facility. In an attempt to issue uniform source guidelines, EPA issues Control Techniques Guidelines (CTGs) for industrial categories. The specific CTGs for a source are available through EPA's Technology Transfer Network. There are several CTGs relevant to Organic Chemical Plants regarding the control of Volatile Organic Compounds (VOCs) from organic chemical and polymer manufacturing, petroleum and volatile organic liquid storage, and wastewater operations. Available information on the specific CTGs in included in Appendix H.

New Source Review

Persons constructing new major stationary sources of air pollution or making modifications to major stationary sources are required by the Clean Air Act to obtain a permit before commencing construction. The process is called **new source review** (NSR) and is required whether the major source or modification is planned for an area where the NAAQS are exceeded (nonattainment areas) or an area where air quality is acceptable (attainment and unclassifiable areas). Permits for sources in attainment areas are referred to as **prevention of significant air quality deterioration** (PSD) requirements and include the following:

- Installation of Best Available Control Technology (BACT);
- A detailed air quality analysis showing that there will be no violation of PSD "increments;"
- Prediction of future air quality standards;
- Possible monitoring of air quality for 1 year prior to the issuance of the permit; and
- Demonstration of standard attainment through the undertaking of an air quality analysis.

> EPA determines BACT requirements by: (1) identifying all control technologies; (2) eliminating technically infeasible options; (3) ranking remaining control options by control effectiveness; (4) evaluating the most effective controls and documenting results; and (5) selecting BACT. See *Draft New Source Review Workshop Manual*, U.S. EPA, Office of Air Quality Planning and Standards, October 1990.

Restrictions in nonattainment areas are more severe. The principal requirements of NSR in nonattainment areas are:

- Installation of Lowest Achievable Emission Rate (LAER) technology; LAER is derived from either of the following: (1) the most stringent emission limitation contained in the implementation plan of any State for such class or category of source; or (2) the most stringent emission limitation achieved in practice by such class or category of source. See CAA Part 171 (3).
- Provision for "offsets" representing emission reductions that must be made from other sources. Emissions offsets are generally obtained from existing

sources located in the vicinity of a proposed source and must (1) offset the emissions increase from the new source or modification and (2) provide a net air quality benefit. The emission offset ratio depends on the category of the nonattainment area and is listed in **Exhibit A-4**. In general, emission reductions which have resulted from some other regulatory action are not available as offsets. Nonattainment area major source permitting provisions are described in 40 CFR Part 52.24. The PSD permitting provisions are described in 40 CFR Part 52.21.

Exhibit A-4. Major Source Definitions and Offset Ratios in Ozone Nonattainment Areas

Category	Size of Major Source (Tons/Year of VOCs and NO_xs)	Offset Ratios
Marginal	100	1.1:1
Moderate	100	1.15:1
Serious	50	1.2:1
Severe	25	1.3:1
Extreme	10	1.5:1

New Source Performance Standards (NSPS)

Major organic chemical industry sources must also comply with certain standards of performance developed by EPA (promulgated as 40 CFR Part 60), irrespective of its location in an attainment or nonattainment area. These are technology-based standards and are commonly referred to as the New Source Performance Standards (NSPS). NSPS affect new sources that are to be constructed or existing sources that undergo modifications after the applicable deadlines. NSPS requirements for organic chemical industry sources include monitoring, recordkeeping, and reporting. Further details on affected processes at major organic chemical industry sources, dates of applicability and regulatory requirements are provided later in this appendix.

National Emissions Standards for Hazardous Air Pollutants (NESHAP) and Maximum Achievable Control Technology (MACT) Standards

The NAAQS apply to five primary pollutants and one secondary pollutant: ozone. Ozone precursors typically regulated include VOC emissions from organic chemical industry sources as part of the Part 60 requirements, discussed earlier in this appendix. However, additional risk-based technology standards were developed by EPA for a few selected hazardous air pollutants prior to enactment of the 1990 Amendments to the CAA. These are commonly referred to as NESHAP and were promulgated at 40 CFR Part 61. Like NSPS, NESHAP requirements for organic chemical industry sources include monitoring, recordkeeping, and reporting. Further details on affected processes at major organic chemical industry sources, dates of applicability and regulatory are provided in the last section of this appendix.

Section 112 of the 1990 CAA identified 189 hazardous air pollutants (HAP) for which standards of performance were to be developed based on maximum achievable control technology rather than risk. Existing NESHAPs for those HAPs on the list of 189 would however still apply. Accordingly, EPA promulgated the so-called hazardous organic NESHAP (HON) rule as under 40 CFR Part 63 that sets the MACT standards applicable to the portion of the organic chemical industry that is the synthetic organic chemical manufacturing industry (SOCMI). Only major sources under Section 112(d) of the Clean Air Act will be regulated. The standards codified under Subparts F, G, H and I of 40 CFR Part 63 regulate emissions of 112 of the 189 HAPs listed in the CAA. HON rule requirements for SOCMI sources include monitoring, recordkeeping, and reporting. Further details on affected processes at major organic chemical industrial facilities including those regulated as SOCMI sources, dates of applicability and regulatory requirements are provided in the last section of this appendix.

Permitting Program

The CAA Title V (promulgated as 40 CFR Part 70) defines the minimum standards and procedures required for State operating permit programs. The permit system is a new approach established under the Amendments that is designed to consolidate all of a source's requirements in one document (permit). In addition, State permit fees will generate revenue to fund implementation of the program.

Any facility defined as a "major source" is required to obtain a permit. Part 70.2 defines a source as a single point from which emissions are released or as an entire industrial facility that is under the control of the same person(s), and a major source is defined as any source that emits or has the potential to emit:

- 10 TPY or more of any hazardous air pollutant;
- 25 TPY or more of any combination of hazardous air pollutants; or
- 100 TPY of any air pollutant.

For **ozone nonattainment areas,** major sources are defined as sources with the Potential To Emit (PTE):

- 100 TPY or more of volatile organic compounds (VOCs) or nitrogen oxides (NO_x) in areas defined as marginal or moderate;

- 50 TPY or more of VOCs or NO_xs in areas classified as serious;
- 25 TPY or more of VOCs or NO_xs in areas classified as severe; and
- 10 TPY or more of VOCs or NO_xs in areas classified as extreme.

Other sources requiring permits regardless of source size include:

- NSPS
- NESHAP
- PSD/NSR
- Acid Rain

Calculation of the PTE at batch chemical manufacturing facilities is especially important in that the maximum capacity of the facility to produce a variety of chemical products is less than the sum of the capacity of each individual product since operation units may not be dedicated to the production of a single chemical. EPA issued a guidance memorandum on August 29, 1996 defining the procedure for calculating PTEs at batch chemical facilities for use in determining the applicability of Title V permitting requirements.

The permit requirement for non-major sources (i.e., area sources) has been deferred for five years.

By November 15, 1993, each State must submit a design for an operating permit program to the EPA for approval. The EPA must either approve or disapprove the State's program within 1 year after submission. Once approved, the State program goes into effect.

Major sources, as well as the other sources identified above, must then develop and submit their permit applications to the State within 1 year (this will take place near the end of 1995). Once a source submits an application, it may continue to operate until the permit is issued. This may take years because permit processing allows time for terms and conditions to be presented to and reviewed by the public and neighboring States, as well as by the EPA. When issued, the permit will include all air requirements applicable to the facility. Among these are compliance schedules, emissions monitoring, emergency provisions, self-reporting responsibilities, and emissions limitations. Five years is the maximum permit term.

As established in Title V (40 CFR Part 70), the States are required to develop fee schedules to ensure the collection and retention of revenues sufficient to cover permit program costs. CAA sets a presumptive fee of $25 per ton for all regulated pollutants (except carbon monoxide), but States can set higher or lower fees so long as they collect sufficient revenues to cover program costs.

Chemical Accident Prevention

Title V of the CAA Amendments requires implementation of measures to prevent accidental releases to the air to mitigate the consequences of such releases by focusing prevention measures on chemicals that pose the greatest risk to the public and to the environment. In response to this requirement, EPA promulgated 40 CFR Part 68 Chemical Accident Prevention Provisions that outline requirements for stationary sources with processes that contain more than a threshold quantity of a regulated substance. Specific program requirements will be dependent on the likelihood of accidental releases from subject processes with the less likely subject to streamlined prevention requirements. All sources are required to prepare a risk management plan based on the risk management programs established at the source with plans submitted to EPA by June 21, 1999, or later as identified in §68.150, and available to the public. The goal of these regulations is to encourage sources to reduce the probability of accidental releases of substances that have the potential to cause immediate harm to public health and the environment and stimulate dialogue between industry and the public.

Stratospheric Ozone Protection (40 CFR Part 82)

The CAA Amendments provide for a phase-out of the production and consumption of chlorofluorocarbons (CFCs) and other chemicals that are causing the destruction of the stratospheric ozone layer. Requirements apply to any individual, corporate, or government entity that produces, transforms, imports, or exports these controlled substances.

Section 602 of the Clean Air Act identifies ozone-depleting substances and divides them into two classes. Class I substances are divided into five groups. Section 604 of the Clean Air Act calls for a complete phase-out of Class I substances by January 1, 2000 (January 1, 2002 for methyl chloroform). Class II chemicals, which are hydrochlorofluorocarbons (HCFCs), are generally seen as interim substitutes for Class I CFCs.

Class II substances consist of 33 HCFCs. The law calls for a complete phase-out of Class II substances by January 1, 2030. The schedule for the HCFC phase-out has not yet been finalized; however, EPA has proposed to begin phase-out of some HCFCs by 2002, with a complete phase-out of all HCFCs to take place by 2030. This same proposal would phase-out CFCs, carbon tetrachloride, hydrobromofluorocarbons, and methyl chloroform by January 1, 1996.

On February 11, 1993, EPA issued a rule under Section 611 of the CAA that, effective May 15, 1993, requires both domestically produced and imported goods containing or manufactured with Class I chemicals to carry a warning label. The rule covers items whose manufacture involves the use of Class I chemicals, even if the final product does not contain such chemicals.

Exports are exempt from this rule's labeling requirements, as are products that do not have direct contact with these chemicals. In addition, if direct contact occurs but is non-routine and intermittent (e.g., spot-cleaning of textiles), no labeling is required. Moreover, if a second manufacturer incorporates a product made with an ozone-depleting chemical into another item, the final product need not carry a label.

Section 608 of the CAA established the National Recycling and Emissions Reduction Program. Effective July 1, 1992, EPA prohibited the venting of ozone-depleting compounds used as refrigerants into the atmosphere during maintenance, service, repair, or disposal of air-conditioning or refrigeration equipment. EPA also promulgated regulations at 40 CFR Part 82, Subpart F. Under 40 CFR Part 82, Subpart F on May 14, 1993 which establish standards for service and disposal practices and to require leak repair. Under these regulations, technicians servicing air-conditioning and refrigeration equipment must evacuate refrigerant according to the prescribed guidelines. In addition, recovery and/or recycling equipment used must be certified and all persons who maintain, service, repair, or dispose of appliances must be certified.

Owners of industrial process refrigeration equipment (those with charges greater than 50 pounds) are required to repair substantial leaks. A 35 percent annual leak rate is established for the industrial process and commercial refrigeration sectors as the trigger for requiring leak repairs. Leak repair is required within 30 days of discovery or a 1-year retrofit or retirement plan must be developed for the leaking equipment.

CAA Assessment Considerations

Under Title V of the 1990 Amendments, many CAA requirements have been summarized into one comprehensive permit (risk management is an exception). In general, Title V requirements (40 CFR Part 70 or 71) are the same as compliance provisions previously required under the CAA. The facility's compliance assessor(s) should consider reviewing data derived from previous facility self-assessments or when determining compliance with Title V requirements. The regulatory inspection forms are generally organized around process equipment (called emission units) and stacks or vents (called emission points). The facility assessor should develop an assessment format where any enforceable limits and the underlying regulatory requirements applying to the emission unit or the emission point are listed so that they can be confirmed during the assessment.

In general, not all of the applicable requirements can be verified during a single self-assessment and each assessment represents a "snapshot" of compliance. In recognition of the fact that a facility assessor can not always be in place to detect violations, "baseline" assessment techniques stress the importance of maintenance plans to ensure proper operation and maintenance of equipment. Baseline assessment techniques also emphasize tracking of operating parameters (such as incinerator temperatures) during assessments for future use in accessing equipment performance. This focus on self-monitoring and self-reporting was reinforced under Title V with requirements for enhanced monitoring, periodic monitoring, compliance plans and programs and maintenance plans. The facility self-assessor can rely upon baseline techniques to ensure that the systems and programs established for self-monitoring and self reporting are appropriately designed and successfully implemented.

The draft Compliance Assurance Monitoring (CAM) Rule will supplant enhanced and periodic monitoring requirements and focuses on the same type of monitoring of equipment performance or other parameters that indicate compliance with applicable requirements. As an example, a emission unit that controls emissions of volatile organic compounds (VOCs) through exhaust gas incineration might have a lower allowable operating temperature of 1800°F. Using baseline assessment techniques, the assessor routinely records this operating temperature. If this unit had traditionally operated at 2000°F, and now operated at 1825°F, this would not constitute a violation of the 1800°F limit, but might indicate a potential for violation and a need for follow-up actions. Under the CAM Rule, the facility might choose to record and report this temperature to demonstrate continued compliance with applicable requirements. However, the facility assessor should also initiate appropriate follow-up actions to investigate the existence of a problem that might result in a violation of the requirement, and pursue proactive compliance assurance measures.

The applicable CAA regulations for an organic chemical manufacturing facility will vary with location. Those facilities located near urban areas are much more likely to be subject to nonattainment provisions. Ozone nonattainment areas have RACT requirements on all major sources of VOCs and NO_x. RACT requirements vary with location and severity on nonattainment; however, organic chemical manufacturing facilities would generally have RACT requirements on reactors, distillation units, storage tanks, pumps and valves (see Appendix E). NSPS requirements are based on the capacity of and on the age of regulated units, but apply nationally to conforming units. NSR requirements generally contain the most stringent emissions or performance limits and apply to new units as they are constructed. BACT applies under the PSD program in areas that meet NAAQS; LAER applies under NSR permits issued in nonattainment areas. MACT standards apply nationally based on magnitude of emissions of 189 HAPs. Units that are subject to these requirements would receive priority in an air quality inspection.

As discussed in the Overview, the process oriented self-assessment approach focuses on following a process from start to finish and developing process flow diagrams to identify key points for inspection. Previous facility assessment techniques generally focused more on individual emission units and emission points without as much attention to understanding the process. This type of approach is also more compatible with a multimedia self-assessment technique in that the process diagrams could contain information on other items such as wastewater discharge or pollution prevention activities.

Title V (or Part 70) permits will present new challenges to the compliance self-assessment. One of these challenges will be inclusion of plantwide emissions limits or caps. Plantwide caps offer operational flexibility to the permittee because changes in use of different processes can occur and as long as overall emissions remain under the limits, no permit terms are violated. The assessor will need to sum emissions from multiple processes in order to determine compliance. Alternative operating scenarios are another example of Part 70 permit conditions that offer operational flexibility. Alternative operating scenarios describe different methods of operation for process equipment; these scenarios will contain different emissions limits based on different production modes. Confirmation of different limits on one process substantially complicates the self-assessment. One other aspect of the Part 70 permit is the permit-as-shield. If a facility is operating within the limits of the Part 70 permit, then the permit shields the facility against charges of noncompliance for those activities.

As mentioned in the description of baseline inspection techniques, self-monitoring and self-reporting activities are important to maintaining compliance. Part 70 requires compliance programs for units operating out of compliance with applicable regulations. Maintenance and compliance plans are required for all facilities. These programs would be used to document efforts to maintain control equipment and replace parts prior to break-downs that could result in excess emissions. The investigator should attempt to verify through evaluation of records the adequacy of these programs.

CAA Regulatory Requirements

The following sections provide summaries of the principal regulations developed pursuant to the CAA that may apply to the organic chemical industry. The section includes:

- 40 CFR Part 60
  - Subparts D_a, D_b, D_c — Standards of Performance for Steam Generating Units
  - Subpart G — Standards of Performance for Nitric Acid Plants
  - Subpart H — Standards of Performance for Sulfuric Acid Plants
  - Subpart K_b — Standards of Performance for VOC Storage Vessels
  - Subpart GG — Standards of Performance for Stationary Gas Turbines

– Subpart V V — Standards of Performance for Equipment Leaks of VOC from SOCMI
– Subpart III — Standards of Performance for VOC Emissions from SOCMI Air Oxidation
– Subpart NNN — Standards of Performance for VOC Emissions from Distillation Unit Processes
– Subpart RRR — Standards of Performance for VOC Emissions from SOCMI Reactor Processes

- 40 CFR Part 61
  – Subpart F — National Emission Standards for Vinyl Chloride
  – Subpart J — National Emission Standards for Equipment Leaks (Benzene)
  – Subpart M — National Emission Standards for Asbestos
  – Subpart V — National Emission Standards for Equipment Leaks (Fugitive Emission Sources)
  – Subpart Y — National Emission Standards for Benzene Emissions from Benzene Storage Vessels
  – Subpart BB — National Emission Standards for from Benzene Transfer Operations
  – Subpart FF — National Emission Standards for Waste Operations

- 40 CFR Part 63
  – Subpart F — National Emission Standards for Organic Hazardous Air Pollutants from SOCMI
  – Subpart G — National Emission Standards for Organic Hazardous Air Pollutants from SOCMI for Process Vents
  – Subpart G — National Emission Standards for Organic Hazardous Air Pollutants from SOCMI for Storage Vessels
  – Subpart G — National Emission Standards for Organic Hazardous Air Pollutants from SOCMI for Transfer Operations
  – Subpart G — National Emission Standards for Organic Hazardous Air Pollutants from SOCMI for Wastewater
  – Subpart H — National Emission Standards for Organic Hazardous Air Pollutants from SOCMI for Equipment Leaks
  – Subpart I — National Emission Standards for Organic Hazardous Air Pollutants for Certain Processes Subject to The Negotiated Regulation for Equipment Leaks
  – Subpart Q — National Emission Standards for Hazardous Air Pollutants for Industrial Cooling Towers

- 40 CFR Part 68 Chemical Accident Prevention Provisions

- 40 CFR Part 82 Protection of Stratospheric Ozone

Applicability:

- Electric utility steam generating units capable of combusting >73 MW (250 million BTU/hr) heat input alone, or in combination with other fossil fuels.
- Electric utility combined cycle gas turbines capable of combusting >73 MW (250 million BTU/hr) heat input of fossil fuel.

40 CFR Part 60 - Subpart D_a

Standards of Performance for Electric Utility Steam Generating Units for which construction is commenced after September 18, 1978.

-Standards for:, particulate matter 60.42a, sulfur dioxide 60.43a, nitrogen oxides 60.44a
-Test Methods 60.48a
-Monitoring 60.47a
-Reporting and record keeping 60.49a

Date of Applicability:

Sources constructed, reconstructed, or modified after September 18, 1978.

Affected Processes:

Emission standards for all affected facilities for:

- Particulate Matter (PM) of 13 ng/J (0.03 lb/mmBtu) heat input from the combustion of solid, liquid or gaseous fuel; 1% of the potential combustion concentration (99% reduction) when combusting solid fuel, 30% of the potential combustion concentration (70% reduction) when combusting liquid fuel.
- Opacity of 20%, averaged over 6 minutes, except for one 6 min. period per hour of 27% opacity.
- SO_2, when combusting solid or solid-derived fuels: 520 ng/J (1.20 lb/mmBtu) heat input and 90% reduction; or 70% reduction when emissions are < 260 ng/J (0.60 lb/mmBtu heat input).
- SO_2, when combusting liquid or gaseous fuels: 340 ng/J (0.80 lb/mmBtu) heat input and 90% reduction; or 0% reduction when emissions are < 86 ng/J (0.20 lb/mmBtu heat input). All limits and percent reduction requirements are based on a 30-day rolling avg.

Alternative limits for SO_2 apply if facility meets one of the following criteria

- combusts solid solvent refined coal (SRC-I) (60.43a(c))
- combusts 100% anthracite (60.43a(d)(1))
- is classified as a resource recovery facility (60.43a(d)(2))
- is located in a noncontinental area and combusts solid or solid-derived fuel (60.43a(d)(3))
- is located in a noncontinental area and combusts liquid or gaseous fuel (60.43a(e))
- combusts different fuels simultaneously (60.43a(h))

- NO_x (NO_2) of various limits in ng/J (lb/mmBtu) heat input depending on fuel type, based a 30-day rolling avg. If two or more fuels are combusted simultaneously, the formula in 60.44a(c) should be used.

Exemptions:

- Subpart Da refers to emissions from fossil fuels only. Gas turbine emissions are subject to Subpart GG.
- Changes to existing fossil fuel-fired steam generating units to allow for the use of combustible materials, other than fossil fuels.
- Changes to existing fossil fuel-fired steam generating units from its original design of gaseous or liquid fossil fuels to accommodate the use of any other fossil or nonfossil fuel.

Partial Exemptions:

Emissions reduction requirements for SO_2 do not apply if facility is operated under an SO_2 commercial demonstration permit issued by the Administrator under the provisions of 60.45a.

Emissions levels for NO_x do not apply if unit is combusting coal-derived liquid fuel and is operating under a commercial demonstration permit issued by the Administrator under the provisions of 60.45a.

Monitoring Requirements:

1) Maintenance and operation of continuous emission monitoring system (CEMS), for monitoring opacity according to 60.47a(a),(h) and (j) except where only gaseous fuel is combusted.

2) Maintenance and operation of continuous emission monitoring system (CEMS), for monitoring SO_2 except where only natural gas is combusted. SO_2 is to be monitored at the sulphur dioxide control device inlet and outlet, unless subject to 68.47a(b)(2) or (3).

3) Maintenance and operation of continuous emission monitoring system (CEMS), for monitoring NO_x emissions according to 60.47a(c).

4) Maintenance and operation of continuous emission monitoring system (CEMS) for monitoring O_2 or CO_2 content of flue gases at each location where SO_2 or NO_x is monitored.

Reporting Requirements:

1) Initial performance test data and CEMS performance evaluation data for SO_2, NO_x and PM.

2) Quarterly reports including:

   - the information collected for 30 successive boiler operating days as specified in 60.49a(b) for sulfur dioxide and nitrogen oxides. If the minimum quantity of data is outlined n 60.49a(c) and/or is information is not collected over 30 days or the data is not available, then the information to be reported is outlined in 60.49a(c) and/or 60.49a(f)

   - the information in 60.49a(d) if standards are exceeded during emergency conditions because of control system malfunction

   - the information in 60.49a(e) if SO2 fuel pretreatment is claimed

   - signed statement in 60.49a(g)

   - excess emission reports as under 60.7

Applicability:

Steam generating units with a heat input capacity from fuels combusted in the steam generating unit >29 MW (100 million BTU/hr).

Date of Applicability:

- Sources constructed, reconstructed, or modified after June 19, 1984.

40 CFR Part 60 - Subpart D_b

Standards of Performance for Industrial, Commercial, Institutional Steam Generating Units

-Standards for: sulfur dioxide 60.42b, particulate matter 60.43b, nitrogen oxides 60.44b
-Test Methods 60.45b, 60.46b
-Monitoring 60.47b, 60.48b
-Reporting and record keeping 60.49b

- Sources meeting applicability and constructed after June 19, 1984 but before June 19, 1986 are subject to standards outlined in Subpart Db 60.40b(b)(1-4).

Affected Processes:

For all affected facilities which combust coal, oil, wood or municipal waste (alone, or in combination with other fuels):

Emission standards for:

- Particulate Matter (PM) of 22 ng/J (0.05 lb/mmBtu) to 86 ng/J (0.20 lb/mmBtu) depending on fuel type and other factors, over 6 hr period

- Opacity of 20%, averaged over 6 minutes, except for one 6 min. period per hour of 27% opacity

- SO_2 of various limits in ng/J (lb/mmBtu) heat input depending on fuel type and other factors, based on a 30-day rolling average unless unit has Federally enforceable low capacity factor for oil (10% or less), combusts only very low sulphur oil, and does not combust other fuels.

- NO_x (NO_2) of various limits in ng/J (lb/mmBtu) heat input depending on fuel type based a 30-day rolling avg., unless unit has a Federally enforceable low capacity factor, or low nitrogen fuels. In this case, compliance determined based on performance tests (specified in 60.44b(j)(1)-(3)).

Exemptions:

- Steam generating units meeting Subpart Dc applicability (i.e. having maximum design heat input capacity $\geq$2.9 MW but $\leq$29 MW) or Subpart Da (electric utility steam generating units) are not subject to Subpart Db.

- Existing steam generating units modified for the sole purpose of combusting gases containing TRS as defined under 60.28.

Partial Exemptions:

Steam generating units at petroleum refineries subject to 40 CFR Part 60, Subpart J or incinerators subject to 40 CFR Part 60, Subpart E are subject to Subpart Db only for PM and NOx.

Steam generators subject to Subpart J who have a heat input capacity of $\leq$73 MW (260 mmBtu/hr) are not subject to NO_x emissions standards.

Percent reduction requirements not applicable to affected facilities

- for SO_2 if one of the following criteria apply:

  - annual capacity for coal and oil $\leq$ 30% (subject to Federal enforceable permit limiting operation to annual capacity factor $\leq$ 30%)
  - located in noncontinental areas
  - facility is combusting coal or oil in a duct burner and$\geq$ 70% of the heat input is from exhaust gases entering the duct burner.
  - burning very low sulfur oil.

Monitoring Requirements:

1) If subject to SO_2 standard in 60.42(b), maintenance and operation of inlet/outlet continuous emission monitoring system (CEMS), for monitoring SO_2 concentrations and either O_2 or CO_2. Or, measurement of SO_2 emissions according to 60.47b(1)-(4). If burning low sulfur oil, may use fuel supplier certification.

2) If subject to opacity standard under 60.43(b) maintenance and operation of continuous monitoring system (COMS) to measure opacity of emissions.

3) If subject to the nitrous oxides standards of 60.44b, maintenance and operation of COMS to measure NO_x emissions not required for duct burners used in combined cycle system or low capacity nitrogen fuel facilities that are subject to the performance test emission standards.

Record keeping Requirements (2 years):

1) All opacity data

2) Amount of each fuel combusted daily with recorded calculation of annual capacity factors, maintained on a quarterly basis

3) Performance test data and initial performance test data

4) Nitrogen content of residual oil combusted in affected facility.

5) For facility subject to nitrous oxide standards: daily records of steam generating unit operations (60.49b(g)(1)-(10))

Reporting Requirements:

1) Excess emission reports (EER) quarterly for each applicable pollutant (PM, NO_x and SO_2) ; semi-annually if no exceedances.

2) Quarterly report of information specified in 60.49b(g) for nitrous oxide if subject to COMs requirement under 60.48b(b).

3) Plan for NO_x monitoring operating conditions, if applicable.

4) Quarterly report for sulfur dioxide as described in 60.49b(j)-(m).

Applicability:

Steam generating unit with maximum design heat input capacity of ≤ 29 MW (100 mmBtu/hr) but ≥ 2.9 MW (10 mmBtu/hr).

40 CFR Part 60 - Subpart D_c

Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

-Standards for: sulfur dioxide 60.42c and particulate matter 60.43c
-Test Methods 60.44c, 60.45c
-Monitoring 60.46c, 60.47c
-Reporting and Record keeping 60.48c

Date of Applicability:

- Sources constructed, reconstructed, or modified after June 19, 1989.

- Sources meeting applicability and constructed after June 19, 1984 but before June 19, 1986 are subject to standards outlined in Subpart Db 60.40(b)(1)-(4).

Affected Processes:

Emission standards for:

- SO_2 of various levels of ng/J (lb/mmBtu), depending on fuel type and other factors. Based on a 30-day rolling average unless facility listed in 60.43c(h)(1), (2), or (3); then compliance with emission limits or fuel oil sulphur limits may be determined based on certification from fuel supplier as in 60.48c(f)(1), (2), or (3).

- Particulate Matter (PM) of 22 ng/J (0.05 lb/mmBtu) to 130 ng/J (0.30 lb/mmBtu) depending on fuel type and other factors

- Opacity of 20% for facilities with heat input capacity ≥ 8.7 MW and combusting coal, wood, or oil, averaged over 6 minutes, except for on 6 minute period per hour of 27% opacity.

Exemptions:

- Percent reduction for SO_2 not applicable to facilities that combust coal (alone or in combination with other fuels) that meet the following criteria:

  - heat input capacity≤22MW
  - annual capacity factor for coal≤55% or Federally enforceable low capacity factor located in noncontinental areas

- facility is combusting coal or oil in a duct burner and ≥ 70% of the heat input is from exhaust gases entering the duct burner.

- Percent reduction for SO_2 not applicable to facilities that combust oil as in 60.42c(d).

Monitoring Requirements:

- If subject to SO_2 standard, maintenance and operation of outlet continuous emission monitoring system (CEMS) for monitoring SO_2 and either O_2 or CO_2. Inlet CEMs for SO_2 and either O_2 or CO_2 if % reduction requirements apply. Or, measurement of SO_2 emissions according to 60.46c(d)(1)-(3).

- Facilities with heat input capacity≥ 8.7 MW may also obtain fuel supplier certifications.

- Facilities subject to 60.42c(h)(1), (2), or (3) that demonstrate compliance with SO_2 standards based on fuel supplier certification.

- For PM: Maintenance of continuous monitoring system (COMS) for opacity if combust coal, wood or residual oil (alone or in combination with other fuels).

Record keeping Requirements (2 years):

1) All SO_2 monitor data as described in 60.46c(f)

2) Fuel supplier certification records (specified 60.48c(f)(1)-(3)).

3) Amounts of each fuel combusted during each day

4) If subject to a Federally enforceable low-capacity factor, calculation of annual capacity factor for each fuel combusted.

Reporting Requirements:

1) Notification of date of construction, reconstruction, anticipated and actual startup as in 60.48c(a)(1-4).

2) Initial and subsequent performance tests

3) Excess emission reports (EER) quarterly for opacity; semi-annually if no exceedances.

4) Quarterly report for SO_2 emissions/monitoring data (specified in 60.48c(e)(1)-(11)).

Applicability:

- Nitric acid production plants
- The discharge of gases is prohibited which:

40 CFR Part 60 - Subpart G

Standards of Performance for Nitric Acid Plants

- Monitoring 60.73
- Test methods 60.74

  - Contain NO_2 in excess of 1.5 kg per metric ton acid produced
  - Exhibit 10% opacity or greater

Date of Applicability:

Sources constructed or modified after August 17, 1971

Exemptions:

None

Monitoring/ Record Keeping Requirements:

1) Continuous monitoring of nitrogen oxides

2) Conversions of monitoring data to units of applicable standard

3) Record daily production rate and hours of operation

4) Monitor flares as required in 60.18

Reporting Requirements:

1) Semiannual report of excess emissions and monitoring system performance

Applicability:

- Sulfuric acid production plants
- The discharge of gases is prohibited which:
  - Contain sulfur dioxide in excess of 2 kg per metric ton of acid produced
  - Contain H_2SO_4 in excess of 0.075 kg per metric ton of acid produced
  - Exhibit 10% opacity or greater

40 CFR Part 60 - Subpart H

Standards of Performance for Sulfuric Acid Plants

- Monitoring 60.84
- Test methods 60.85

Date of Applicability:

Sources constructed or modified after August 17, 1971

Exemptions:

None

Monitoring/ Record Keeping Requirements:

1) Continuous monitoring of sulfur dioxide or applicable alternative

2) Conversion of monitoring data into units of applicable standard

3) Record all conversion factors and computed values

Reporting Requirements:

1) Semiannual report of excess emissions and monitoring system performance

Applicability:

> ***40 CFR Part 60 - Subpart K_b***
> **Standards of Performance for VOC Storage Vessels**
> - Monitoring 60.116b
> - Record keeping and Reporting 60.115b
> - Test methods 60.113b

- Storage vessels with design capacity ≥ $151m^3$, containing a VOL with TVP ≥ 5.2 kPa but less than 76.6 kPa
- Storage vessels with design capacity ≥ $75m^3$, but ≤ $151m^3$, containing VOL with TVP ≥ 27.6 kPa but less than 76.6 kPa
- Storage vessels with design capacity ≥ $75m^3$ and TVP ≥ 76.6 kPa

40 CFR Part 60 - Subpart K_B	
Affected Processes	**Regulatory Threshold**
Storage vessel must be equipped with either: Fixed roof with internal floating roof meeting the specifications in 60.112b(a)(1) External floating roof meeting the specifications in 60.112b(a)(2) Closed vent system and control device meeting the specifications in 60.112b(a)(3) Vessels with design capacity ≥ $75m^3$ and TVP > 76.6kP_a must be equipped with a closed vent system and control device, or equivalen system	If detectible emissions > 500 ppm above background: • Reduce VOC emissions by 95% or greater or • Flares must meet requirements of 60.18

Date of Applicability:

Sources constructed, reconstructed or modified after July 23, 1984.

Exemptions:

- Coke oven by-product plants
- Pressure vessels designed to operate in excess of 204.9 kPa
- Vessels permanently attached to mobile vehicle

- Vessels with design capacity ≤ 1,589.874 m^3 used for petroleum or condensate stored, processed, or treated prior to transfer
- Vessels at bulk gasoline plants
- Storage vessels at gasoline service stations
- Vessels to storage beverage alcohol

Monitoring Requirements:

1) Visual inspections of vessels and fixed roof and internal floating roof as described in 60.113b(a) and of vessels with external floating roofs as described in 60.113b(a) and of vessels with external floating roofs as described in 60.113b(b)(6)

2) Determine gap areas and maximum gap widths of vessels with external floating roofs as described in 60.113b(b).

3) Monitor parameters of closed vent system and control device in accordance to operating plan

4) Monitor flares as required in 60.18

Record Keeping Requirements (at least 2 years):

1) Visual inspection data

2) Storage vessel dimensions and capacity

3) VOL storage information as applicable under 60.116b(c)

4) Gap measurements if floating roof

5) Storage vessels with design capacity ≥ 40m^3, must keep records of vessel dimension and capacity

Reporting Requirements:

1) Notification to the Administrator 30 days prior to filling storage vessel required to be inspected under 60.113b(a)(1), 60.113b(a)(4), or 60.113b(b)(6) or required to determine gap measurements required under 60.113b(b)(1)

2) Operating plan for closed vent system and control device as in 60.113b(c)(1)

3) Initial report describing control equipment and certification, and required measurements

4) Report any defects within 30 days

Applicability:

Stationary gas turbines with heat input at peak load $\geq$ 10.7 gigajoules/ hour, based on lower heating value of the fuel fired.

40 CFR Part 60 - Subpart GG

Standards of Performance for Stationary Gas Turbines

-Standards for: nitrogen oxides 60.332, sulfur dioxide 60.333
-Monitoring 60.334
-Test Methods 60.335
-Reporting and record keeping 60.334

Date of Applicability:

Sources constructed, reconstructed, or modified after October 3, 1977, except as provided in 60.332(e) and (j).

Affected Processes:

Emission standards for:

- $NO_{x,}$ according to the standard (STD) equation outlined in 60.332(a)(1) or (2), as directed in 60.332(b),(c), and (d)
- Gases with SO_2 in excess of $\leq$ 0.015% by volume at 15% O_2 on a dry basis. In addition, no fuel shall be burned which contains sulfur in excess of 0.8% by weight.

Exemptions:

Standards for NO_x are not applicable for gas turbines outlined in 60.332(e) - (I).

Monitoring Requirements:

- For units using water injection to control NO_x, continuous monitoring system to monitor and record the fuel consumption and ratio of water to fuel being fired in the turbine, within 5% accuracy
- Monitoring of fuel sulfur and nitrogen content as specified in 60.334(b)(1)-(2).

Reporting Requirements:

Quarterly reports as required under 60.7, including reports of excess emissions data. The periods of excess emissions to be reported are outlined in 60.334 (c)(1)-(4). The calculation of emissions rates are outlined in 60.335.

Applicability:

Design Capacity of Facility to produce as a final product or intermediate 1,000 Mg/Year or more of any of the chemicals identified

40 CFR Part 60 - Subpart V V

Standards of Performance for Equipment Leaks of VOC from SOCMI

- Monitoring 60.485
- Record keeping 60.486
- Reporting 60.486
- Standards 60.482, 60.483

40 CFR PART 60 - SUBPART V V	
AFFECTED PROCESSES	REGULATORY THRESHOLD
Pumps in light liquid service	If measured leak > 10,000 ppm, or detection of leak
Compressors	If detectable emissions > 500 ppm above background
Pressure relief devices in gas/vapor service	If detectable emissions > 500 ppm above background
Sampling connection systems	Zero emissions except when an in-situ sampling systems are used
Open-ended valves or lines	Zero emissions except when a double block-and-bleed valve is used
Valves in gas/vapor service in light liquid service	If measured leak > 10,000 ppm, or detection of leak
Pumps and valves in heavy liquid service	If measured leak > 10,000 ppm, or detection of leak
Pressure relief devices in light or heave liquid service	If measured leak > 10,000 ppm, or detection of leak
Flanges and other connectors	If measured leak > 10,000 ppm, or detection of leak
Closed vent systems and control devices	If detectable emissions > 500 ppm above background, or detection of leak

Date of Applicability:

Sources constructed or modified after January 5, 1981

Exemptions:

- Beverage alcohol
- Facilities with no equipment in VOC service

Monitoring Requirements:

1) Inspections
2) Monitoring specified for each process as per 60.482
3) Utilization of Method 21 to determine the presence of leaking sources and background levels

Record Keeping Requirements:

1) Tagging leaking equipment with ID# until repaired as ID# on valves may be removed after two successive months with no detected leaks
2) Log for each detected leak (retained for 2 years) including information required under 60.486(c)(1-9)
3) Maintenance of control equipment design information
4) Maintenance of monitoring data
5) Maintenance of operating data
6) Maintenance of equipment data

Reporting Requirements:

1) Submittal of semiannual reports beginning 6-months after the start-up date containing the information outlined in 60.487(b) and (c)
2) Notification of the Administrator of the alternative standard selected 90 days before implementing one of the three alternative standards for valves
3) Reporting of the performance test results to the Administrator

Applicability:

Each affected facility that produces any of the chemicals listed in 60.617 as a product, co-product, by-product, or intermediate

40 CFR Part 60 - Subpart III

Standards of Performance for VOC Emissions from SOCMI Air Oxidation Unit Processes

- Monitoring 60.613
- Test methods 60.614
- Reporting and Record keeping 60.615

Affected Processes:

Each vent stream from any affected facility shall comply with one of the following:

- 40 CFR 60.612(a): Reduce emissions of TOC (less methane and ethane) by 98 weight percent or to a TOC (less methane and ethane) 20 ppmv on a dry basis corrected to 3 percent oxygen whichever is less stringent; or

- 40 CFR 60.612(b): Combustion emissions in a flare that meets the requirements of §60.18; or

- 40 CFR 60.612(c): Maintain a TRE index value greater than 1.0 without use of VOC emissions control device

Note: Any vent stream subject to the requirements of this subpart shall be in compliance on or after the date on which the initial performance test as required under §§60.8, 60.18, and 60.614 is completed, but not later than 60 days after maximum production rate or 180 days after initial startup, which ever date comes first.

Date of Applicability:

Sources constructed, reconstructed or modified after October 21, 1983

Exemptions:

Affected facility with TRE index value greater than 4.0 are only required to follow the requirements specified in §§60.612, 60.614(f), 60.615(h), and 60.615(l).

Monitoring Requirements:

1) Incinerators

- Firebox temperature/temperature upstream and downstream of bed (for catalytic incinerators)

- Vent stream flow to the incinerator

2) Boilers or process heaters

- Firebox temperature (if design heat input < 44 MW)
- Periods of operation (if design heat input ≥ 44 MW)
- Vent stream flow to the boiler/process heater

3) Flares

- Continuous presence of pilot flame (thermocouple or other similar device)
- Vent stream flow to the flare

4) Demonstrate compliance with TRE index value using a recovery device of recovery system

- Absorber
  - Scrubbing liquid temperature
  - Specific gravity
  - Concentration of organic compounds exiting recovery device

- Condenser
  - Concentration of organic compounds exiting recovery device
  - Exit temperature (product site)

- Carbon adsorber
  - Steam flow
  - Carbon bed temperature
  - Concentration of organic compounds exiting recovery device

5) Alternative control devices or recovery device

- As specified in §60.613(e)

Record Keeping Requirements: (Applicable to all affected facilities)

1) Performance test data as specified in 60.615(b) for each control device, flare or recovery device.

2) Continuous records specified for each control device, flare, or recovery device 60.615(c) - (h) including:

- Equipment operating parameters specified to be monitored; and
- Periods of operation in which parameter boundaries are exceeded [as defined in 60.615(c)]; and
- Flow indication; and
- Periods when vent stream is diverted from control device or has no flow rate

Reporting Requirements: (Applicable to all affected facilities)

1) Notification to the Administrator of the specific provision (control device, flare, TRE) selected to comply.

2) Notification to the Administrator 90 days before implementation of a change to use an alternative provision.

3) Initial performance test report as per §60.8 and 60.615.

4) Semiannual reports containing the information outlined in 60.615(j)

Testing Requirements:

All performance tests to be conducted in conformance with §60.8. 60.18 (flares), and 60.614.

40 CFR Part 60 - Subpart NNN

Standards of Performance for VOC Emissions from SOCMI Distillation Operations

- Monitoring 60.663
- Test methods 60.664
- Reporting and Record keeping 60.665

Applicability:

Each affected facility that produces any of the chemicals listed in 60.667 as a product, co-product, by-product, or intermediate

Affected Processes:

Each vent stream from any affected facility shall comply with one of the following:

- 40 CFR 60.662(a): Reduce emissions of TOC (less methane and ethane) by 98 weight percent or to a TOC concentration; of 20 ppmv on a dry basis corrected to 3 percent oxygen, whichever is less stringent, or
- 40 CFR 60.662(b): Combust emissions in a flare that meets the requirements of 60.18; or
- 40 CFR 60.662(c): Maintain a TRE index value greater than 1.0 without use of VOC emissions control device

Note: Any vent stream subject to the requirements of this subpart shall be in compliance on or after the date on which the initial performance test as required under §§60.8, 60.18 and 60.664 is completed, but not later than 60 days after maximum production rate or 180 days after initial startup, which date comes first.

Date of Applicability:

Sources constructed, reconstructed or modified after December 30, 1983.

Exemptions:

- Coal tar or beverage alcohol producing processes or affected facilities that use, contain or produce no VOC
- Polymer manufacturers (subject to Subpart DDD)
- Distillation units operated as a batch processes

Partial Exemptions:

- Affected facility with TRE index value greater than 8.0 are only required to follow the requirements specified in §§60.662, 60.664(d), (e), and (f); and 60.665(h) and (l).

- Affected facility with a total design capacity for all chemicals produced is less than 1 Gg/year are only required to follow the record keeping and reporting requirements in §60.665(j), (l)(6).

- Affected facility operated with a vent stream flow rate less than 0.008 scm/minute are only required to follow the test method and procedure and the record keeping and reporting requirements in §60.664(g) and §60.665(I),(l)(5) and (o).

Monitoring Requirements:

1) Incinerators

   - Firebox temperature/temperature upstream and downstream of bed (for catalytic incinerators)
   - Vent stream flow to the incinerator

2) Boilers or process heaters

   - Firebox temperature (if design heat input < 4 MW)
   - Periods of operation (if design heat input ≥ 44 MW)
   - Vent stream flow to the boiler/process heater

3) Flares

   - Continuous presence of pilot flame (thermocouple or other similar device)
   - Vent stream flow to the flare

4) Demonstrate Compliance with TRE index value using a recovery device or recovery systems

   - Absorber

     - Scrubbing liquid temperature
     - Specific gravity
     - Concentration of organic compounds exiting recovery device

   - Condenser

     - Exit temperature
     - Concentration of organic compounds exiting recovery device

   - Carbon adsorber

     - Steam flow
     - Carbon bed temperature

- Concentration of organic compounds exiting recovery device

5) Alternate control devices or recovery device

   - As specified in §60.663(e)

Record Keeping Requirements (Applicable to all affected facilities)

1) Performance test data as specified in §60.665(b) for each control device, flare, or recovery device

2) Continuous records specified for each control device, flare, or recovery device as per 60.665(c) - (j) including:

   - Equipment operating parameters specified to be monitored; and
   - Periods of operation in which parameter boundaries are exceeded [as defined in 60.665(c)]; and
   - Flow indication; and
   - Periods when vent stream is diverted from control device or has no flow rate.

Reporting Requirements (applicable to all affected facilities):

1) Notification to the Administrator of the specific provisions (control device, flare, or TRE) selected to comply.

2) Notification to the Administrator 90 days before implementation of a change to use an alternative provision.

3) Initial performance test report as per §§60.8 and 60.665.

4) Initial and semiannual reports containing the information in 60.665(l), (n), and (o).

Testing Requirements

All performance tests to be conducted in conformance with §§60.8, 60.18 (flares), and 60.664.

Applicability:

Each affected facility that produces any of the chemicals listed in 60.707 as a product, co-product, by-product, or intermediate.

40 CFR Part 60 - Subpart RRR

Standards of Performance for VOC Emissions from SOCMI Reactor Processes

- Monitoring 60.703
- Test methods 60.704
- Reporting and Record keeping 60.705

Affected Processes:

Each vent stream from any affected facility shall comply with one of the following:

- 40 CFR 60.702(a): Reduce emissions of TOC (less methane and ethane) by 98 weight percent or to a TOC concentration; of 20 ppmv on a dry basis corrected to 3 percent oxygen, whichever is less stringent; or

- 40 CFR 60.702(b): Combust the emissions in a flare that meets the requirements of 60.18; or

- 40 CFR 60.702(c): Maintain a TRE index value greater than 1.0 without use of VOC emissions control device

  Note: Any vent stream subject to the requirements of this subpart shall be in compliance on or after the date on which the initial performance test as required under §§60.8, 60.18 and 60.704 is completed, but not later than 60 days after maximum production rate or 180 days after initial startup, whichever date comes first.

Date of Applicability:

Sources constructed, reconstructed or modified after June 29, 1990.

Exemptions:

- Reactor process designed and operated as a batch operation
- Process unit produces beverage alcohols or which uses, contains, and produces no VOC
- Reactor process subject to subpart DDD

Partial Exemptions:

- Affected facility with TRE index value greater than 8.0 only required to follow the requirements specified in §§60.702(c); 60.704(d), (e), and (f); 60.705(g), (l), and (t).

- Affected facility with a total design capacity for all chemicals produced is less than 1 Gg/year are only required to follow the record keeping and reporting requirements under §60.705(I), (l)(6) and (n).

- Affected facility operated with a vent stream flow rate less than 0.011 scm/min are only required to follow the test method and procedure and the record keeping and reporting under §60.704(g) and 60.705(h), (l)(5), and (o).

- Vent stream is routed to a distillation unit subject to Subpart NNN is only required to follow §60.705.

- Affected facility operated with TOC concentration (less methane and ethane) in the vent stream less than 300 ppmv (Method 18) or 150 ppmv (Method 25A) is only required to follow the test method and procedure and the reporting and record Keeping Requirements in §§60.704(h) and 60.705(j), (l)(8) and (p).

Monitoring Requirements:

1) Incinerators

- Firebox (or immediately downstream of the firebox) temperature or temperature upstream and downstream of bed (for catalytic incinerators);
- Vent stream flow diverted from being routed to the incinerator;
- Install monitor of the entrance to any by-pass line; or
- Car-seal/lock-and-key type configuration with month visual check.

2) Boilers or process heaters

- Firebox temperature (if design heat input < 44 MW);
- Periods of operation (if design heat input ≥ 44 MW);
- Vent stream flow diverted from being routed to the boiler/process heater;
- Install monitor of the entrance to any by-pass line; or
- Car-seal/lock-and-key type configuration with month visual check.

3) Flares

- Continuous presence of pilot flame (thermocouple or other similar device);
- Vent stream flow diverted from being routed to the flare;
- Install monitor of the entrance to any by-pass line; or
- Car-seal/lock-and-key type configuration with month visual check.

4) Demonstrate compliance with TRE index value using a recovery device or recovery system

- Absorber

- Scrubbing liquid temperature
- Specific gravity
- Concentration of organic compounds exiting recovery device

• Condenser

  - Exit temperature
  - Concentration of organic compounds exiting recovery device

• Carbon adsorber

  - Steam flow
  - Carbon bed temperature
  - Concentration of organic compounds exiting recovery device

5) Alternative control devices or recovery devices

   • As specified in §60.703(e) by the Administrator

Record Keeping Requirements (Applicable to all affected facilities)

1) Performance test data as specified in §60.705(b) for each control device, flare, or recovery device

2) Continuous records specified for each control device, flare, or recovery device as per 60.705(c) - (j) including:

   • Equipment operating parameters specified to be monitored; and
   • Periods of operation in which parameter boundaries are exceeded [as defined in 60.705(c)]; and
   • Flow indication; and
   • Periods when vent stream is diverted from control device or has no flow rate.

Reporting Requirements (Applicable to all affected facilities)

1) Notification to the Administrator of the specific provisions (control device, flare, or TRE) selected to comply.

2) Notification to the Administrator 90 days before implementation of a change to use on alternative provision.

3) Initial performance test report as per §§60.8 and 60.705

4) Initial and semiannual reports containing the information in 60.705(l), (n)-(p), and (r)-(t).

Testing Requirements

All performance tests to be completed in conformance with §§60.8, 60.18 (flares), and 60.704.

Applicability:

Plants producing:

1) Ethylene dichloride by reaction of oxygen and hydrogen chloride with ethylene.

2) Vinyl chloride by any process, and/or

3) One or more polymers containing any fraction of polymerized vinyl chloride.

40 CFR Part 61 - Subpart F

National Emissions Standards for Vinyl Chloride

- Monitoring 61.67, 61.68
- Record keeping 61.71
- Reporting 61.69, 61.70Standards of Performance for VOC Storage Vessels

Affected Processes:

Emission standards for:

- Ethylene dichloride plants
  - ethylene dichloride purification [61.62(a)]
  - oxychlorination reactor [61.62(b)]
- Vinyl chloride plants
  - vinyl chloride formation and purification [61.63(a)]
- Polyvinyl chloride plants
  - reactor [61.64(a)]
  - stripper [61.64(b)]
  - mixing, weighing, and holding containers [61.64(c)]
  - monomer recovery system [61.64(d)]
  - sources following stripper [61.64(e)]
  - reactor used as stripper [61.64(f)]
- All ethylene dichloride, vinyl chloride, and polyvinyl chloride plants
  - relief valve discharge [61.65(a)]
  - fugitive emissions [61.65(b)]

Date of Applicability:

All existing sources.

Exemptions:

- Equipment used in research and development if reactor used to polymerize the vinyl chloride has a capacity of less than 0.19 m³ (50 gal)

- Equipment used in research and development with reactor (used to polymerize the vinyl chloride) > 0.19 m³ and < 4.17 m³ (1,100 gal) are subject to 61.64(a)(1), (b), (c), and (d); 61.67; 61.68; 61.69; 61.70; and 61.71

Monitoring Requirements:

1) Monitoring program to detect and identify major leaks [61.65(b)(8)]

2) Monitoring of flares in accordance with 60.18(d) and 60.18(f)(2)

3) Emission tests (with prior notification to the Administrator) as required under 61.67.

4) Continuous monitoring system for vinyl chloride as described under 61.68.

Reporting Requirements:

1) Reports to the Administrator from polyvinyl chloride plants on any discharge from manual vent valves [61.64(a)(3)], from all affected facilities on any relief valve discharges [61.65(a)].

2) Submission of monitoring program to detect, identify, and repair major leaks [61.65(b)(8)].

3) Reports concerning flare design and operation as required under 61.65(d)(2).

4) Notification to the Administrator 30 days prior to performing emission test.

5) Initial report as described in 61.69.

6) Quarterly reports containing the information described in 61.70(c).

Record Keeping Requirements (at least 2 years):

1) Visual inspection data

2) Storage vessel dimensions and capacity

3) VOL storage information as applicable under 60.116b(c)

4) Gap measurements if floating roof

5) Storage vessels with design capacity $\geq$ 40 m^3 must keep records of vessel dimension and capacity.

Applicability:

40 CFR Part 61 - Subpart J
National Emission Standard for Equipment Leaks (Fugitive Emission Sources of Benzene)

- Sources intended to operate in benzene service including pumps, compressors, pressure relief devices, sampling connections, systems, open-ended valves or lines, valve flanges and other connectors, product accumulator vessels, and control devices.

- Required to comply with Part 61, Subpart V

Date of Applicability:

All existing sources.

Exemptions:

- Sources located in coke by-product plants

- Plant sites designed to produce or use less than 1,000 mg/year

- Any process unit that has no equipment in benzene service

Monitoring Requirements:

Requirements in Part 61, Subpart V

Applicability:

- 61.145 is applicable to owners or operators of a demolition or renovation activity

- 61.146 is applicable to owners or operators of an operation in which asbestos-containing materials are spray applied.

40 CFR Part 61 - Subpart M

National Emission Standard for Asbestos

- Standard for Demolition and Renovation 61.145
- Standard for Spraying 61.146
- Standard for Insulating Materials 61.148
- Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations

Affected Processes:

- For demolition, requirements in 61.145(b) and (c) apply if the combined amount of Regulated Asbestos-Containing Material (RACM) meets criteria listed in 61.145(a)(1)(I) or (ii)

- For renovation, requirements in 61.145(b)(and (c) apply if the combined amount of RACM to be stripped, removed, dislodged, cut, drilled, or disturbed meets the criteria in 61.145(4)(I) or (ii)

- All RACM must be removed from a facility being demolished or renovated before any activity begins that would break up, dislodge, or disturb the material or preclude access to the material for removal

- When a facility component that contains, is covered with, or is coated with RACM is being taken out of the facility as a unit or in sections, the procedures in 61.145(c)(2) must be followed; and when RACM is stripped from a facility component while it remains in place at the facility, procedures in 61.145(c)(3) must be met

- After a facility component covered with, coated, with, or containing RACM is taken out of the facility, it must be handled according to the procedures in 61.145(c)(4). Large components such as reactor vessels, large tanks, and steam generators must be handled according to procedures in 61.145(c)(5)

- All RACM must be handled according to procedures in 61.145(c)(6)

- No RACM can be stripped, removed, or otherwise handled or disturbed at a facility unless at least one onsite representative is trained in compliance with the regulations

- Under 61.146, material that contains more than 1% asbestos cannot be used for spray application on buildings, structures, pipes, and conduits

- Under 61.148, no owner or operator may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet-applied and friable after drying; and this does not apply to spray-applied insulating materials regulated under 61.146

- Under 61.150, each owner or operator of any source covered under 61.145 or 61.146 must:

  - Discharge no visible emissions to the outside air during the collection, processing, packaging, or transporting any asbestos-containing waste material generated by the source, or use one of the emission control and waste treatment methods specified in 61.150(a)((1) through (4)

  - Dispose of all asbestos-containing waste material as soon as practical at sites as listed in 61.150(b)

  - Mark vehicles used to transport asbestos-containing waste material as in 61.150(c)

Exemptions:

- If the facility is being demolished under State or local government order because the facility is structurally unsound or in danger of imminent collapse, only 61.145(b)(1), (b)(2), b(3)(iii), (b)(4) (except (b)(4)(VIII)), (b)(5), and (c)(4) through (c)(9)

- RACM does not need to be removed before demolition if it meets the criteria in 61.145(c)(1)(I), (ii), (iii), or (iv)

- Spray-on application of materials is not subject to 61.146 when the asbestos fibers in the materials are encapsulated with a bituminous or resinous binder during spraying and the materials are not friable after drying

- Owners and operators of sources subject to 61.146 are exempt from the requirements of 61.05(a), 61.07, and 61.09.

- Requirements in 61.150(a) do not apply to demolition and renovation for Category I nonfriable ACM waste and Category II nonfriable ACM waste that did not become crumbled, pulverized, or reduced to powder

Reporting and Record Keeping Requirements

- Owner or operator of demolition or renovation activity must submit and update written notice containing the information in 61.145(b)(4)(I) through (xvii)

- Spray-on application of materials that contain more than 1% asbestos on equipment and machinery are subject to the notification and procedural requirements in 61.146(b)(1) and (2)

- Waste shipment records must be maintained for all asbestos-containing waste as described in 61.150(d)

Applicability:

Sources intended to operate in VHAP service including pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, flanges and other connectors, product accumulator vessels, and control devices.

40 CFR Part 61 - Subpart V

National Emission Standard for Equipment Leaks (Fugitive Emission Sources)

- Monitoring 61.242, 61.245
- Reporting 61.247
- Recordkeeping 61.246

40 CFR Part 61 - Subpart V	
Affected Processes	Regulatory Threshold
Pumps	If measured leak 10,000 ppm or more, or if indication of liquids dripping from pump seal.
Compressors	Facility required to determine a criterion that indicates failure of the seal system and/or barrier fluid system.
Valves	If measured leak 10,000 ppm or more. Alternative standards 1 and 2, leak is detected if more than 2% of valves emitting 10,000 ppm or more.
Pressure relief devices in gas/vapor service	If detectable emissions greater than 500 ppm above background.
Presssure relief devices in liquid service and flanges and other connectors	If measured leak 10,000 ppm or more.
Closed-Vent Systems	Leak is detected if detectable emissions greater than 500 ppm.
Control devices	Vapor recovery systems must recover vapors with 95% efficiency or greater. Combustion devices must recover vapors with 95% efficiency or greater and must provide a minimum residence time of 0.5 seconds at minimum temperature of 760°C.

Date of Applicability:

After date of promulgation of specific Subpart in Part 61.

Exemptions:

None

Monitoring Requirements:

1) Pumps—Weekly visual inspection (not required if pump within boundary of unmanned plant site) and monthly instrumental monitoring using RM 21. Instrumental monitoring of pumps equipped with a dual mechanical seal system is required only if indication of liquid drippings from pump seal. Instrumental monitoring of pumps designated for no detectable emission is required annually.

2) Compressors—Daily check of sensor or equip sensor with audible alarm. If compressor is equipped with closed vent system capable of capturing and transporting leak to control device, annual monitoring using RM 21.

3) Valves—Monthly instrumental monitoring using RM 21 (unless leak not detected for 2 successive months, then quarterly monitoring) or implementation of Alternative 1 or 2.

4) Pressure relief devices in gas/vapor service—Monitoring using RM 21 within 5 days of pressure release.

5) Pressure relief devices in liquid service and flanges and other connectors—Monitoring using RM 21 within 5 days of detecting potential leak.

6) Closed vent systems—Initial and annual monitoring.

Reporting Requirements:

1) Initial notification that requirement is being implemented as required under 61.247(a).

2) Semiannual report (including information on leaks and repairs) as required under 61.247(b).

Record Keeping Requirements:

1) Tagging leaking equipment with ID# until after 2 successive months with no detected leaks.

2) Information on leaking equipment and repairs as required under 61.246(c), kept for 2 years.

3) Equipment design information for closed-vent systems and control devices as described in 61.246(d).

4) Information on equipment to which a standard applies as described in 61.246(e).

5) Information on valves as required under 61.246(f) and (g).

6) Design criterion as described in 61.246(h).

7) Information related to exemptions as described in 61.246(i) and (j).

Applicability:

All benzene storage vessels with a design capacity ≥38 m^3 (10,000 gal)

40 CFR Part 61 - Subpart Y

National Emission Standard for Benzene Emissions from Benzene Storage Vessels

- Monitoring 61.272
- Record keeping 61.276
- Reporting 61.274 & 61.275

Affected Processes:

Storage vessels storing benzene having specific gravities as indicated in 61.270(a)

Storage vessel must be equipped with either:

1) Fixed roof and internal floating roof, meeting the specifications in 61.271(a), or

2) External floating roof meeting the specifications in 61.271(b), or

3) Closed vent system and control device meeting the specifications in 61.271(c). Operated with emissions <500 ppm above background and a control device to reduce benzene emissions by 95% or greater

Date of Applicability:

All existing sources.

Exemptions:

- Vessels at coke-byproduct facilities
- Vessels permanently attached to trucks, rails cars, barges or ships
- Pressure vessels designed to operate in excess of 204.9 kPa and without emissions to the atmosphere
- If also subject to 40 CFR Part 60, subparts K, K_a, K_b, must comply only with the subpart with the most stringent standards.

Monitoring Requirements:

1) Visual inspections of vessels with fixed roof and internal floating roof as described in 61.272(a)

2) Determine gap areas and widths between primary and secondary seals and the vessel wall as in 61.272(b), and conduct visual inspections of each time a vessel with external floating roof is emptied and degassed as in 61.272(b)(6)

3) Monitor parameters of closed vent systems and control devices in accordance with operating plan

4) Monitor flares as required in 60.18

Record Keeping Requirements:

1) Maintain records showing dimensions of storage vessel and analysis of capacity as long as vessel is in operation. This requirement is also applicable to storage vessels with a design capacity $< 38m^3$

2) Records related to vessels equipped with closed vent systems with control devices as described in 61.276(c) (maintain for at least 2 years)

Reporting Requirements:

1) Vessels with fixed roofs and internal floating roofs, and vessels with external roofs: Notification to the Administrator 30 days prior to filling storage vessel required to be inspected under 61.272(a)(1), (a)(3), or b(6).

2) Operating plan for closed vent system and control device that meets the requirements of 61.272(c)(1)

3) Initial report describing control equipment and other information as required under 61.274(a) and (b) (all affected storage vessels)

4) Periodic reports describing inspection results of vessels with fixed roof and internal floating roofs [61.275(a), (b) and (c)], and describing results of seal gap measurements of vessels with external floating roofs [61.275(d)]

5) Quarterly reports of each occurrence that results in excess emissions for vessels equipped with closed vent systems with control devices [61.275(e)]

Applicability:

Facilities loading benzene onto tank trucks, rail cars or marine vessels at each benzene production facility and bulk terminal.

40 CFR Part 61 - Subpart BB

National Emission Standard for Benzene Emissions from Benzene Transfer Operations

- Monitoring 61.303
- Record keeping 61.304
- Reporting 61.305

Affected Processes:

Loading Racks:

- Each loading rack must be equipped with a vapor collection system
- Control devices must be installed that reduce benzene emissions through it by 98 weight percent
- Benzene loading must be done in accordance to procedures and criteria outlined in 61.302

Date of Applicability:

All existing sources.

Exemptions:

- Facilities loading benzene-laden waste, gasoline, crude oil, natural gas, liquids, petroleum distillates or benzen-laden liquid from coke by-product recovery plants
- Facilities with annual benzene loading less than 1.3 million liters of 70 weight-percent or more benzene.
- Facilities that load only liquid containing less than 70 weight percent benzene

Monitoring Requirements:

1) Inspect vapor collection system and control device for detectable emissions

2) Incinerator

   - Temperature (continuous)
   - Percent reduction of benzene achieved (performance test)
   - Duration of loading cycle (performance test)

3) Flares

- Heat sensing device
- Visible emission readings, flow rate measurements, maximum permitted velocity calculations, exit velocity, and heat content (performance test)
- Flare pilot flame monitoring, loading cycle duration, loading cycles where pilot flame is absent (performance test)

4) Process heater or steam generating unit

- Temperature (units < 44 MW design)
- Periods of operation (units > 44 MW design)
- Description of location at which vent stream is introduced (performance test)
- Duration of loading cycle (performance test)

5) Control Devices: Carbon Adsorption System

- Concentration of organic compounds in outlet gas (continuous)
- Control efficiency, R, of system and all supporting performance test data and calculations

6) Records of equipment operating parameters specified to be monitored and records of periods of operation during which parameter boundaries are exceeded

7) Records relating to vent systems with valves that could divert emission from control device

8) Vapor tightness documentation

Reporting Requirements:

1) Initial performance test and engineering report including data required under 61.305(a)

2) Quarterly reports of the information required under 61.305(f)

Applicability:

All existing sources and facilities handling benzene wastes including: chemical manufacturing plant, coke by-product recovery plants, petroleum refineries and hazardous waste treatment storage and disposal facilities.

40 CFR Part 61 - Subpart FF

National Emissions Standard for Benzene Waste Operations

- Monitoring 61.354
- Record keeping 61.356
- Reporting 61.357

40 CFR Part 61 - Subpart FF	
Affected Processes	**Regulatory Threshold**
Tanks	Fixed-roof and closed-vent system with control device so that detectable emissions $<$500 ppmv above background meeting the specifications in 61.343.
Surface impoundments	Cover and closed-vent system with control device designed such that detectable emissions are no greater than 500 ppmv above background meeting the specifications in 61.344.
Containers	Cover (or cover and closed-vent system for treatment) designed such that detectable emissions are no greater than 500 ppmv above background meeting the specifications in 61.345.
Oil-water separators	Fixed-roof and closed-vent system with control device meeting the specifications in 61.347 designed such that detectable emissions are no greater than 500 ppmv above background.
Treatment processes	Treatment process meeting the specifications in 61.348 that either removes benzene from waste stream to $<$ 10 ppmw on a flow-weighted basis, 99% on a mass basis or 99% destruction efficiency by combustion.
Individual drain systems	Cover and closed-vent system meeting the specifications in 61.346 with control device designed such that detectable emissions are no greater than 500 ppmv above background.

40 CFR PART 61 - SUBPART FF	
AFFECTED PROCESSES	REGULATORY THRESHOLD
Closed-vent systems and control devices	Closed-vent systems meeting the specifications in 61.349 designed such that detectable emissions are no greater than 500 ppmv above background Control devices designed so that: • Enclosed combustion device either reduces organic emissions by 95 weight-percent or greater; achieves a total organic concentration of 20 ppmv on a dry basis corrected to 3% oxygen; or provides minimum residence time of 0.5 seconds at minimum temperature of 760°C. • Flares must comply with 60.18. • Vapor recovery system recovers or controls organic emissions with an efficiency of 95 weight-percent or greater or controls benzene emissions with 98 percent efficiency. • Flare complies with requirements of 60.18.

Date of Applicability:

All existing sources.

Exemptions:

- Waste gases or vapors from process fluids
- Waste in segregated storm water sewer
- Facilities with a total annual benzene quantity of less than 10 mg/year [calculated in accordance with 61.342(a)].

Monitoring Requirements:

1) Conduct initial and annual monitoring of detectable emissions from tanks, surface impoundments, containers, oil/water separators, drain systems, and closed-vent systems and control devices.

2) Visually inspect tanks, surface impoundments, containers, oil/water separators, and closed-vent systems and control devices initially and quarterly thereafter.

3) Monitor each treatment process or wastewater treatment system unit in accordance with 61.354(a) or (b).

4) Continuously monitor control device operation in accordance with 61.354(c).

5) Monitor carbon adsorption systems that do not regenerate carbon onsite in accordance with 61.354(d).

6) Inspect bypass line valves and flow readings from closed-vent bypass lines that could divert vent streams from control devices in accordance with 61.354(f).

7) Determine annual benzene quantity from facility waste using the procedure specified in 61.355.

Record Keeping Requirements:

1) Records identifying each waste stream and the information required under 61.356(b).

2) Documentation for each offsite waste shipment for treatment, including information in 61.356(c).

3) Engineering design documentation for control equipment (for life of equipment).

4) Records of treatment processes as required under 61.356(e).

5) Records of closed-vent systems and control devices as required under 61.356(f).

6) Records of visual inspections conducted as described under 61.356(g).

7) Records of tests for no detectable emissions as described under 61.356(h).

8) Information on operation of each treatment process as described in 61.356(i).

9) Information on operation of each control device as described in 61.356(j).
Control devices designed so that:

- Enclosed combustion device either reduces organic emissions by 95 weight-percent or greater; achieves a total organic concentration of 20 ppmv on a dry basis corrected to 3% oxygen; or provides minimum residence time of 0.5 seconds at minimum temperature of 760°C.

- Flares must comply with 60.18.

- Vapor recovery system recovers or controls organic emissions with an efficiency of 95 weight-percent or greater or controls benzene emissions with 98 percent efficiency.

- Flare complies with requirements of 60.18.

Reporting Requirements:

1) Initial reports containing information as in 61.357(a) and (d)(1).

2) Annual reports in accordance with 61.357(d)(2)-(5) and 61.357(d)(8).

3) Quarterly reports required in 61.357(d)(6) and (7).

Applicability:

SOCMI facility that meets all of the following:

1) Manufactures as a primary product one or more of the chemicals listed in Table 1,

2) Uses as reactant or manufacture as a product, by-product, or co-product, one or more of the organic HAPs listed in Table 2, and

3) Is located at a plant site that emits more than 10 tpy of any individual HAP or more than 25 tpy of any combination of HAP in any 12 month period

> *40 CFR Part 63 - Subpart F*
> **National Emission Standard for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry**
> - Monitoring 63.103
> - Reporting and Record keeping 63.103

Affected Processes:

Must limit emissions from all sources (process vents, storage vessels, transfer operations, wastewater streams, equipment leaks) according to provisions in Subpart G and H.

Date of Applicability:

Sources constructed or modified after December 31, 1982, shall be in compliance with subparts F, G and H upon initial start-up or April 24, 1994

Existing sources must comply with subparts F and G no later than 3 years from April 22, 1994

Existing sources must comply with subpart H shall comply according to their Table 1 Groups (I-V) and schedules specified in 63.100(k)(3)-(7)

Exemptions:

- If facility satisfies 1) and 2) above and has a federally enforceable exemption proving 3) is not satisfied
- If facility satisfies 1) and 3) above but does not use or produce any organic HAP listed in Table 2

Monitoring Requirements:

Initial performance tests and initial compliance determinance as specified in Subpart G and H

Record Keeping Requirements:

Facilities subject to subparts F, G and H to keep all applicable reports and records as required for 5 years (recent 2 at facility and remaining 3 off-site) or as specified in subpart

Reporting Requirements:

1) Initial reports required under subparts F, G and H, and Part 70 or Part 71 operating permits

2) Notification to the Administrator 30 days prior to conducting performance test

Applicability:

Affects all Group 1 and Group 2 process vents (defined in 63.111) at affected facilities as determined under subpart F.

40 CFR Part 63 - Subpart G

National Emissions Standards for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry for Process Vents

- Monitoring 63.114
- Record keeping 63.117, 63.118
- Reporting 63.118

40 CFR PART 63 - SUBPART G - PROCESS VENTS	
AFFECTED PROCESSES	REGULATORY THRESHOLD
All affected facilities	Must control organic HAP emissions according to equations provided in 63.112(a) or comply with the other requirements set forth in 63.112
Group 1 process vents (63.113(a))	Reduce organic HAP emissions using a flare
Halogenated Group 1 process vent (63.113(c))	Reduce emissions of total organic HAP by 98 weight percent or 20 ppmv on a dry basis corrected to 3 percent oxygen whichever is less stringent
Group 2 process vent (63.113(d))	Maintain a TRE index value greater than 1.0 at outlet to recovery device
	Reduce overall emissions of hydrogen halides and halogens by 99 percent or reduce the outlet mass of total hydrogen halides and halogens to less than 0.45 kg/h whichever is less stringent
	Comply with requirements set forth in 63.113(d)-(g)

Date of Applicability:

Dates are specified in Subpart F (63.100(k))

Exemptions:

Overlap with other regulations for process vents must be examined in 63.110(d)

Monitoring Requirements:

Monitoring requirements for each control device are specified in 63.114; monitoring devices requires continuous emissions monitoring. Performance tests as required under 63.116.

Record Keeping Requirements:

Logs containing up-to-date records of monitoring; notification of compliance; performance tests

General reporting requirements as per 63.152:

Initial notification; implementation plan; notification of compliance status; periodic reports submitted semiannually

Applicability:

Affects all Group 1 and Group 2 storage vessels (defined in 63.111) at affected facilities as determined under subpart F.

40 CFR Part 63- Subpart G

National Emissions Standards for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry for Storage Vessels

- Monitoring 61.119
- Record keeping 63.123
- Reporting 63.122

40 CFR PART 63 - SUBPART G - STORAGE VESSELS	
AFFECTED PROCESSES	REGULATORY THRESHOLD
All affected facilities	Must control organic HAP emissions according to equations provided in 63.112(a) or comply with the other requirements set forth in 63.112
Group 1 storage vessels (63.119(a))	If stored liquid emits a HAP and has a maximum true vapor pressure less than 76.6 kPA, then it must install a control device which complies with the requirements 63.119(b)-(d)
Group 2 storage vessels	If stored liquid emits a HAP and has a maximum true vapor pressure greater than 76.6 kPA, then it must install a closed vent system that vents to control device and complies with the requirements 63.119(e) Must verify emissions average using directions in 63.150 and determine compliance provisions to be used

Date of Applicability:

Dates are specified in Subpart F (63.100(k)).

Exemptions:

Overlap with other regulations for process vents must be examined in 63.110(b)

Monitoring Requirements:

Visual inspections of gaps and seals; monitoring requirements for each control device is specified in 63.119; monitoring devices requires continuous emissions monitoring

Record Keeping Requirements:

Logs containing up-to-date records of monitoring; notification of compliance; design evaluation; performance tests

Reporting Requirements as per 63.152:

Initial notification; implementation plan; notification of compliance status; periodic reports submitted semiannually

Applicability:

Affects all Group 1 and Group 2 transfer operations (defined in 63.111) at affected facilities as determined under subpart F.

40 CFR Part 63- Subpart G

National Emissions Standards for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry for Transfer Operations

- Monitoring 63.127
- Reporting and Record Keeping 63.129

40 CFR PART 63 - SUBPART G - TRANSFER OPERATION	
AFFECTED PROCESSES	REGULATORY THRESHOLD
All affected facilities	Must control organic HAP emissions according to equations provided in 63.112(a) or comply with the other requirements set forth in 63.112
Group 1 transfer operations (63.125)	Reduce organic HAP (except halogenated) emissions using a flare Reduce emissions of total organic HAP by 98 weight percent or 20 ppmv on a dry basis corrected to 3 percent oxygen whichever is less stringent Use a vapor balancing system to collect and recirculate vapors to storage tanks
Group 2 transfer rack	Only record keeping required and no other thresholds apply

Date of Applicability:

Dates are specified in Subpart F (63.100(k))

Exemptions:

Overlap with other regulations for process vents must be examined in 63.110(c)

Monitoring Requirements:

Monitoring requirements for each control device is specified as 63.127; monitoring devices requires continuous emissions monitoring

Record Keeping Requirements:

Logs containing up-to-date records of monitoring; notification of compliance; design evaluation; performance tests.

Reporting Requirements (as per 63.152):

Initial notification; implementation plan, notification of compliance status; periodic reports submitted semiannually.

Applicability:

Affects all Group 1 and Group 2 process wastewater (defined in 63.111 and 63.132(d)) at affected facilities as determined under subpart F.

40 CFR Part 63- Subpart G

National Emissions Standards for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry for Wastewater

- Monitoring 63.143
- Record keeping 63.147
- Reporting 63.146

40 CFR Part 63 - Subpart G - Wastewater	
Affected Processes	Regulatory Threshold
All affected facilities	Must control organic HAP emissions according to equations provided in 63.112(a) or comply with the other requirements set forth in 63.112
Wastewater tanks (Group 1 waste stream) (63.133)	A fixed roof required unless the wastewater tank is used for mixing, heating or treating with exothermic reaction in which case provisions in 63.133(a)(2) through (h) apply
Surface impoundments (Group 1 waste stream) (63.134)	Must comply with requirements in paragraphs (b), (c), and (d).
Containers (Group 1 waste stream) (63.135)	Must comply with requirements in paragraphs (b) through (f).
Individual drains (Group 1 waste stream) (63.136)	Must comply with requirements in paragraphs (b) through (d) or (e) through (g).
Oil-water separators (Group 1 waste stream) (63.137)	Must comply with requirements in paragraphs (c) and (d).
Treatment processes (63.138)	New sources must comply with requirements in paragraph (a)(1) and existing sources must comply with requirements in paragraph (a)(2)

Date of Applicability:

Dates are specified in Subpart F (63.100(k))

Exemptions:

Overlap with other regulations for process vents must be examined in 63.110(e)

Monitoring Requirements:

Comply with inspection requirements in Table 11; monitor appropriate parameters to demonstrate proper operation of selected treatment

Record keeping Requirements:

Logs containing up-to-date records of monitoring; notification of compliance; design evaluation; performance tests; periodic reports

Reporting Requirements (as per 63.152):

Initial notification; implementation plan; notification of compliance status; periodic reports submitted semiannually.

Applicability:

40 CFR Part 63- Subpart H

National Emissions Standards for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry for Equipment Leaks

- Monitoring 63.180
- Record keeping 63.181
- Reporting 63.182

Applies to pumps, compressors, agitators, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, instrumentation systems, and control devices or systems used to operate an organic HAP for 300 hours or more during a calendar year

40 CFR Part 63 - Subpart H	
Affected Processes	**Regulatory Threshold**
Pumps in light liquid service	Must determine Phase (I, II, or III) as per provisions in 63.163 and the applicable threshold for leak detection
Compressors	Must be equipped with a seal system that prevents leakage to atmosphere and complies with provisions in 63.164
Pressure relief devices in gas/vapor service	Must have detectable emissions < 500 ppm above background and must comply with other provisions in 63.165
Sampling connection systems	Must be equipped with a closed-vent system that returns the purge to the process and complies with provisions in 63.166
Valves in gas/vapor service and in light liquid service	Must determine Phase (I, II, or III) as per provisions in 63.168 and the applicable threshold for leak detection
Pumps, valves, connectors, and agitators in heavy liquid service; instrumentation systems; and pressure relief devices in liquid service	Must report leaks detected by visual, olfactory, audible or any other method must be repaired by methods specified in 63.180
Surge control vessels and bottoms receivers	If not routed back to the process and meets conditions specified in Table 2 or 3 must be equipped with closed-vent system
Closed-vent system and control devices	Must comply with requirements as per 63.172
Agitators in gas/vapor and light liquid service	Must be monitored monthly to detect leaks as per 63.173 and comply with all provisions therein
Connectors in gas/vapor and light liquid service	Must be monitored to detect leaks as per 63.174 and comply with all provisions therein

Date of Applicability:

Dates are specified in Subpart F (63.100(k))

Exemptions:

Lines and equipment not containing process fluids

Monitoring Requirements:

Compliance with Method 21 of 40 CFR 60, App. A, and other provisions in 63.180(b)

Record Keeping Requirements:

Only one record keeping system must be maintained for all process units at one plant. Information must be maintained as described in 63.181(b)-(k) including: identification numbers for all affected process units; initial and periodic reports, delay of repair records; design specifications and performance demonstration activities; documentation for all quality assurance programs implemented; notifications of compliance status

Reporting Requirements:

1) Initial notification as described in 63.182(b)
2) Notification of compliance status as described in 63.182(c)
3) Semiannual reports as described in 63.182(d)

40 CFR Part 63 - Subpart I

National Emission Standards for Organic Hazardous Air Pollutants Certain Processes Subject to the Negotiated Regulation for Equipment Leaks

Applicability:

Major sources (including pumps, compressors, agitators, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, and instrumentation systems that are intended to operate in organic hazardous air pollutant services for 300 hours or more during the calendar year)

Affected Processes:

Emissions of designated organic HAPs from the following processes: styrene-butadiene rubber production, polybutadiene rubber production, agricultural chemicals as identified in §63.190(b)(3), polymers/resins or other chemical products listed in §63.190(b)(4), pharmaceutical production processes using carbon tetrachloride or methylene chloride, and processes producing the polymers/resins or other chemical products listed in §63.190(b)(6).

Date of Application:

Variable dates, but not later than April 22, 1997

Exemptions:

Temporary exemption, provided that notification and certification is provided, for facilities that emit less than 10 tons per year of any individual HAP, and less than 25 tons per year of any combination of HAPs.

Requirements:

Owners and operators of subject sources must comply with the requirements of Subpart H for the processes and designated organic HAPs and certain provisions of Subpart A, as identified in §63.192(b). Also, all facilities subject to this subpart must receive a permit under 40 CFR Part 70 or 71.

Record Keeping:

All records required in Subpart H and in §63.192(f)(2) for at least two years, except as otherwise specified in Subpart H.

40 CFR Part 63 - Subpart Q

National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers

Applicability:

All new and existing industrial process cooling towers (IPCTs) which use chromium-based water treatment chemicals and are either a major source or are integral parts of a facility which is a major source (defined in 64.401).

Date of Applicability:

Existing IPCTs must comply with subpart Q no later than 18 months from September 8, 1994. New IPCTs that have initial startup before September 8, 1994, must comply by September 8, 1994. New IPCTs that have initial startup on or after September 8, 1994, must comply upon initial startup.

Affected Processes:

No owner/operator of an IPCT shall use chromium-based water treatment chemicals in any affected IPCT (63.402).

Monitoring Requirements:

No monitoring is required unless there is evidence to indicate that the IPCT is not in compliance with the requirements of 63.402.

Record Keeping:

Copies of initial notification and notification of compliance status are required to be kept onsite for at least 5 years as specified in 63.405(a).

Reporting Requirements (as per 63.405):

Initial notification, notification of compliance status (in accordance with Part 63, subpart A): Table 1 of Subpart Q indicates general provisions applicability.

40 CFR Part 68
Chemical Accident Prevention Provision

Applicability:

Owners or operators of stationary sources that have more than a threshold quantity of a regulated substance in a process, as determined under §68.115.

Date of Applicability:

The latest of the following dates:

- June 21, 1999
- Three years after the date on which a regulated substance is first listed
- The date on which a regulated substance is first present above a threshold quantity

Applicable Program:

Program 1 - For five years prior to submission of the RMP, the process has not had an accidental release of a regulated substance that led to death, injury, or response or restoration activities for exposure to an environmental receptor, and the distance to a toxic or flammable endpoint for a worst-case release assessment is less than the distance to any public receptor, and emergency response procedures have been coordinated between the stationary source and local emergency planning and response organizations.
Program 2 - A covered process not subject to Program 1 or Program 3
Program 3 - A covered process, not subject to Program 1 and either; the process is in SIC code 2611, 2812, 1821, 2865, 2869, 2873, 2879, or 2911, or, the process is subject to the OSHA process safety management standard 29 CFR §1910.119.

General Requirements:

Submit a Risk Management Plan (RMP) with a registration that includes all covered processes.

Risk Management Plan Requirements: RMPs shall include:

- an executive summary describing elements of the RMP
- a single registration form covering all regulated substances
- worst-case release scenario information
- five-year accident history information

- emergency response program information
- certification statement
- regular review and updates to the RMP
- additional Programs 2 and 3 information.

Other Requirements:

- Maintain records for five years
- Information available to the public
- Additional permit requirements for facilities permitted pursuant to Parts 70 or 71.
- Provide access to implementing agency for RMP audits.

Additional Program 1 Requirements:

- Analyze worst-case release scenarios, document public receptor is beyond endpoint, and submit
- Complete five year accident history for the process and submit
- Ensure that response actions coordinated with local agencies
- Certify as specified in §68.12(b)(4).

Additional Program 2 Requirements:

- Develop and implement a management system, assigning a qualified person with the overall responsibility for the program
- Conduct a hazard assessment
- Implement a Program 2 or Program 3 Prevention Program
- Develop and implement an emergency response program
- Submit the data on prevention program elements for Program 2 processes.

Additional Program 3 Requirements:

- Develop and implement a management system, assigning a qualified person with the overall responsibility for the program
- Conduct a hazard assessment
- Implement a Program 3 Prevention Program
- Develop and implement an emergency response program
- Submit the data on prevention program elements for Program 3 processes.

Applicability:

Any individual, corporate or government entity that produces, transforms, imports, or exports these controlled substances.

40 CFR Part 82

Protection of Stratospheric Ozone

Subpart A:	Production and Consumption Controls
Subpart E:	The Labeling of Products Using Ozone-Depleting Substances
Subpart F:	Recycling and Emissions Reduction

40 CFR PART 82	
REQUIREMENTS	EFFECTIVE DATE
Subpart A: Production and Consumption Controls	
Prohibition on the production and consumption of any Class I substance in annual quantities greater than the relevant percentage specified in the regulations (based on quantity of substance produced in the baseline year).	January 1 of each year specified in the regulations.
Prohibition on the production of all Class I substances.	January 1, 2000 (January 1, 2002, for methyl chloroform)
Prohibition on the production of all Class II substances.	January 1, 2030
Reporting Requirements: Reports on production, imports, and exports of Class I and II substances.	Quarterly
Subpart E: The Labeling of Products Using Ozone-Depleting Substances	
Containers in which Class I and II refrigerants are stored or transported are required to be labeled with a warning stating that it contains a substance which harms public health and environment by destroying ozone in the upper atmosphere.	
Subpart F: Recycling and Emissions Reduction	
Prohibition on knowingly venting ozone-depleting compounds used as refrigerants into the atmosphere during maintenance, service, repair, or disposal or air-conditioning or refrigeration equipment.	July 1, 1992
Technicians servicing air-conditioning and refrigeration equipment are required to evacuate refrigerant in the line according to prescribed guidelines.	July 13, 1993

40 CFR PART 82	
REQUIREMENTS	EFFECTIVE DATE
Recovery and/or recycling equipment must be tested by an EPA-approved third-party testing organization.	All equipment sold after November 15, 1993. Equipment manufactured prior to this date is grandfathered.
Require repair of substantial leaks in industrial process refrigeration equipment (charge greater than 50 pounds).	Within 30 days of recovery
All persons who maintain, service, repair, or dispose of appliances are required to be certified.	November 14, 1994
Persons servicing or disposing of air-conditioning and refrigeration equipment are required to certify that certified recovery and recycling equipment has been acquired and they are complying with the applicable requirements of 40 CFR Part 82, Subpart F.	August 12, 1993

Appendix B Safe Drinking Water Act (SDWA)

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint Federal/State system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water through the control of underground injection of liquid wastes. The Public Water System Program (i.e., the National Primary and Secondary Drinking Water Regulations) and the Underground Injection Control (UIC) Program are two components of the SDWA that may be applicable to chemical facilities. The requirements of the programs are summarized below.

Public Water System Program

Under the SDWA, EPA has established primary and secondary drinking water regulations designed to protect the public health. The primary drinking water regulations cover contaminants that have been determined to have adverse effects on human health or are enforceable by EPA or a State. The secondary drinking water regulations cover contaminants that affect the aesthetic quality of drinking water and are intended as guidelines that are not enforceable by EPA but a State can choose to enforce some or all of the secondary drinking water regulations. Most of the States have "primacy" for the program; that is, they have adopted the primary drinking water regulations and are responsible for implementing and enforcing the regulations. The States can develop regulations more stringent than the national drinking water regulations. The national drinking water regulations apply to public water systems. A public water system is defined as a system that either (1) has at least 15 service connections or (2) regularly serves an average of at least 25 individuals daily at least 60 days out of the year. There are three types of public water systems: community water systems, non-transient non-community water systems and transient non-community water systems. Facilities employing at least 25 people and regularly providing potable water from its private well, lake, river or reservoir to these same employees for over 6 months of the year would be classified as a non-transient non-community public water system.

National Primary Drinking Water Regulations have been established for 78 contaminants: 50 organics, 18 inorganics, 2 radionuclides,

Safe Drinking Water Act

and 8 microbiologicals. For each contaminant, the national primary drinking water regulations establish Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs) or treatment techniques.

The National Primary Drinking Water Regulations also establish testing procedures, monitoring requirements such as minimum monitoring frequencies, record-keeping requirements, public notification requirements and requirements for routine reporting to the State or EPA. Specific analytical methods must be used and the analyses must be conducted by laboratories certified by EPA or the State. Some state programs require that the analyses be conducted by the State laboratory.

Monitoring requirements vary by contaminant, by source of supply, and by system size. The State customizes the sampling frequency to the local circumstances and may even waive sampling requirements for specific contaminants.

Underground Injection Control Program

The SDWA UIC program (40 CFR Parts 144-148) is a **permit** program that protects underground sources of drinking water through regulation of five different classes of injection wells. A "well" is defined at 40 CFR §144.3 as a bored, drilled, or driven shaft, or a dug hole, whose depth is greater than the largest surface dimension. The five well classes are as follows:

Class I: Technologically sophisticated wells that inject large volumes of hazardous and non-hazardous wastes into deep isolated rock formations that are separated from the lowermost underground source of drinking water (USDW) by many layers of impermeable clay and rock.

Class II: Wells that inject fluids associated with oil and natural gas production. Most of the injected fluid is brine that is produced when oil and gas are extracted from the earth (about 10 barrels for every barrel of oil).

Class III: Wells that inject super-hot steam or water into mineral formations, which are then pumped to the surface and extracted. Generally, the fluid is treated and reinjected into the same formation. More than 50 percent of the salt and 80 percent of the uranium extraction in the United States is produced this way.

Class IV: Wells that inject hazardous or radioactive wastes into or above underground sources of drinking water. These wells are banned under the UIC program because they directly threaten the quality of underground sources of drinking water.

Class V: Wells that use injection practices not included in the other classes. Some Class V wells are technologically advanced wastewater disposal systems used by chemical facilities, but most are "low-tech" holes in the ground. Generally, these wells are shallow and depend upon gravity to drain or "inject" liquid waste into the ground. Their simple construction provides little or no protection against possible ground water contamination, so it is important to control what goes into them.

Class I and V UIC permitting programs are of significance to chemical facilities. The UIC permit program is primarily state-run, since EPA has delegated authority to all but a few states. In some instances, the UIC program may consist of a state-administered program applicable to some classes of wells and an EPA-administered program applicable to other classes of wells. UIC permits include design, operating, inspection, and monitoring requirements. Operation of injection wells may also be authorized by rule (i.e., permit by rule). Wells used to inject hazardous waste must also comply with RCRA corrective action standards and must meet applicable RCRA LDR standards.

Any underground injection is unlawful unless authorized by a permit or a rule. Additionally, the construction of any well required to have a permit is also prohibited until issuance of that permit. All owners or operators are required to apply for a permit, even if authorized by rule, unless the authorization was for the life of the well.

Currently, there are no specific Federal requirements for the injection into Class V wells. However, if injection into these wells could cause the water in the receiving USDW to violate primary drinking water regulations, then EPA or an authorized state could require the issuance of a permit that could include the substantive requirements of the UIC program (40 CFR §144.12(c)).

SDWA Assessment Considerations

Compliance evaluations should determine whether the facility has its own potable water supply and if so, whether the facility regularly provides this potable water to at least 25 of the same people at least six months of the year. If it is determined that the facility is subject to the national drinking water regulations, then the inspection team should evaluate whether the facility has conducted monitoring of required contaminants at required frequency. The inspector should verify that the facility is using an approved laboratory and approved tests and is maintaining the required records. The inspectors should confirm that the facility has notified employees of violations through continuous posting in conspicuous places in the workplace or through hand delivered or mailed written notices.

Compliance evaluations should determine if wastes are being injected at the site, and if so, if the facility is operating under a permit or by rule. If permitted, the inspection team should verify that all terms of the permit are being met. The inspection team should confirm that wastes being injected are identified in the permit and no unpermitted wastes are injected. Also, the inspectors should evaluate well records and verify that the volume of waste being injected is within the limitations of the permit. If operating under rule, inspectors should verify that a permit application has been submitted in accordance with the Federal or State requirements unless the facility is authorized by rule to inject during the life of the well. If operating under permit by rule conditions, the inspectors should verify that the facility is complying with applicable regulations identified in 40 CFR Part 144, Subpart C.

SDWA Regulatory Requirements

The following section provides a summary of the principal regulations developed pursuant to the SDWA that may apply to the organic chemical industry: 40 CFR Part 141 - National Primary Drinking Water Regulations; 40 CFR Part 143 - National Secondary Drinking Water Regulations; and 40 CFR Part 144 - Underground Injection Control Program.

<u>Applicable Subparts:</u>

Public water systems classifications applicable to organic chemical manufacturers:

40 CFR Part 141
National Primary Drinking Water Regulations

- Community water system - A public water system which serves at least 15 service connections used by year round residents or regularly serves at least 25 year-round residents.
- Non-transient non-community water system - A public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

40 CFR Part 141	
Requirements	**Effective Date**
Maximum Containment Levels Subpart B, G Maximum Containment Level Goals Subpart F Monitoring and Analytical Requirements Subpart C, H, I Reporting, Public Notification and Record Keeping Subpart D, H, I	All regulations in effect

Required Sampling and Testing Frequencies, §141.21

Tests	Frequency (Community System)	Frequency (Non-community)
Inorganics	• Systems using surface water: every year • Systems using groundwater only: every 3 years	State option except for nitrate*
Organics: except THMs	• Systems using surface water: every 3 years • Systems using groundwater only: state option	State option
Organics: THMs	• Systems serving populations of 10,000 or more: 4 samples per quarter per plant	State option

TESTS	FREQUENCY (COMMUNITY SYSTEM)	FREQUENCY (NON-COMMUNITY)
Coliform bacteria**	• Dependent on number of people served by the water system	Systems using surface and/or groundwater: 1 per quarter (for each quarter water is served to public)
Radiochemicals: natural	• Systems using surface water: every 4 years • Systems using groundwater only: every 4 years	State option
Radiochemicals: man-made	• System using surface water serving population greater than 100 000: every 4 years. All other systems: state option	System using surface and/or groundwater: state option

* Although routine nitrate monitoring is established at state option, the initial monitoring is required and should have been completed by June 1979.

** Repeat sampling required if routine sampling is total coliform-positive.

Special Monitoring Requirements for Sodium and Corrosion (Community systems only)*

TEST	FREQUENCY
Sodium	Systems using surface water: annually Systems using groundwater only: every 3 years
Corrosivity includes those characteristics known to indicate corrosivity: • pH • Calcium hardness • Total dissolved solids (TDS) • Temperature • Langelier Index	Once unless additional monitoring required by state or EPA

* First analyses must have been completed by February 1983.

Record-Keeping Requirements [§§141.33 and 141.91]

RECORDS PERTAINING TO	TIME PERIOD
Bacteriological analyses	At least 5 years
Chemical analyses	At least 10 years
Actions taken to correct violations	At least 3 years after last action taken
Sanitary survey reports	At least 10 years
Variances or exemptions	At least 5 years following expiration
Lead and copper control	At least 12 years

Lab Reports Summary Requirements [§141.33]

SAMPLING INFORMATION	ANALYSIS INFORMATION
Date, place, and time of sampling	Date of analysis
Name of sample collector	Laboratory conducting analysis
Identification of sample:	Name of person responsible for analysis
• Routine or check sample	Analytical method used
• Raw or treated water	Analysis results

Reporting Requirements for Check Sampling

CONTAMINANT	CHECK-SAMPLE REPORTING
Microbiological	Must report to state within 48 hours when any check sample confirms the presence of coliform bacteria.
Nitrate	Must report to state within 24 hours if check sampling confirms MCL has been exceeded
All others	Must be reported to the state within 10 days after the end of the month in which the sample was received.

MCL Violations

CONTAINANT	VIOLATION
Inorganic chemicals (expect nitrate) and organic chemicals (except THMs)	If average of results from initial sample plus 3 check samples exceeds MCL
Nitrate	If average of results from initial sample plus the check sample exceeds MCL
THMs	If average of results from present quarter plus those of 3 preceding quarters exceeds MCL*
Radionuclides (natural and man-made)	If average annual concentration exceeds MCL**
Microbiological (coliform testing): membrane filter and multiple-tube fermentation	If any of the MCLs are exceeded

* Quarter means a 3-month period. For convenience, calendar quarters are used.
** Based on individual analyses of 4 consecutive quarterly samples or a single analysis of an annual composite of 4 quarterly samples.

Public Notification Requirements, §141.32

VIOLATION OR CONDITION	REQUIRED TIMING			
	72 HOURS	14 DAYS	45 DAYS	3 MONTHS
Violation of an MCL, acute	3, 4, 5	2, 4, 5	1, 4, 5	1, 4, 5
Violation of an MCL, non-acute		2, 4, 5	1, 4, 5	1, 4, 5
Failure to monitor				2, 4, 5
Failure to follow compliance schedule				2, 4, 5
Failure to use approved testing procedure				2, 4, 5
System granted a variance or exemption				1, 4, 5

1 - Direct mail
2 - Local newspaper
3 - By local radio and/or TV
4 - Hand delivery
5 - Continuous posting in conspicuous places

<u>Applicable Subparts:</u>

These regulations are not Federally enforceable but are intended as guidelines for States.

40 CFR Part 143

National Secondary Drinking Water Regulations

40 CFR Part 143	
Component	**Regulatory Recommendation**
Standards	Secondary MCLs exist for 15 contaminants
Monitoring	Conducted at least as frequently as the monitoring performed for inorganic chemicals in the National Interim Primary Drinking Water Regulations and more frequently for parameters such as pH, color, and odor
Analytical Methods	pH, copper, and fluoride should be analyzed consistent with methods described in 40 CFR Part 141. Other contaminants should be analyzed using the procedures specified in 143.4(b).
Notification	Community water systems that exceed the secondary MCL for fluoride, but do not exceed the primary MCL, should notify (using the public notice provided in 143.5(b)) all billing units annually, all new billing units at the time service begins, and the state public health officer.

Applicable Subparts:

Well classifications applicable to organic chemical manufacturers:

40 CFR Part 144

Underground Injection Control Program

- Class I - Wells used to inject hazardous or nonhazardous wastes beneath the lower most formation containing within one-quarter mile of the well-bore, an underground source of drinking water.
  Class V - Injection wells not included in other classes.

40 CFR PART 144	
REQUIREMENTS	EFFECTIVE DATE
Any underground injection is prohibited unless authorized by permit or rule. Construction of any well required to have a permit is prohibited until the permit has been issued.	
Authorization by Rule Requirements:	
Reporting Requirements:	
• Inventory information as specified in 40 CFR 144.26	One year after the date of approval or effective date of the UIC program for the State.
• 24-hour notification of noncompliance that may endanger health or the environment (Class I wells) as required in 40 CFR 144.28(b)	Orally within 24 hours and written five days
• Plugging and abandonment plan (Class I wells) as required in 40 CFR 144.28(c).	One year after the effective date of the UIC program in the State (EPA administered programs).
• Reports containing the information required in 40 CFR 144.28(h)(l) (Class I wells)	Quarterly
• Notice of abandonment as required in 40 CFR 144.28(j)	As specified by the Director
• Plugging and abandonment report as required in 40 CFR 144.28(k)	Existing wells: No later than 4 years from approval or promulgation of UIC program. New wells: Reasonable time before construction is expected to begin

40 CFR PART 144	
REQUIREMENTS	EFFECTIVE DATE
Authorization by Permit Monitoring requirements: • All owners and operators (even those authorized by rule, unless authorized for life of the well) are required to submit a permit application containing the information in 40 CFR 144.31.	

Appendix C Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulates the manufacture, distribution, sale, and use of pesticides to minimize risk to human health and the environment. A pesticide is defined as any substance intended to prevent, destroy, repel, or mitigate pests. Chemical facilities that produce pesticides or pesticide active ingredients are subject to FIFRA and its implementing regulations, which are found at 40 CFR §§150-189. These regulations are summarized below; however, the detailed requirements included in the applicable regulations are presented later in this appendix. For the purposes of this manual, the term pesticide includes pesticide active ingredients. Specifically, FIFRA requires:

- All pesticides to be registered with EPA
- All manufacturers of pesticides to be registered with EPA, submit specific reports, and keep specific records.

Registration of Pesticides and Pesticide-Producing Establishments

Section 3 of FIFRA and the regulations at 40 CFR Part 152 state who may register a pesticide and the procedures and information necessary for registration. Basically, no pesticide can be sold or distributed unless it is registered with EPA. The party who registers the pesticide is known as the registrant, and may be the manufacturer. Any party seeking a registration for a new pesticide product must submit an application for registration, which contains the information specified in 40 CFR §152.50. (40 CFR Part 158 specifies the types and minimum amounts of data and information EPA requires to make regulatory judgements about the risks and benefits of pesticides.) All applications for new registrations must be approved by EPA before the product may legally be distributed or sold. Exemptions to the registration requirements are contained in 40 CFR §152.30.

The Federal Insecticide, Fungicide, and Rodenticide Act

Under Section 7 of FIFRA and 40 CFR Part 167, all pesticide-producing establishments must register with EPA and receive a registration number. 40 CFR §167.2 identifies who must register, the exact information an establishment must submit, and the required timeframes for registration. Specific reporting requirements for pesticide-producing establishments (found at 40 CFR §167.85) include for each pesticide produced, the amount (1) produced during the past year, (2) sold or distributed during the past year, or (3) estimated to be produced during the current year. These reports (called Annual Pesticide Production Reports) must be submitted to EPA annually on or before March 1. 40 CFR §167.85 also identifies the specific recordkeeping requirements with which the pesticide producer must comply. Additional recordkeeping and reporting requirements for the pesticide producer are identified in 40 CFR Part 169.

In addition to the above requirements, FIFRA has stringent standards for the labeling and packaging of pesticides. 40 CFR Part 156 identifies specific labeling requirements. 40 CFR Part 157 identifies packaging requirements, including child-resistant packaging requirements (Subpart B).

FIFRA Assessment Considerations

Chemical manufacturers are not responsible for complying with the requirements of FIFRA unless it produces a pesticide. If a facility does produce a pesticide, it should have an EPA Establishment Number. And, if it has an EPA Establishment Number, it should be submitting an Annual Pesticide Production Report for each pesticide it produces.

Not all chemical facilities that produce a pesticide are necessarily registrants. A registrant is the person who registers the pesticide with EPA prior to selling or distributing it. If the chemical facility is the registrant of a specific pesticide, that pesticide must be registered with EPA and have a registration number.

Most facilities that produce pesticides are aware of the various registration processes they must comply with. However, it is the reporting and recordkeeping requirements that tend to be overlooked. The facility must be certain it is complying with *all* reporting requirements, not just the Annual Pesticide Production Report. One of the regularly overlooked requirements is the child-resistant packaging reporting requirements at 40 CFR Part 157. Recordkeeping requirements under FIFRA are extensive with retention times varying from 2 years up to 20 years. Again, a pesticide producer must ensure that it maintains *all* the records required by regulation for the period of time required. As mentioned, some of the records must be kept for a period of 20 years; however, they can be transferred to EPA after 3 years. A facility must track these records carefully and ensure it has documentation regarding the transfer to EPA.

FIFRA Regulatory Requirements

The following sections provide a summary of the principal regulations developed pursuant to FIFRA that may apply to the organic chemical industry. These regulations include:

- 40 CFR Part 152 - Pesticide Registration and Classification Procedure
- 40 CFR Part 156 - Labeling Requirements for Pesticides and Devices
- 40 CFR Part 157 - Packaging Requirements for Pesticide Devices
- 40 CFR Part 167 - Registration Pesticide and Active Ingredient Producing Establishments
- 40 CFR Part 167.85 - Submission of Reports for Pesticide and Active Ingredient Producing Establishment
- 40 CFR Part 169 - Books and Records of Pesticide Production and Distribution

Affected Community:

Anyone wishing to legally distribute or sell a pesticide

FIFRA - 40 CFR Part 152

Pesticide Registration and Classification Procedures

Applicability:

Prior to distributing or selling the pesticide

Requirements:

All pesticides must be registered with EPA

Affected Community:

Producer or registrant of the pesticide

FIFRA - 40 CFR Part 156

Labeling Requirements for Pesticides and Devices

Applicability:

Prior to distribution or selling

Requirements:

All pesticide products must bear a label containing the following information:

1) name, brand, or trademark under which the product is sold;
2) name and address of the producer/registrant;
3) net contents;
4) product registration number;
5) producing establishment number;
6) ingredient statement;
7) warning or precautionary statement;
8) directions for use; and
9) use classification(s)

The label must be approved by EPA prior to distribution of the product.

Affected Community:

Registrant of the pesticide

FIFRA - 40 CFR Part 157

Packaging Requirements for Pesticides and Devices

Applicability:

Certification:

- When applying for registration or within 6 months of notification that the pesticide must be in child-resistant packaging.

Reporting:

- When applying for registration or within 6 months of notification that the pesticide must be in child-resistant packaging.

Record Keeping:

- As long as the registration of the pesticide is in effect

Requirements:

Pesticides meeting the requirements of §157.22 must be packaged in child-resistant packaging for distribution or sale.

Certification:

- Certify that the package meets the standards of §157.32

Reporting:

- A certification statement containing:
  - name and EPA registration number of the product to which the certification applies,
  - registrant's name and address,
  - date,
  - name, title, and signature of the company official making the certification, and
  - a statement that the packaging meets the established effectiveness, compatibility, and durability standards

Record Keeping:

- A description of the package including:

  - the dimension and composition of container and
  - the closure or child-resistant mechanism

- Copy of the certification statement (see above)

- One of the following types of records verifying the package is child-resistant:

  - test data based on established protocol;
  - test data, not based on established protocol, or measurements of the package and an explanation as to why the data or measurements demonstrate the package is child resistant;
  - test data on a different package and an explanation of why the data demonstrate the package is child resistant, or
  - written evidence indicating testing was conducted in conformance with the established protocol

- Records verifying the package meets the established compatibility and durability standards

Affected Community:

Any pesticide-producing establishment

FIFRA - 40 CFR Part 167 Registration of Pesticide and Active Ingredient Producing Establishments

Applicability:

Prior to any pesticide production at the facility

Requirement:

Any establishment where a pesticide is produced must be registered with EPA

Affected Community:

Each pesticide producer operating an establishment

FIFRA - 40 CFR Section 167.85

Submission of Pesticide Reports for Pesticide and Active Ingredient Producing Establishments

Applicability:

Initial report no later than 30 days after the first registration and annually thereafter, on or before March 1

Requirement:

Each pesticide producer operating an establishment must submit a report, using a form supplied by EPA, containing the following information:

- name and address of the establishment, and
- the amount of each pesticide
  - produced during the past year,
  - sold or distributed during the past year, and
  - estimated to be produced during the current year

Affected Community:

All producers of pesticides

FIFRA - 40 CFR Part 169

Books and Records of Pesticide Production and Distribution

Applicability:

Retention of records from 2 years to 20 years

Requirement:

Maintain the specific records identified in §169.2 and provide access to authorized representatives to review and to copy records required to be maintained.

Appendix D Resource Conservation and Recovery Act (RCRA)

The Resource Conservation and Recovery Act (RCRA) of 1976, which amended the Solid Waste Disposal Act of 1965, addresses hazardous (Subtitle C) and solid (Subtitle D) waste management activities. The Hazardous and Solid Waste Amendments (HSWA) of 1984 strengthened RCRA's waste management provisions, including adding a Subtitle I which governs Underground Storage Tanks (USTs). The goals and objectives of RCRA are to protect human health and the environment and to conserve valuable materials and energy resources. The applicable RCRA titles and the regulations and guidelines developed pursuant to RCRA are illustrated in Exhibit D-1 and are discussed below.

Regulations promulgated pursuant to Subtitle C of RCRA, at 40 CFR Parts 260-299, establish a "cradle-to-grave" system that governs hazardous wastes from the point of generation to treatment or disposal. As of 1996, 46 States are authorized to implement aspects of the RCRA program and may include requirements more stringent than Federal regulations in their authorized program. There are different levels of State authorization. States can be granted primacy (i.e., approval to implement a State-administered program) for the base RCRA program, or pre-HSWA RCRA requirements, for administering land disposal requirements, and for administering the RCRA corrective action program. Non-RCRA authorized states or territories (Alaska, Hawaii, Iowa, Puerto Rico and Wyoming) may also have state laws that address hazardous waste management requirements.

Subtitle D of RCRA sets up a framework for regulating non-hazardous solid wastes. Impacts from Subtitle D on a chemical facility may be direct, where the facility operates a solid waste incinerator or manages an on-site solid waste landfill, or indirect, coming into play as a result of a facility's use of an off-site solid waste disposal facility. Non-hazardous solid wastes are regulated through state solid waste management programs and are specific to each state. Typically, units such as solid waste landfills and non-hazardous waste incinerators are regulated through state-issued permits. Subtitle I regulates USTs that contain petroleum and hazardous substances. Regulations for USTs are promulgated at 40 CFR Part 280. Following is a summary of RCRA regulations applicable to the chemical industry.

Resource Conservation and Recovery Act Requirements

Exhibit D-1. RCRA Statutes and Regulatory Requirements for Organic Chemical Facilities

Resource Conservation and Recovery Act	
Subtitle C	Hazardous Waste Management
Subtitle D	State or Regional Solid Waste Plans
Subtitle I	Regulation of Underground Storage Tanks

Subtitle C

- 40 CFR Part 261 Hazardous Waste Identification
- 40 CFR Part 262 Hazardous Waste Generators
- 40 CFR Part 263 Hazardous Waste Transportation
- 40 CFR Part 264-265 Treatment, Storage, Disposal
- 40 CFR Part 266 Specific Hazardous Wastes/Specific Hazardous Waste Management Facilities (Subpart H-Boilers/Industrial Furnaces)
- 40 CFR Part 268 Land Disposal Restrictions
- 40 CFR Part 270 RCRA Permit Program
- 40 CFR Part 279 Used Oil Management

Subtitle D

- 40 CFR Part 257 Solid Waste Disposal Criteria
- 40 CFR Part 258 Municipal Waste Landfills

Subtitle I

- 40 CFR Part 280 Underground Storage Tanks

Hazardous Waste Generation

Generators of hazardous waste are subject to requirements under 40 CFR Part 262. The determination of what material is a hazardous waste is the essence of any RCRA compliance evaluation. Regulations for identification of hazardous wastes are detailed in 40 CFR Part 261. The definition of a hazardous waste is not straightforward. Under the Federal rules, to be a hazardous waste, a waste must: be a solid waste (as defined in 40 CFR §261.2); not be excluded from regulation as a hazardous waste under 40 CFR §261.4; and be a characteristic waste, a listed waste, a mixture of a solid waste and a listed waste, or a mixture of a solid waste and a characteristic waste that still exhibits that characteristic. Also, a waste is hazardous if it is a mixture of soil or water and a listed waste, or a mixture of soil or water and a characteristic waste that still exhibits that characteristic.

A solid waste, by definition, is any discarded material—solid, liquid, or containerized gas—that is not excluded under the regulations. Exclusions include hazardous waste mixed with domestic sewage, discharged as point source discharges regulated under the CWA and certain secondary materials that are reclaimed and reused in the original process or processes in which they were generated.

If a waste meets the definition of solid waste, it is considered hazardous if it exhibits one or more of four defined hazardous waste characteristics (see Exhibit D-2), or is listed as a hazardous waste in 40 CFR Part 261 (see Exhibit D-3). It is the generator's responsibility to determine whether a waste is hazardous. This determination must be based on test results or the generator's knowledge and familiarity with the waste. Generators may be subject to enforcement penalties for improperly determining that a waste is not hazardous.

Exhibit D-2. Characteristic Hazardous Wastes

Ignitability	Flashpoint below 140°F §261.21
Corrosivity	Liquids with a pH equal to or below 2 or equal to or above 12.5 or which corrode steel at a specified rate §261.22
Reactivity	Reacts violently with water or other substances to create toxic gases §261.23
Toxicity	A waste that leaches specified amounts of metals, pesticides, or organic chemicals using the Toxicity Characteristic Leaching Procedure (TCLP) §261.24

Exhibit D-3. Listed Hazardous Wastes

"F" Wastes	Hazardous wastes from nonspecific sources §261.31
"K" Wastes	Hazardous wastes from specific sources §261.32
"U" Wastes	Hazardous wastes from discarded commercial chemical products, off-specification species, container residues, and spill residues §261.34
"P" Wastes	Acutely hazardous wastes from discarded commercial chemical products, off-specification species, container residues, and spill residues §261.33

If the waste is not found on any of these lists, it is not hazardous, although it may be listed on a State hazardous waste list.

Secondary materials generated by organic chemical industries may be classified as solid wastes and potentially hazardous wastes where they are recycled in certain ways (e.g., used in a manner constituting disposal, burned for energy recovery, reclaimed, or accumulated speculatively). Such materials are considered accumulated speculatively where the material is stored with less than 75 percent recycled within one calender year. Under 40 CFR 261(c)(8), persons accumulating secondary materials prior to recycling must be able to show 1) the material is potentially recyclable; 2) they have a feasible means of recycling such material; and 3) during the calendar year the amount of material recycled or transferred to a different site for recycling equals at least 75 percent by weight or volume of the amount of material accumulated at the beginning of the period. The 75 percent requirement is to be applied to each material of the same type that is recycled in the same way. Materials accumulating in units exempt from regulation under § 261.4(c) are not included in making the calculation. And commercial chemical products being speculatively accumulated are not regulated as solid wastes.

Hazardous wastes that are recycled are subject to the requirements for generators, transporters, and storage facilities as identified in 40 CFR §261.6(b) and (c), except as excluded in 40 CFR §261.6(a)(3). In addition, §261.6(a)(2) identifies recycled materials that are only subject to Parts 266 (recycling regulations), 270 (permits), and 124 (NPDES permits). This includes recyclable materials such as those that are used in a manner constituting disposal, hazardous wastes burned for energy recovery in boilers and industrial furnaces, and used oil burned for energy recovery. Any facility that stores recyclable materials before they are recycled, except those materials excluded in 40 CFR §261.6(a), must comply with applicable storage requirements of 40 CFR Parts 264 and 265.

The regulations also establish requirements for residues of hazardous waste in empty containers. Specifically, 40 CFR §261.7 establishes that empty containers and inner liners from an empty container are not subject to the hazardous waste regulations, provided that all wastes have been removed using the practices commonly employed to remove materials from that type of container, no more than one inch of residue remains in the container or inner liner, or no more than 3 percent by weight of the total capacity (or 0.3 percent for larger containers) remains in the container or inner liner. Containers that have held compressed gas are considered empty when the pressure approaches atmospheric. For acute hazardous wastes, additional measures are required.

Generators of hazardous wastes are the first link in the cradle-to-grave chain of hazardous waste management. Under RCRA, there are three categories of hazardous waste generators: large quantity generators (LQGs), small quantity generators (SQGs), and conditionally exempt small quantity generators (CESQGs). The determination of a generator's applicable category is summarized in Exhibit D-4.

CESQGs must only comply with the Part 262 generator regulations as established at 40 CFR §261.5. Specifically, CESQGs must identify the waste to determine if it is a hazardous waste, accumulate less than 1,000 kilograms of hazardous waste at any time, treat or dispose of the waste on-site, or ensure that the waste is sent to a permitted facility or a recycling facility. The requirements CESQG are exempt from include, but are not limited to, the following:

- Manifest requirement
- Exception report—when generator does not receive a copy of the signed manifest from the TSD facility
- Biennial/annual report
- Personnel training
- Contingency plan
- EPA ID number
- Storage requirements—no need to meet technical requirements under part 264 or 265 for containers or tanks.

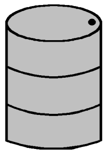
However, many transporters will not accept wastes from a generator without an EPA ID number or manifest.

CESQGs that exceed the 100 kilograms per month hazardous waste generation cutoff are subject to SQG provisions. CESQGs that exceed the 1 kilogram per month of acutely hazardous waste generation cutoff are subject to the LQG provisions. Note that some States do not have CESQG exemptions (i.e., all generators must meet the same requirements).

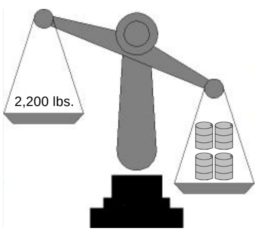
All SQGs and LQGs must comply with requirements as described in 40 CFR Part 262. Standards for generators establish responsibilities including obtaining an EPA identification number, preparing hazardous waste manifests, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. This Part also identifies requirements for generators that are importing or exporting hazardous wastes into or out of the country.

Generators can accumulate and store hazardous waste for up to 90 days (180 days for SQGs) without obtaining a storage permit provided that the facility complies with specific conditions in 40 CFR §262.34, including applicable management standards for containers, tanks, and drip pads. Each accumulation container must include a "Hazardous Waste" label, identify the date upon which accumulation began, and the facility must comply with 40 CFR Part 265, Subpart C (Preparedness and Prevention). Additionally for LQGs, Subpart D (Contingency Plan and Emergency Procedures), and with 40 CFR §265.16 (Personnel Training). SQGs have less stringent requirements for accumulation than LQGs as identified in 40 CFR §262.34(d) and (e).

Exhibit D-4. Categories of Hazardous Waste Generators

KEY:  = 1 barrel = about 200 kilograms of hazardous waste which is about 55 gallons

YOU ARE A LARGE QUANTITY GENERATOR IF ...



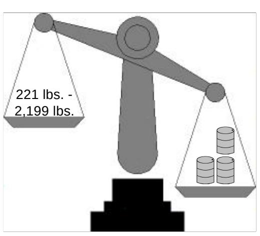
In one calendar month you ...

- generate 2,200 pounds or more of hazardous waste or
- generate 2,200 pounds or more of spill cleanup debris containing hazardous waste or
- generate more than 2.2 pounds of acutely hazardous waste or
- generate more than 220 pounds of spill cleanup debris containing an acutely hazardous waste or

At any time you ...

- accumulate more than 2.2 pounds of acutely hazardous waste on-site

YOU ARE A SMALL QUANTITY GENERATOR IF ...



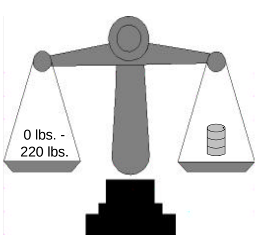
In one calendar month you ...

- generate more than 220 pounds and less than 2,200 pounds of hazardous waste or
- generate more than 220 pounds and less than 2,200 pounds of spill cleanup debris containing hazardous waste or

At any time you ...

- accumulate more than 2,200 pounds of acutely hazardous waste on-site

YOU ARE A CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR IF ...



In one calendar month you ...

- generate 2.2 pounds or less of acutely hazardous waste or
- generate 220 pounds or less of hazardous waste or
- generate 220 pounds or less of spill cleanup debris containing hazardous waste or

At any time you ...

- accumulate up to 2.2 pounds of hazardous waste on-site

Hazardous Waste Transportation Regulations

Facilities that transport hazardous wastes off-site, where these wastes are required to be manifested pursuant to 40 CFR Part 262, must comply with transporter requirements established in 40 CFR Part 263. Hazardous waste transportation requirements, the middle link in the "cradle-to-grave requirements of RCRA, require that the transporter obtain an EPA identification number, and specify manifesting and recordkeeping requirements, including specific conditions for shipment by rail or water. It is important to note that a transporter that stores wastes at an off-site location for more than 10 days must comply with Parts 264, 265, 268, and 270 for storage of those wastes. Subpart C of Part 263 establishes response requirements for discharges of hazardous wastes during transport.

Hazardous Waste Treatment, Storage, and Disposal Regulations

Any facility that treats, stores, or disposes of hazardous waste is considered to be an owner/operator of a treatment, storage, or disposal (TSD) facility and is subject to requirements identified in 40 CFR Parts 264 and 265. Treatment, storage, and disposal facilities (TSDFs) are the last link in the cradle-to-grave regulation of RCRA. All TSDFs are required to obtain an operating permit and abide by TSD regulations. The TSD regulations establish design and operating criteria as well as performance standards that owners and operators must meet to protect human health and the environment. Because TSDs involve many different types of units, these regulations are far more extensive than those just described for generators and transporters.

The RCRA TSD regulations include both administrative and technical requirements. The regulations identify administrative requirements such as the applicability of the requirements, general facility standards, preparedness and prevention, contingency plans and emergency procedures, and manifesting, reporting, and recordkeeping. Technical requirements may address ground water monitoring, closure/post-closure, financial requirements, and standards related to the different types of waste management units. Specifically, the regulations identify requirements for containers, tanks, surface impoundments, waste piles, land treatment, landfills, incinerators, waste treatment, underground injection, and miscellaneous units. Also, RCRA TSD regulations identify air emission requirements for process vents, equipment leaks, and units that store hazardous wastes with high volatile organic concentrations from specific operations related to the managing and recycling of hazardous waste.

EPA's hazardous waste permitting program is established at 40 CFR Part 270. New TSDFs requiring a permit must submit a two part permit application. Part A is a short, standard form that collects general information about the facility, while Part B of the application is much more extensive and requires the facility to supply detailed and highly technical information.

This submission must be made at least 180 days prior to the date on which physical construction is expected to start. Once issued, RCRA permits are valid for up to 10 years.

TSDFs fall into two categories: interim status facilities and permitted facilities. Interim status regulations (40 CFR Part 265) apply to facilities that are operating under a Part A permit while their Part B permit application is being reviewed. Any facility that is in existence on the effective date of statutory or regulatory amendments under RCRA that render the facility subject to permitting requirements shall have interim status, provided that the facility notifies EPA of hazardous waste activity and complies with application requirements of 40 CFR §270.10. Interim status standards are "good housekeeping" types of requirements that must be addressed until a Part B permit is issued. TSDF permit standards (40 CFR Part 264) are facility-specific performance standards and design and operating requirements that are incorporated into a TSD permit. Permit writers use the standard permit language established in 40 CFR Part 264 to set facility-specific conditions. TSD permits can be extremely complex and may be several hundred pages in length. As such, an evaluation of specific permit conditions must be made at chemical facilities operating under a RCRA TSD permit.

Land Disposal Restrictions

Under the Land Disposal Restriction (LDR) regulations (40 CFR Part 268), hazardous wastes are largely prohibited from land disposal. Once prohibited, the statute provides two options: comply with a specified treatment standard or dispose of the waste in a “no migration unit.” Land disposal includes any placement of hazardous waste into a landfill, land treatment unit, waste pile, inject well, salt dome or salt bed formation, underground mine or cave or surface impoundment. Restricted hazardous wastes may be land disposed only if certain treatment standards are met or if waste extract or waste treatment residue concentrations are met, as specified in 40 CFR §§268.41-43. Generators of wastes subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal. Facilities that generate less than 100 kilograms of non-acute hazardous waste or less than one kilogram of acute hazardous waste per month are not subject to the LDRs. The LDRs allow wastes which would otherwise be prohibited from land disposal to be treated in surface impoundments, provided that specific conditions are met as outlined in 40 CFR §268.4. Facilities may petition EPA for extensions to the LDRs in certain instances.

The Land Disposal Restrictions also specify that for certain characteristic wastes managed in non-Clean Water Act (CWA) wastewater treatment systems, non-CWA equivalent systems or non-Class I injection wells, the underlying hazardous constituents reasonably expected to be present in the waste at the point of generation should be treated as well as the hazardous characteristic. For wastes that are characteristic for organics (i.e., D018-D043), this requirement applies to both wastewaters and non-wastewaters. Underlying hazardous constituents include all those constituents listed in 40 CFR 268.48 (Universal Treatment Standards).

The LDRs prohibit the use of dilution as a substitute for treatment to meet the LDRs with one exception. Wastes that are hazardous only because they exhibit a characteristic in a treatment system which treats wastes and subsequently discharges these wastes pursuant to a CWA permit are exempt from LDRs. **Exhibit D-5** provides a decision tree for making the determination as to whether dilution of a waste is permissible. Storage of hazardous wastes restricted from land disposal under Part 268 Subpart C is prohibited, unless certain conditions are met as identified in 40 CFR §268.50.

Underground Storage Tank Regulations

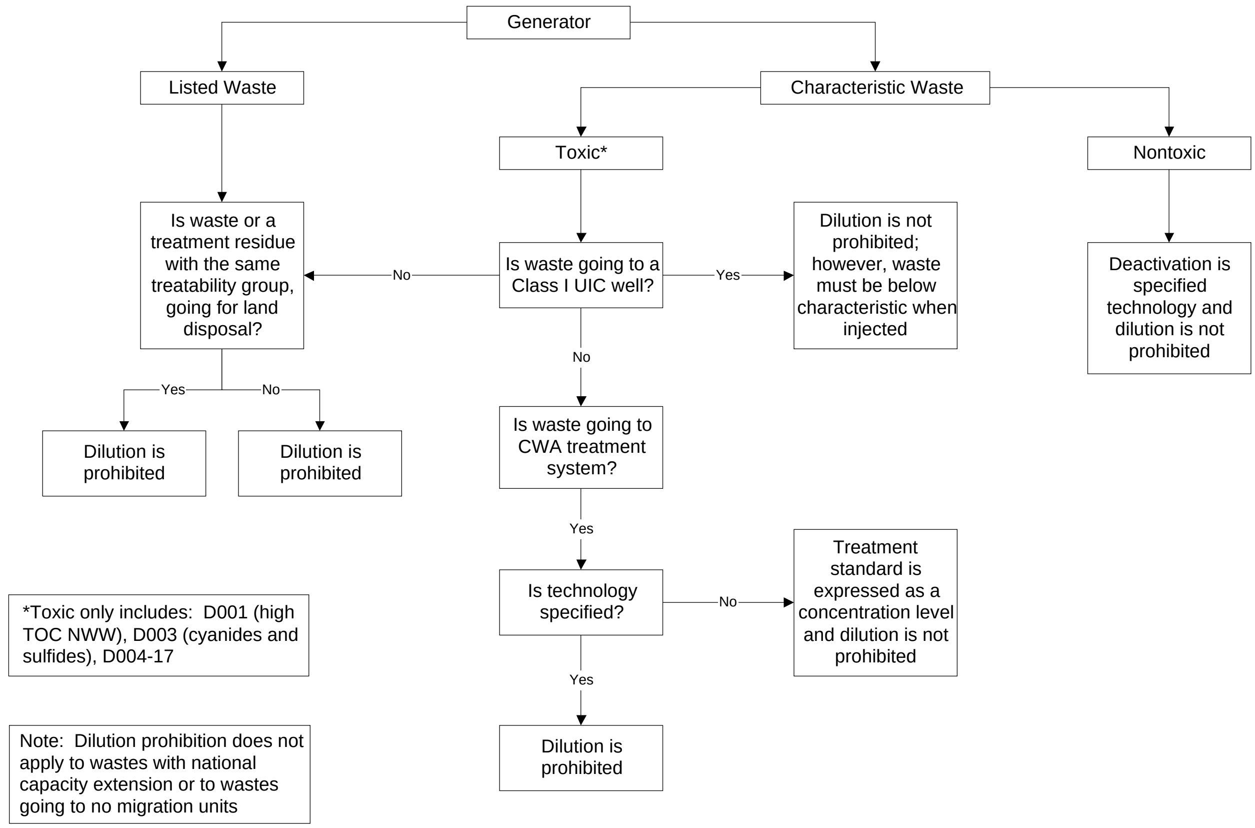
Underground storage tanks (USTs) containing petroleum and hazardous chemicals are regulated under 40 CFR Part 280. Federal, state, and local agencies are or may be involved in regulating USTs. The statute provides EPA with the authority to develop and enforce the UST program, but states have discretionary authority to develop their own UST regulatory program as long as the program is no less stringent than the Federal program. Local agencies may also implement UST provisions through local ordinances.

An underground storage tank is one that stores "regulated substances" and that has at least 10 percent of its volume below the surface of the ground, including piping connected to the tank. Regulated substances include hazardous chemical products regulated under CERCLA (above de minimis concentrations) and any petroleum products that are liquid at standard conditions. Regulated substances do not include hazardous wastes. As identified in 40 CFR §280.10(b)(1), underground tanks containing hazardous waste are not subject to 40 CFR Part 280 requirements. Rather, underground tanks containing hazardous wastes are subject to RCRA requirements, as appropriate.

Exclusions to the UST regulations include tanks such as for heating oil used primarily for space heating on the premises where the tank is stored, flow-through process tanks, any wastewater treatment tank system regulated under the CWA, tanks less than 110 gallons in capacity, spill or overflow containment systems that are expeditiously emptied after use, storm water and wastewater collection systems, and tanks situated on or above the floor of underground areas such as basements, shafts, and tunnels.

The regulations at 40 CFR Part 280 include conditions for design, construction, operation, installation, and notification; general operating requirements; release detection; release response, investigation, and confirmation; release reporting and corrective action; out-of-service UST systems and closures; and financial responsibility.

Exhibit D-5. LDR Dilution Decision Tree



The UST program requires that by December 22, 1998, all existing USTs must add spill, overfill, and corrosion protection; close the existing UST; or replace the existing UST with a new UST. Spill protection is defined as installation of catchment basins to contain spills from delivery hoses. Overfill protection requires either an automatic shutoff valve, overfill alarms, or ball float valves. Corrosion protection requires that existing tanks match one of the following tank conditions and one of the piping conditions:

- Tanks
  - Steel tank has corrosion-resistant coating AND cathodic protection
  - Tank made of noncorrodible material
  - Steel tank clad with noncorrodible material or tank enclosed in noncorrodible material
  - Uncoated steel tank has cathodic protection system
  - Uncoated steel tank has interior lined with noncorrodible material
  - Uncoated steel tank has cathodic protection AND interior lined with noncorrodible material

- Piping
  - Uncoated steel piping has cathodic protection
  - Steel piping has a corrosion-resistant coating AND cathodic protection
  - Piping made of (or enclosed in) noncorrodible material.

New USTs must have a suitable dielectric coating in addition to cathodic protection. Also, new USTs must be installed in accordance with a code of practice and in accordance with the manufacturer's instructions. Installation of new USTs must also be certified. Any facility which brings an UST into use after May 8, 1986, must submit the Notification Form prescribed in Appendix I of Part 280 (or a comparable state form) within 30 days of bringing the UST into use. This form must be submitted to the state or local agency or department designated in Appendix II of Part 280.

RCRA Assessment Considerations

Similar to the facility assessment elements discussed in the Overview, the key components of a RCRA assessment are knowledge of the facility, a document review, and an assessment plan.

A RCRA self-assessment requires familiarity with what hazardous wastes are generated at the chemical facility and how these wastes are managed. Chemical facilities' operations can be exceedingly complex and varied, so a knowledge of each operation is necessary.

One source of information for determining compliance with RCRA requirements is a document review. Useful documents to review include facility maps and blueprints; aerial photographs; plant organization charts; piping and instrumentation diagrams (P&IDs); operating or procedure manuals; information about emission points, waste streams, or monitoring results; the daily operating log; company spill reports; permit applications; TRI reports; annual/biannual operating reports; and documents prepared for environmental activities such as siting a facility or remedial activity.

Before conducting an assessment, the assessor should draw up a Plan that traces material flows through the plant. The Plan should indicate whether samples will be necessary to determine if a particular waste stream is hazardous or if a release of hazardous material has occurred. In addition, appropriate reports should be prepared as required, for example, Quality Assurance/Quality Compliance Plans. Also, the Plan should reflect any special considerations set forth in the facility permit or any consent decree or agency findings and orders.

EPA has published various RCRA Inspection Checklists which are useful as guidance and as a framework for a Plan. For example, checklists are available that list requirements from RCRA regulations for generators of hazardous waste, closure and post-closure plans and requirements, and land disposal requirements for generators.

Assessing compliance with RCRA paperwork and administrative requirements is as important as assessing compliance with waste management requirements. Administrative and paperwork requirements include keeping a daily log of facility operations, submitting an annual/biannual operating report to the regulatory agency, manifest requirements, waste analysis plans, certifications, having a contingency plan on file and procedures in place to implement the plan, conducting an adequate training program, and implementing adequate plant security.

During the actual assessment, the evaluation team should sit down with plant operations personnel and discuss plant organization and site operations, identifying and verifying major facility processes, preparedness and prevention measures, safety procedures that are observed and that need to be observed during the visual inspection, descriptions and locations of special equipment, and training programs.

RCRA Regulatory Requirements

The following sections provide summaries of the principal regulations developed pursuant to RCRA that may apply to that organic chemical industry. The section includes:

- 40 CFR §§261.5 and 262.34 - Generator Classifications and Requirements
- 40 CFR Part 262 - Hazardous Waste Generator Requirements
- 40 CFR Part 263 - Hazardous Waste Transporter Requirements
- 40 CFR Part 264 and 265 - Hazardous Waste Treatment Storage and Disposal
- 40 CFR Part 268 - Land Disposal Restrictions
- 40 CFR Part 280 - Underground Storage Tanks (UST)

40 CFR Part 261.5 and 262.34
Generator Classifications and Requirements

Conditionally Exempt Small Quantity Generators (CESQG)

REQUIREMENTS	AFFECTED FACILITY
• Make hazardous waste determination under §262.11 • Waste must be managed and disposed in a hazardous waste facility, or a landfull or other facility approved by the State for industrial or municipal wastes • Must comply with §261.5(g) to be excluded from requirements under parts 262 through 266, 268, and 270.	• Generate less than 100 kg/month (220 lbs/month) of hazardous waste, or • Generate less than 1 kg/month (2.2 lbs/month) of acute hazardous waste, or • Accumulate up to 1,000 kg (2,200 lbs) of hazardous waste onsite at any time

Small Quantity Generator (SQG)

REQUIREMENTS	AFFECTED FACILITY
• Subject to regulation under parts 262 through 266, 268, and 270. • Special requirements under §265.201 for accumulating hazardous waste in tanks. • May not accumulate more than 6,000 kg of hazardous waste at any time. • May not accumulate hazardous waste onsite for longer than 180 days (270 days if waste must be transported over 200 miles to hazardous waste facility), otherwise hazardous waste storage permit required.	• Generate more than 100 kg/month (220 lbs/month) of hazardous waste and less than 1,000 kg/month (2,200 lbs/month) of hazardous waste, or • Accumulate more than 1,000 kg (2,200 lbs), but less than 6,000 kg of hazardous waste at any time

Large Quantity Generator (LQG)

REQUIREMENTS	AFFECTED FACILITY
• Subject to regulation under parts 262 through 266, 268, and 270. • May not store hazardous waste onsite for more than 90 days, otherwise hazardous waste storage permit required.	• Generate more than 1,000 kg/month (2,200 lbs/month) of hazardous waste, or • Generate more than 1 kg/month (2.2 lbs/month) of acutely hazardous waste, or • Generate more than 100 kg/month (220 lbs/month) of spill cleanup debris containing an acutely hazardous waste, or • Accumulate more than 1kg (2.2 lbs) of acutely hazardous waste at any time

40 CFR Part 262 - Hazardous Waste Generator Requirements		
Requirements	**Description**	**Affected Facility**
EPA ID Number §262.12	• Cannot treat, store dispose of, or transport hazardous waste without EPA ID Number • Cannot offer hazardous waste to transporter or to treatment, storage, or disposal facilities that do not have an EPA ID Number	LQG or SQG that transports, or offers for transportation, hazardous waste for offsite treatment, storage or disposal
Subpart B - Manifest Requirements §§262.20-260.33	• Must complete and sign EPA form 8700-22 or 8700-22A for each shipment of hazardous waste	
Subpart C - Pre-transport Requirements §§262.30-262.34	• Must label and package hazardous waste in accordance with DOT regulations (49 CFR parts 172, 173, 178, 179) prior to transport	
	• Accumulation in units that comply with Subpart I of 40 CFR 265 (containers), or Subpart J of 40 CFR part 265 (tanks)	SQGs allowed up to 180 (or 270) days for accumulating hazardous waste without a storage permit

40 CFR Part 262 - Hazardous Waste Generator Requirements		
Requirements	**Description**	**Affected Facility**
	• Accumulation in units that comply with air emission standards identified in 40 CFR 265 Subparts AA (process vents), BB (equipment leaks) and CC (tanks, surface impoundments and containers) and with Subpart DD (containment buildings) • May accumulate wastes up to 90 days without storage permit • Must develop and maintain a contingency plan for storing wastes on-site	
Subpart D - Record keeping and Reporting §§262.40-262.44	• Maintain copies of manifest for three years • Must prepare and submit Biennial Report • Must file exception report if manifests not received by designated facility within 35 days (LQG) or 60 days (SQG)	SQG exempt from biennial reporting requirements
Subpart E - Exports of Hazardous Waste §§262.50-262.57	• Notify EPA 60 days before shipment • Must confirm waste receipts or file an exception report • Must file a Summary Report of Foreign Activity on March 1 of each year	

40 CFR Part 262 - Hazardous Waste Generator Requirements		
Requirements	**Description**	**Affected Facility**
Subpart F - Imports of Hazardous Waste §262.60	• Must prepare manifest that identifies foreign generator and importer • Must comply with all other generator standards in 40 CFR Part 262	

40 CFR Part 263 - Hazardous Waste Transporter Requirements		
Requirements	**Description**	**Affected Facility**
EPA ID Number §263.11	• Must obtain an EPA ID Number in order to transport hazardous waste	Persons who transport hazardous waste within the U.S. if manifest is required under 40 CFR §262.
Transfer Facility Requirements §263.12	• May store manifested shipments for ten days or less, otherwise subject to hazardous waste storage requirements under parts 264, 265, 268, and 270	
Manifest and Record Keeping Requirements §263.20	• Cannot receive a waste shipment unless accompanied by a hazardous waste manifest	
Hazardous Waste Discharges §263.30	• Take appropriate action • Notify proper authorities	

40 CFR Part 264 and 265

Hazardous Waste Treatment, Storage, and Disposal

40 CFR Part 264 - Facility Requirements (Part 265 Interim Status Standards are Similar but not Identical)		
Requirements	**Description**	**Affected Facility**
General Facility Requirements (Subpart B) Identification Number §264.11	• Must obtain an EPA ID Number in order to treat, store, or dispose of hazardous waste	Facilities that treat, store or dispose of hazardous waste
Required Notices §264.12	• Must notify Regional Administrator of receipt of a hazardous waste from foreign source • Must notify generator that the facility receiving the waste has the proper permits	
General Facility Management Plans §§264.13-264.19	• General Waste Analysis §264.13 • Security §264.14 • General Inspection Requirements §264.15 • Personnel Training §264.16 • General Requirements for I, C, R wastes §264.17 • Location Standards §264.18 • Construction Quality Assurance Program §264.19	

40 CFR Part 264 - Facility Requirements (Part 265 Interim Status Standards are Similar but not Identical)		
Requirements	**Description**	**Affected Facility**
Preparedness and Prevention (Subpart C)	• Must be equipped with communications and alarm systems, fire control equipment, spill control equipment, decontamination equipment, adequate water supply and distribution system • Must make arrangements with local authorities for the event of an emergency	
Contingency Plan and Emergency Procedures (Subpart D)	• Must develop and follow written contingency plan to minimize hazardous from fires, explosions and releases	
Manifest System, Record keeping/Reporting (Subpart E)	• Must maintain a written operating record • Must comply with hazardous waste manifest requirements • Must submit a biennial report • Must submit Unmanifested Waste Report within 15 days of receiving hazardous waste without an accompanying manifest	
Releases from Solid Waste Management Units (Subpart F)	• Must implement a groundwater program capable of determining the facility's impact on ground-water quality • Groundwater monitoring system • Develop and follow a ground-water sampling and analysis plan	Owner/operator of a surface impoundment, landfull or land treatment facility used to manage hazardous waste

40 CFR Part 264 - Facility Requirements (Part 265 Interim Status Standards are Similar but not Identical)		
Requirements	**Description**	**Affected Facility**
Closure and Post-Closure (Subpart G)	• Must develop and submit a written closure plan as part of the permit application under 40 CFR Part 270	
Financial Requirements (Subpart H)	• Must have detailed written estimate of the cost of closing the facility under the closure plan • Must establish financial assurance by selecting appropriate options	

40 CFR Part 264 and 265

Hazardous Waste Treatment, Storage and Disposal - Unit Specific Standards

40 CFR Part 264 and 265 Unit Specific Standards	
Requirements	**Affected Facility**
Containers (Subpart I)	Facilities that treat, store, or dispose of hazardous wastes in containers
Tank Systems (Subpart J)	Facilities that treat, store or dispose of hazardous wastes in tanks
Surface Impoundments (Subpart K)	Facilities that treat, store, or dispose of hazardous wastes in surface impoundments
Waste Piles (Subpart L)	Facilities that treat, store, or dispose of hazardous wastes in piles
Land Treatment (Subpart M)	Facilities that treat or dispose of hazardous wastes in land treatment units
Landfills (Subpart N)	Facilities that dispose of hazardous waste in landfills
Incinerators (Subpart O)	Facilities that treat or dispose of hazardous wastes in incinerators
Drip Pads (Subpart W)	Facilities that treat, store, or dispose of hazardous waste on drip pads.
Miscellaneous (Subpart X)	Facilities that treat, store or dispose of hazardous wastes in units not identified in 40 CFR Parts 264/265
Air Emission Standards for Process Vents (Subpart AA)	Facilities subject to RCRA permitting that have distillation, fractionation, thin-film evaporation, solvent extraction, or air/stream stripping operations that manage wastes with organic concentrations of at least 10 ppmw. (See §264.1030)
Air Emission Standards for Equipment Leaks (Subpart BB)	Facilities with equipment, regardless of process, that manage hazardous wastes in units which are subject to permitting under 40 CFR Part 270 and recycling units located at facilities subject to permitting. (See §264.1050). Units that manage less than ten percent organics by weight require only record keeping.

40 CFR Part 264 and 265 Unit Specific Standards	
Requirements	**Affected Facility**
Air Emissions Standards for Tanks, Surface Impoundments, and Containers (Subpart CC)	Facilities that treat, store, or dispose of hazardous waste in tanks, surface impoundments, or containers subject to subparts J, K, or I, respectively. Certain units may not be subject to subpart CC if criteria under §§264.1080 and 264.1082 re met.
Containment Buildings (Subpart DD)	Facilities that treat or store hazardous wastes in containment buildings are required to meet certain design and operating standards.

40 CFR Part 268 - Generator - Certification and Notification		
Requirements	**Description**	**Affected Facility**
Waste Analysis and Record keeping for Generators §268.7(a)	• Must determine if waste is restricted from land disposal • If waste does not meet treatment standards in §268 Subpart D, must notify treatment or storage facility receiving waste • If waste meets treatment standards §268 Subpart D, must submit notification, certification, and supporting information to treatment, storage, or disposal facility receiving the waste • If accumulating and treating restricted wastes onsite, must develop waste analysis plan and file with Administrator or authorized State • Maintain copies of records, certifications, and notices for five years	LQGs and SQGs

40 CFR 268 - Treatment and Disposal - Certification and Notification		
Requirements	**Description**	**Affected Facility**
Waste Analysis and Record Keeping for Treatment Facilities §268.7(b)	• Must test waste in accordance with waste analysis plan • Must submit notification and certification to land disposal facility receiving the waste	Facilities that treat hazardous wastes subject to LDRs
Waste Analysis and Record Keeping for Disposal Facilities §268.7(c)	• Must maintain copies of all notices and certifications specified in §268.7(a) and (b) • Must test waste in accordance with waste analysis plan to determine if the treatment standards have been met	Disposal facilities

40 CFR PART 280 - UNDERGROUND STORAGE TANK REQUIREMENTS		
REQUIREMENTS	**DESCRIPTION**	**AFFECTED FACILITY**
Design, Construction, Installation, and Notification (Subpart B)	• New USTs (installed after December 1988) must meet performance standards detailed in 40 CFR §280.20 • All existing UST systems (installed before December 1988) must be upgraded to meet standards detailed in 40 CFR §280.21 by December 1998 • Notify State and/or local agencies upon the Installation and use of new UST systems (40 CFR §280.22)	All owners and operators of underground storage tank systems as defined in 40 CFR §280.12 (See §280.10 (b-d) for exceptions)
General Operating Requirements (Subpart C)	• Must ensure the prevention of releases through spill and overfill control, proper corrosion protection, use of compatible materials, and proper and appropriate repairs to the UST system • Reporting requirements include notification, reports of all releases (suspected and confirmed), corrective action, and permanent change ins service or closure. • Record keeping requirements include documentation of corrosion controls, UST system repairs, release detection compliance	
Release Detection (Subpart D)	• Must provide a method or combination of methods to detect leaks and releases from the UST system • Must comply with release detection requirements according to the schedule set forth in 40 CFR §280.40(c)	

40 CFR Part 280 - Underground Storage Tank Requirements		
Requirements	**Description**	**Affected Facility**
	• Petroleum USTs must comply with release detection requirements under 40 CFR §280.41 • Hazardous substance USTs must comply with release detection requirements under 40 CFR §280.42 • Must maintain records demonstrating compliance with release detection requirements	
Release Reporting, Investigation, and Confirmation (Subpart E)	• Must report any suspected releases within 24 hours or another reasonable time period specified by implementing agency • Must investigate and confirm any suspected releases • Must contain and cleanup any release, and report to implementing agency	
Release Response and Corrective Action for UST Systems Containing Petroleum or Hazardous Substances (Subpart F)	In the event of a release • Must notify implementing agency upon confirmation of a release and take action to prevent additional release • Must submit report to implementing agency that summarizes initial abatement activities within 20 days • Must submit site characterization report • Must develop and implement a corrective action plan as directed by implementing agency	UST systems that manage petroleum or hazardous substances.
Out-of-Service UST Systems and Closure (Subpart G)	• For temporary closure, must maintain operating practices to ensure prevention of releases • Must notify within 30 days of permanent closure • Must maintain records to demonstrate compliance with closure requirements in accordance with §280.34	

40 CFR PART 280 - UNDERGROUND STORAGE TANK REQUIREMENTS		
REQUIREMENTS	DESCRIPTION	AFFECTED FACILITY
Financial Responsibility (Subpart H)	• Must demonstrate financial responsibility for taking corrective action and for compensating third parties for bodily injury and property damage caused by accidental releases	

Appendix E Emergency Planning and Community Right-to-Know Act (EPCRA)

The Emergency Planning and Community Right-To-Know Act (EPCRA), also known as Superfund Amendments Reauthorization Act (SARA) Title III, is designed to provide the general public and emergency planning and response personnel with information regarding the potential hazards in their community. EPCRA regulations identify emergency planning and notification procedures for hazardous chemicals in the community. Pursuant to EPCRA, EPA implements and enforces four regulatory programs applicable to chemical facilities. These programs are described below. The detailed requirements included in the applicable regulations are presented later in this appendix.

Hazardous Substance Notification

Pursuant to 40 CFR §302.6, facilities that release a hazardous substance in a quantity equal to or exceeding the reportable quantity (RQ) established in 40 CFR §302.4 must immediately notify the National Response Center at (800) 424-8802 and in the Washington, D.C. area at (202) 426-2675. Depending on the hazardous substance, the RQ ranges from 1 to 5,000 pounds. For this regulation, "release" means any spilling, leaking, pumping, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment, but excludes any release that results in exposure to persons solely within a workplace. Reporting procedures are similar to those required under 40 CFR Part 117 (FWPCA) (see Appendix F), but specify a different list of hazardous substances.

Emergency Planning and Notification

Pursuant to 40 CFR Part 355, any facility at which there is present an amount of any extremely hazardous substance, as defined in 40 CFR Part 355, equal to or in excess of its threshold planning quantity, shall notify the Commission (i.e., the State

Emergency Planning and Community Right-to-Know Act emergency response commission (SERC) or the Governor if there is no commission) and the local emergency planning committee (LEPC) identified in 40 CFR §355.30. Any facility producing, using, or storing a hazardous chemical, as defined in 40 CFR §355.20, that releases an RQ of an extremely hazardous substance or a CERCLA hazardous substance must immediately notify the local emergency planning committee and the State emergency planning commission as specified in 40 CFR §355.40.

Hazardous Chemical Reporting: Community Right-To-Know

As required in 40 CFR Part 370, chemical facilities are required to submit a Material Safety Data Sheet (MSDS), as required in 29 CFR §1910.1200(c), or a list of hazardous chemicals for which MSDSs are required (i.e., a minimum threshold of zero pounds), for each hazardous chemical used as defined in 40 CFR §370.2 to the SERC, LEPC, and the fire department.

All chemical facilities must also submit a Tier I or Tier II Form, as identified in 40 CFR §§370.40 and 41, for all hazardous chemicals (above a threshold of 500 pounds) and all extremely hazardous chemicals (above a threshold of zero pounds) indicating the aggregate amount of these chemicals at their facilities classified by hazard category. All facilities must submit a Tier I form (Aggregate Information by Hazard Type). If any agency requests a Tier II report (Specific Information by Chemical), the chemical facility is required to submit this information within 30 days of the request. Any facility may submit a Tier II form in lieu of a Tier I form.

Information required in 40 CFR Part 372 must be submitted to the SERC, LEPC, and the fire department.

Toxic Chemical Release Inventory

Section 313 of EPCRA requires submission of the Toxic Chemical Release Inventory (TRI) Reporting Form (the Form R) as required in 40 CFR Part 372. Form R provides EPA with a compilation of release information that supports future regulations and also provides the public with information on releases of toxic chemicals in the community. Facilities subject to the requirement must report the quantities of both routine and accidental releases of listed toxic chemicals (40 CFR §372.65), the maximum amount of the listed toxic chemicals onsite during the calendar year, and the amount contained in wastes transferred offsite.

A complete Form R is required annually for each toxic chemical manufactured, processed, or otherwise used at each covered facility as described in 40 CFR Part 372. The form must be filed on or before July 1 of the following year and submitted both to EPA and the State.

Included in the Form R reporting requirements are air releases that are not released through any point source (stocks, vents, ducts, pipes, or any other combined air stream). These releases include (1) fugitive equipment leaks from valves, pump seals, flanges, compressors, sampling connections, etc., (2) evaporative losses from surface impoundments and spills; (3) releases from building ventilation systems; and (4) any other fugitive or non-point air emissions. Engineering estimates and mass balance equations may be useful in estimating these fugitive emissions.

Chemical manufacturing facilities that have 10 or more employees are required to submit a form for any Section 313 listed toxic chemical that is manufactured or processed at the facility in excess of a 25,000 pound threshold during the course of a calendar year or is a listed toxic chemical that is otherwise used at the facility in excess of a 10,000 pound threshold during the course of the year. (Toxic chemicals contained in mixtures and trade name products must also be accounted for when making threshold and release determinations.) The facility should use the best information available to determine chemical quantities. Section 313 listed toxic chemicals do not have to be considered if they are present in a mixture at less than a de minimis total of 1.0 percent, or 0.1 percent combined for toxic chemicals meeting the OSHA carcinogen standard. Uses that are exempt from reporting requirements include, among others, use of toxic chemicals contained in intake water (used for processing or non-contact cooling) or in intake air (used either as compressed air or for combustion).

A supplier notification requirement exists at 40 CFR Part 372, Subpart C for facilities that manufacture, import, or process a listed toxic chemical, and then sell or otherwise distribute a mixture or trade name product containing the toxic chemical above de minimis levels to either another manufacturing facility or another facility that then sells the same mixture or trade name product to another manufacturing facility. Supplier notification is also required if a waste mixture containing a toxic chemical is **sold** to a recycling or recovery facility. This notification must be made to each customer with the first shipment of each calendar year. Records of notifications must be kept for at least 3 years.

An alternative threshold of one million pounds per year applies to facilities that calculate the annual reportable amount of a toxic chemical to be less than 500 pounds for the combined total of quantities released, disposed, treated, recovered, combusted, and transferred. Facilities meeting these alternative reporting thresholds are not required to submit Form R for these chemicals. Rather, the regulations at 40 CFR §372.95 identify certification procedures that are to be followed.

EPCRA Assessment Considerations

When attempting to determine compliance with EPCRA at a chemical facility, activities will focus primarily on reporting and recordkeeping. The Form R is the highest profile reporting requirement under EPCRA. If the chemical facility meets the requirements set out above for reporting, it must submit a Form R annually for every chemical it has on site in excess of the threshold amounts. The Form R does not require specific studies or analyses, the information submitted may be based on existing information and on estimates. However, EPA does consider data quality when reviewing the Form R and will question numbers and data that do not appear to be reasonable.

The facility should pay particular attention to intermediate products it manufactures and then uses in different products; it should also identify any chemicals it uses in waste treatment. The facility is required to submit a Form R both for intermediates and treatment chemicals. A facility should also be mindful of areas that are likely to have unreported spills, such as raw materials handling areas, pumps, and pipe fittings and connections. In addition, a facility should identify if (and where) volatile organic chemicals are used. VOC emissions in an open area to the atmosphere do constitute a regulated release under EPCRA. These emissions must be reported on the Form R.

EPCRA Regulatory Requirements

The following sections provide a summary of the principal regulations developed pursuant to EPCRA that may apply to the organic chemical industry. The regulations included are:

- 40 CFR Part 302 - Designation, Reportable Quantities and Notification
- 40 CFR Part 355 - Emergency Planning and Notification
- 40 CFR Part 370 - Hazardous Chemical Reporting: Community Right-to-Know
- 40 CFR Part 372 - Toxic Chemical Release Reporting, Community Right-to-Know

40 CFR Part 302

Designation, Reportable Quantities, and Notification

Designation of Hazardous Substances, §302.4

REQUIREMENTS	REGULATORY THRESHOLD
Under Section 102(a) of CERCLA, these regulations identify reportable quantities of hazardous substances and set forth reporting requirements of releases. Listed hazardous substances are in Table §302.4 and are designated as "hazardous under Section 102 (a) of CERCLA." Also included are "unlisted" hazardous substances which are defined in 40 CFR 302.4(b) as characteristics of hazardous waste.	The Table includes the reportable quantities of these substances. Unlisted hazardous substances have reportable quantity limit of 100 pounds (§302.5), except for unlisted hazardous wastes that exhibit extraction procedure (EP) toxicity as identified in Part 261 which vary based on the reportable quantity of the pollutant of concern and its lowest value in Table §302.4. Appendix A of §302.4 contains a sequential CAS number listing of chemicals and Appendix B contains a listing of regulated radionuclides.

Notification Requirements, §302.6

REQUIREMENTS	REGULATORY THRESHOLD
Facilities which release reportable quantities established in Table §302.4 must immediately notify the National Response Center at (800) 424-8802 or in the Washington D.C. area at (202) 426-2675. Table §302.4 is used to determine whether the regulations apply to a specific facility based on chemicals that are released.	Exposure to persons within a workplace is excluded. Reportable quantities range from 1 to 5,000 pounds. Release means any spill, leak, pumping, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment. Specific requirements for various types of radionuclides, including those which are exempt from reporting to the National Response Center are given in §302.6.

Emergency Planning, §355.30

REQUIREMENTS	REGULATORY THRESHOLD
Facilities subject to emergency planning requirements must notify the local and State emergency planning commissions. They must designate an emergency planning coordinator, provide information to the local planning committee, and calculate Threshold Planning Quantities [§355.30(e)] for substances listed in Appendices A and B of §355. • §355.30(b) notification of planning commission due May 17, 1987, or within 60 days of becoming subject to the planning requirements; • §355.30© facility emergency coordinator designated due September 17, 1987, or 30 days after establishing a local emergency planning committee; • §355.30(d) information for planning must be provided "promptly" upon request.	The facility has onsite an extremely hazardous substance equal to or greater than its threshold planning quantity.

Emergency Release Notification, §355.40

REQUIREMENTS	REGULATORY THRESHOLD
A facility must immediately notify the local community emergency coordinator (or emergency response personnel) and State coordinator any time a release will likely affect an area/state. Notice must include chemical name or identity of any substance released, indication of whether it is an extremely hazardous substance, estimate of quantity released, estimate of time and duration of release, media into which release occurred, known or expected acute or chronic health risks including medical advice for exposed individuals, precautions to be taken, contact/phone numbers for further information. A written follow up emergency notice must be provided to update the information about the release, and actions taken. For transportation-related releases, this information can be provided to the 911 operator.	The facility produces, uses, or stores a hazardous chemical and there is a release of a reportable quantity of any extremely hazardous substance or CERCLA hazardous substance.

General Applicability:

Any facility that is required to prepare or have available an MSDS for a hazardous chemical under OSHA (1970).

40 CFR Part 370

Hazardous Chemical Reporting: Community Right-to-Know (EPCRA)

Reporting Requirements, §370.20

This part applies to any amount of onsite hazardous chemicals greater than or equal to 10,000 lb and for all extremely hazardous substances present in an amount greater than or equal to 500 pounds, or the Threshold Planning Quantity (TPQ), whichever is less. Applicable facilities must submit Tier I forms by March 1, 1991, and annually thereafter. If requested, they must also submit Tier II forms.

MSDS Reporting, §370.21

Applicable facilities must submit to the local emergency planning committee, state emergency response commission and the local fire department (1) MSDSs for the facility for hazardous chemicals as required in §370.20; or (2) similar information including a list of hazardous chemicals by hazard category, the chemical or common name and components.

Reporting Upon Request, §370.21(d)

An MSDS must be provided for any changed chemicals within 3 months of the change.

Inventory Reporting, §370.25

The owner or operator must provide an inventory form to the emergency planning commission, the committee and the fire department with jurisdiction over the facility. It should contain Tier I information on hazardous chemicals present at the facility during the preceding calendar year above the threshold levels in §370.20(b). It must be submitted before March 1 each year. Tier II information may be submitted as an alternative per §370.25(b).

Submission of Tier II Information, §370.25©

Upon request by the committee, the facility must submit Tier II information.

Fire Department Inspection, §370.25(d)

The facility must allow the fire department to conduct inspections and must provide specific information on locations of chemicals upon request.

Mixtures, §370.28

The facility must report on mixtures and quantify its mixtures using procedures in §370.28.

Public Access and Availability of Information (Subpart C), §370.30

The committee must provide any person with MSDS or Tier II information for a specific facility, except upon request by the facility owner or operator, the commission or committee can withhold information on the locations of chemicals identified on Tier II forms.

Inventory Forms, Tier I and Tier II (Subpart D), §370.40

The forms contain information on hazardous and extremely hazardous chemicals onsite at the facility.

40 CFR Part 372

Toxic Chemical Release Reporting, Community Right-to-Know

Reporting Requirements, Subpart B

REQUIREMENTS	AFFECTED FACILITY
This section of the regulations sets forth requirements for the submission of information relating to the release of toxic chemicals under §313 of EPCRA yearly on July 1. Date of applicability: February 16, 1988.	Section §372.22 specifies the types of facilities that are subject to the Form R reporting requirements: a) facilities with 10 or more full time employees; b) facilities in SIC codes 20-39 (as of January 1, 1987). Criteria for the determination of SIC are further explained in Section §372.22(b); and (c) facilities which process, manufacture, or use a toxic chemical in excess of the threshold quantity set forth for the chemical in §§372.25 or 372.27. Exemptions to the reporting of releases of toxic chemicals are detailed in §372.38 (e.g., de minimis concentrations, toxic chemicals contained in articles, structural components, routine janitorial uses, personal use by employees, maintaining motor vehicles, chemicals in process water or noncontact cooling water, and laboratory activities). Owners of industrial parks or similar real estate owners are also exempt since the operators of the facilities would hold this responsibility.

Record Keeping, §372.10

REQUIREMENTS	REGULATORY THRESHOLD
Facilities must retain copies of reports, supporting documentation, including such items as data to show how reportable quantities were determined, data to calculate the quantity of a release, documentation of offsite transfer or release of toxic chemicals, and manifests or records for offsite transfer for a period of 3 years after each report is made. The reports must be available for inspection by EPA.	All facilities subject to any reporting requirements in Part 372. Threshold in §372.25(a) applies to chemicals manufactured, imported or processed at a facility. The threshold is 25,000 lb/yr for chemicals manufactured or processed and 10,000 lb/yr for chemicals used.

Reporting Requirements and Schedule for Reporting, §372.30

REQUIREMENTS	REGULATORY THRESHOLD
EPA Form 9350-1 (i.e. EPA Form R) is to be used to report chemicals above thresholds for manufactured, imported, processed, used or combined into a mixture or trade name product. Details on characterizing mixtures and trade name products are given in §372.30(b). Reports are due annually on July 1.	A regulated facility may consist of more than one establishment (defined as economic unit) and separate forms may be used for each establishment as long as reporting is accomplished for the entire facility.

Supplier Notification Requirement - Subpart C

REQUIREMENTS	REGULATORY THRESHOLD
Facilities must notify the person to whom toxic chemicals, mixtures or trade name products containing toxic chemicals, are sold. The notification must be in writing and include specific information per §372.45(b): product trade name, a statement that the product contains a SARA Title III, Section 313 chemical and the chemical name, the CAS number of the chemical, and the percent by weight of each toxic chemical in the mixture or product. Notification must be with the first shipment of the product in each calendar year. If the product is renamed or changed, the notification must be initiated over again.	Owners and operators of facilities classified as SIC code 20-39 who manufacture, import or process toxic chemicals, and who sell or otherwise distribute a mixture or trade name product containing a toxic chemical to a facility who uses or sells the product or mixture. If an MSDS is required in accordance with 29 CFR 1910.1200, the notification must be attached or incorporated into the MSDS. Exceptions include mixtures or trade name chemicals with de minimis amounts (see §372.45(d) for others). However, if the chemical is considered proprietary (trade secret) under 29 CFR 1910.1200, the notification can be written with generic language.

Specific Toxic Chemical Listings - Subpart D

Tables, with alphabetical and CAS number listings of chemicals and chemical categories, along with the effective date of the regulation for each of the chemicals are provided in §372.65.

Forms and Instruction - Subpart E
Toxic Chemical Release Reporting Form and Instruction - §372.85

REQUIREMENTS	REGULATORY THRESHOLD
EPA Form R must be used and is available by writing to the Section 313 Document Distribution Center, PO Box 12505, Cincinnati, OH 45212.	Toxic chemicals, manufactured, processed, or otherwise used in excess of an applicable threshold in §372.25.

Appendix F Clean Water Act (CWA)

The primary objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The CWA regulates both "direct" discharges to waters of the United States and "indirect" discharges to publicly owned treatment works (POTWs). Under the authority of the CWA, several types of regulations have been developed to control discharges to the Nation's waters. **Exhibit F-1** illustrates how the following regulations and permits work to limit the wastewater discharged:

- Effluent Limitation Guidelines and Categorical Pretreatment Standards establish limitations for direct and indirect discharges (40 CFR Part 405-471)
- National Pollutant Discharge Elimination System (NPDES) Program controls direct discharges (40 CFR Parts 122-125, 501, 503)
- National Pretreatment Program controls indirect discharges (40 CFR Parts 403)
- Spills of Oil and Hazardous Substances [CWA §311(b)(3)] prohibits oil discharges (40 CFR Part 110)
- Oil Pollution Prevention establishes procedures to prevent discharge of oil (40 CFR Part 112)
- Reportable Quantities for Hazardous Substances designates hazardous substances and the reportable volumes for each (40 CFR Parts 116 and 117).

The following sections address each regulation individually and identify the inspection considerations for programs implemented under the CWA. The following sections emphasize how the program is implemented with the specific requirements and compliance dates.

Clean Water Act:

Exhibit F-1. CWA and Regulatory Requirements for Organic Chemical Facilities

Clean Water Act

NPDES Program

40 CFR Part 122

Regulatory requirements to issue permits controlling the discharge of pollutants to the nation's waters

Regulates all industrial direct (point source) discharges (e.g., process wastewater, cooling water) discharged to the nation's waters

- Storm water requirements
- Effluent Guidelines for Process Wastewater Discharges
- Cooling water discharges

Regulates municipal wastewater treatment plant discharges

- Requires implementation of municipal pretreatment programs
- Individual control mechanism (i.e., permit) issued by municipality to all facilities regulated by categorical pretreatment standards

Oil and Hazardous Substances

40 CFR Part 110
40 CFR Part 112
40 CFR Part 116 and 117

Regulatory requirements that regulate the discharges of oil into waters of the United States and the designation of and reportable quantities of hazardous substances

Effluent Limitations Guidelines and Categorical Pretreatment Standards

For the CWA, industrial wastewater is regulated either by effluent limitations guidelines (direct dischargers) or categorical pretreatment standards (indirect dischargers). Effluent guidelines and categorical pretreatment standards apply only to industrial users with specific industrial processes. Categorical pretreatment standards are technology-based limitations, requiring compliance at the end-of-process. EPA has promulgated effluent guidelines (for direct discharges) and existing source and new source pretreatment standards (for indirect dischargers) for about 50 industrial categories. In addition to effluent limitations and standards for Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF) (Part 414), chemical

> Less frequently, but still of potential applicability, effluent limitations also exist for Soaps and Detergents (Part 417), Fertilizers (Part 418), Phosphate Manufacturing (Part 422), Rubber Manufacturing (Part 428), Roofing Materials (Part 443), Paint Formulating (Part 446), Ink Formulating (Part 447), Explosives (Part 457), Plastics Molding and Forming (Part 463), and Pesticides Formulating, Packaging, and Repackaging (Part 465).

manufacturers are also commonly subject to regulations for Inorganic Chemicals (Part 415), Petroleum Refining (Part 419), Pharmaceutical Manufacturing (Part 439), Gum and Wood Chemicals (Part 454), and Pesticides Manufacturing (Part 455). These standards may limit any pollutant, but emphasize the control of the 126 toxic pollutants designated by EPA as "priority pollutants." Although chemical facilities may produce both organic and inorganic chemicals, this document focuses on organic chemical manufacturers.

In general, wastewater from organic chemical facilities is regulated by 40 CFR Part 414 regulations (i.e., OCPSF Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards) but may also be regulated by one or more of the industry-specific CFR Parts identified above. These regulations apply to process wastewater discharged from organic chemical facilities. In most cases, the facility will have a wastewater discharge permit issued either by an EPA Regional office, the State, or the local sewer authority that incorporates applicable guidelines and standards. Where a facility discharges to a POTW that is not authorized to implement and enforce the pretreatment program, the facility will generally not have a wastewater discharge permit unless it has been issued by the State. In these instances, it is the facility's responsibility to comply with the applicable categorical pretreatment standards and requirements. Specific applicability determinations are described in the appropriate regulation and are summarized below.

The 40 CFR Part 414 regulations do not apply to all organic chemical manufacturers. Specifically, process wastewater discharges from the manufacture of organic chemicals solely by extraction from plant and animal raw materials or by fermentation processes are not regulated. Also, OCPSF process/product discharges which are covered by the provisions of other categorical effluent limitations guidelines or categorical pretreatment standards if the wastewater is treated in combination with the non-OCPSF industrial category regulated wastewater are not covered. However, the OCPSF regulations **do apply** to the product/processes covered if the facility reports OCPSF products under SIC codes 2865, 2869, or 2821, and its OCPSF wastewaters are treated in a separate treatment system at the facility or discharged separately to a POTW.

For example, some vertically integrated petroleum refineries and pharmaceutical manufacturers discharge wastewaters from the production of synthetic organic chemical products that are specifically regulated under the Petrochemical and Integrated Subcategories of the Petroleum Refining Category (40 CFR Part 419) or the Chemical Synthesis Products Subcategory of the Pharmaceuticals Manufacturing Category (40 CFR Part 439). Unless the OCPSF production wastewater from these facilities is treated or discharged separately from the non-OCPSF wastewaters, discharges from these operations are subject to the other categorical standards.

In addition, the OCPSF regulation does not apply to a plant's OCPSF production that has been reported by the plant in the past under Standard Industrial Classification (SIC) groups that are regulated by other guidelines. For example, benzene, toluene, and xylene manufacturing that has been reported under SIC code 2911058 (Aromatics, Made from Purchased Refinery Products) is not subject to the OCPSF requirements. Rather, these facilities must comply with 40 CFR Part 419 (Petroleum Refining) requirements.

Additionally, EPA intends to promulgate effluent limitations guidelines and categorical pretreatment standards for the Centralized Waste Treatment Category (40 CFR part 437) that will regulate discharges from facilities that treat wastes received form offsite.

The following sections provide some additional details on the OCPSF, pharmaceutical manufacturing, gum and wood chemicals, pesticide chemicals, and centralized waste treatment regulations. Due to the scope of the petroleum refining regulations and the detail needed to adequately address the industry, it has not been included in the scope of this manual.

Organic Chemical, Plastics, and Synthetic Fibers

The 40 CFR Part 414 regulations cover all OCPSF products or processes whether or not they are located at facilities where the OCPSF covered operations are a minor portion of and ancillary to the primary production activities or a major portion of production. Stand-alone OCPSF research and development, pilot plants, technical services, and laboratory bench scale operations are covered by the OCPSF regulation ***only if*** these operations are conducted ***in conjunction with and related to*** existing OCPSF manufacturing operations.

Federal effluent limitations guidelines, categorical pretreatment standards, and new source performance standards set numerical concentration-based limitations. Applicable limitations for a chemical facility subject to 40 CFR Part 414 must be based on a reasonable estimate of ***process*** wastewater flows and the concentration limitations to develop mass limitations. Compliance is to be evaluated against these mass limits.

Process wastewater flows are defined in the regulations (40 CFR §401.11) to include wastewaters resulting from manufacture of OCPSF products that come in direct contact with raw materials, intermediate products, or final products, and surface runoff from the immediate process area that has the potential to become contaminated. Non-contact cooling waters, utility wastewaters, general site runoff, ground waters, and other nonprocess wastewaters generated onsite are specifically excluded from the definition of process wastewater discharges. As such, the composition of each wastestream that is being generated is not as crucial as the source of the wastewater. The permitting authority is responsible for determining the appropriate flows to use for calculating permit limits.

In addition to limitations for organics and conventional pollutants, the OCPSF regulations also set specific requirements for chromium, copper, lead, nickel, zinc, and cyanide. For these pollutants, only the flows from metal-bearing (for metals) or cyanide-bearing (for cyanide) wastestreams and any incidental metals from intake water, corrosion of construction material, or contamination of raw waters are to be used to calculate mass limitations. Specific metal- and cyanide-bearing wastestreams are identified in Appendix A of 40 CFR Part 414, in addition to any wastestreams, metal-bearing or cyanide-bearing, identified by the regulatory agency issuing the permit. Discharges of chromium, copper, lead, nickel, and zinc, in "complexed metal-bearing wastestreams," listed in Appendix B of 40 CFR Part 414, and non-amenable cyanide as identified by the permitting authority, are not subject to the OCPSF regulations.

Pharmaceutical Manufacturing

The existing Pharmaceutical Manufacturing regulations at 40 CFR Part 439 set effluent limitation guidelines (for direct dischargers) based on required removal efficiencies for BOD, COD, and TSS. In addition, the regulations specify cyanide limits according to the applicable subpart (except Subpart E - Research for which categorical pretreatment standards are not specified) and set allowable pH ranges. Cyanide effluent limitation guidelines are not specified for discharges from bench-scale pharmaceutical research operations and product development activities under Subpart E. The existing regulations specify categorical pretreatment standards (for indirect dischargers) for cyanide only.

On May 2, 1995, EPA proposed revisions to the Pharmaceutical Manufacturing regulations. The proposed regulations set end-of-pipe effluent limitation guidelines (for direct dischargers) for BOD, COD, TSS, pH, and the priority and nonconventional pollutants contained in the applicable subpart. EPA anticipates the rule to be finalized in early 1998. EPA may simultaneously promulgate the effluent guidelines along with the planned National Emission Standards for Hazardous Air Pollutants (NESHAPs) for the pharmaceutical industry.

Gum and Wood Chemicals

Under 40 CFR Part 454, direct discharge facilities manufacturing char and charcoal briquets under Subpart A are prohibited from discharging process wastewater. The regulations establish BOD and TSS production-based effluent limitation guidelines and specify an allowable pH range for direct dischargers subject to other subparts of the regulations:

- Subpart B–Gum Rosin and Turpentine
- Subpart C–Wood Rosin, Turpentine, and Pine Oil
- Subpart D–Tall Oil Rosin, Pitch, and Fatty Acids
- Subpart E–Essential Oils

- Subpart F–Rosin-Based Derivatives.

The regulations do not establish categorical pretreatment standards for indirect dischargers. Therefore, indirect dischargers are only subject to the general and specific discharge prohibitions and any applicable local limits as referred in 40 CFR § 403.5.

Pesticide Chemicals

Existing 40 CFR Part 455 regulations establish effluent limitation guidelines for dischargers under Subpart A (Organic Pesticide Chemicals) for BOD, COD, TSS, organic pesticide chemicals, and pH. In addition, dischargers subject to Subpart A must meet the effluent limitation guidelines for pesticide active ingredients contained in Tables 2 or 3 of 40 CFR Part 455, if that pesticide active ingredient is manufactured and listed in Table 1 of 40 CFR Part 455. Finally, dischargers subject to Subpart A that manufacture pesticide active ingredients listed in Table 1 of 40 CFR Part 455 must meet the effluent limitation guidelines for priority pollutants listed in Table 4 of 40 CFR Part 455 (if end-of-pipe biological treatment is used) or Table 5 of 40 CFR Part 455 (if end-of-pipe biological treatment is not used). Direct dischargers subject to Subpart B (Metallo-Organic Pesticide Chemicals) and Subpart C (Pesticide Chemicals Formulating and Packaging) are prohibited from discharging process wastewater.

Existing 40 CFR Part 455 regulations establish categorical pretreatment standards for dischargers under Subpart A (Organic Pesticide Chemicals) for the pesticide active ingredients contained in Tables 2 or 3 of 40 CFR Part 455, if that pesticide active ingredient is manufactured and listed in Table 1 of 40 CFR Part 455. Dischargers subject to Subpart A must also comply with the categorical pretreatment standards for the priority pollutants listed in Table 6 of 40 CFR Part 455. Facilities subject to Subpart C are prohibited from discharging process wastewater. The existing regulations do not establish categorical pretreatment standards for facilities subject to Subpart B.

On April 14, 1994, EPA proposed revisions to 40 CFR Part 455 which would establish Subpart E to regulate discharges from the repackaging of agricultural pesticides performed by refilling establishments whose principal business is retail sales. Direct and indirect dischargers subject to Subpart E would be prohibited from discharging process wastewater. Exterior wastestreams from small sanitizer pesticide facilities would be exempt from the zero discharge requirements. Table 8 of proposed 40 CFR Part 455 includes a list of sanitizer pesticides included in this exemption. Under the proposed regulations, direct and indirect dischargers subject to Subpart C would have wastewater discharges from employee showers, fire protection equipment test, and laundries exempted from regulation. Indirect dischargers subject to Subpart C would have wastewater discharges from the formulating, packaging, or repackaging of bleach exempted.

On June 8, 1995, EPA published a supplemental notice to the proposed April 14, 1994, rule. This supplemental notice solicited comments on providing a Pollution Prevention Alternative to the zero discharge limitations and standards for direct and indirect dischargers. Under this option, facilities regulated under existing Subpart C and proposed Subpart E would have the choice of meeting the zero discharge limitation or standard or conducting the pollution prevention practices listed in Tables B-1 and B-2 of the notice. Facilities that choose to conduct the pollution prevention alternatives would also have to notify the NPDES permit writer (direct dischargers) or pretreatment authority (indirect dischargers), and keep necessary paperwork onsite.

The June 8, 1995, supplemental notice solicited comments on exempting additional sanitizer pesticides, microorganisms, and certain pesticide mixtures from regulation and on exempting other chemicals used in the swimming pool industry from pretreatment standards.

Centralized Waste Treatment

On April 27, 1995, EPA proposed 40 CFR Part 437, Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Centralized Waste Treatment Category (60 FR 5463). This proposed regulation would establish technology-based limits and standards for discharges by existing and new "centralized waste treatment facilities." The facilities covered by the guideline include stand-alone waste treatment and recovery facilities which treat waste received from offsite and also include treatment systems which treat onsite generated process wastewater with wastes received from offsite. Specifically, centralized waste treatment facilities include the following: (1) commercial facilities that accept waste from offsite for treatment from facilities not under the same ownership; (2) non-commercial facilities that accept waste from offsite for treatment only from facilities under the same ownership (i.e., intra-company transfer); or (3) mixed commercial/non-commercial facilities that accept some waste from offsite for treatment from facilities not under the same ownership and some waste from facilities under the same ownership.

Organic chemical manufacturing facilities that might be covered by this rule should review the proposed regulation and note any future rulemaking activities for 40 CFR Part 437.

NPDES Program

NPDES permits, issued by either EPA or an authorized State (EPA has authorized 41 States and territories, as

> The NPDES permit program is implemented according to 40 CFR Part 122: EPA Administered Permit Programs: The National Pollutant Discharge Elimination System. These regulations establish the general program requirements, permit application requirements, permit conditions, and procedures for transfer, modification, revocation, reissuance, and termination of permits.

identified in **Exhibit F-2**, to issue permits), contain industry-specific technology-based (i.e., effluent guidelines as discussed in the previous section) and water quality-based effluent discharge limitations, as well as monitoring, recordkeeping, reporting, and other requirements. *All facilities discharging to the Nation's waters must receive an NPDES permit prior to initiating their discharges.* This covers both process and non-process (e.g., non-contact cooling) wastewaters, and storm water discharges associated with industrial activity that discharge either to a municipal separate storm sewer or directly to waters of the United States. To regulate such dischargers, EPA/States may issue NPDES permits to chemical facilities that include process, non-process, and storm water conditions or these may be in separate permits.

The terms process, non-contact cooling water, and industrial activity (as it applies to the storm water regulations) are defined in 40 CFR 401.11(q), 401.11(n), and 122.44(b) respectively.

EPA issues two types of NPDES permits, individual and general. An individual permit is a permit tailored for a specific facility. A general permit regulates a category of similar dischargers within a geographical area or within a State. However, because of the potential hazards associated with the chemical industry, EPA has elected to issue individual permits to this sector with the exception that general permits for storm water discharges may be issued. There are few exemptions to the requirement to obtain an NPDES permit, as specified in 40 CFR §122.3. For chemical facilities, there are four instances where this exemption may apply:

- Discharges to POTWs (these discharges will be regulated by a permit issued by the POTW if the municipality has an approved pretreatment program and are regulated by the National Pretreatment Program)

- Discharges into privately owned treatment works, except as otherwise required by EPA

- Discharges of dredged or fill material (regulated by CWA §404)

- Any discharge in compliance with instructions from an on-scene coordinator pursuant to 40 CFR Part 300 (i.e., The National Oil and Hazardous Substances Pollution Contingency Plan) or 33 CFR §153.10(e) (i.e., Pollution by Oil and Hazardous Substances).
  [Note: Pollution by Oil and Hazardous Substances is enforced by the Coast Guard and is not discussed herein.]

EPA or the State may terminate or modify a permit where it is determined that a permitted activity endangers human health or the environment and can only be regulated to acceptable levels by a permit modification or termination of the permit. Likewise, the permit may be

Exhibit F-2. State NPDES Program Approval Status

State	Approved State NPDES Permit Program	Approved to Regulate Federal Facilities	Approved State Pretreatment Program	
Alabama	10/19/79	10/19/79	10/19/79	06/26/91
Arkansas	11/01/86	11/01/86	11/01/86	11/01/86
California	05/14/73	05/05/78	09/22/89	09/22/89
Colorado	03/27/75	--	--	03/04/83
Connecticut	09/26/73	01/09/89	06/03/81	03/10/92
Delaware	04/01/74	--	--	10/23/92
Florida	05/01/95	--	05/01/95	05/01/95*
Georgia	06/28/74	12/08/80	03/12/81	01/28/91
Hawaii	11/28/74	06/01/79	08/12/83	09/30/91
Illinois	10/23/77	09/20/79	--	01/04/84
Indiana	01/01/75	12/09/78	--	04/02/91
Iowa	08/10/78	08/10/78	06/03/81	08/12/92
Kansas	06/28/74	08/28/85	--	11/24/93
Kentucky	09/30/83	09/30/83	09/30/83	09/30/83
Louisiana	08/27/96	08/27/96	08/27/96	08/27/96
Maryland	09/05/74	11/10/87	09/30/85	09/30/91
Michigan	10/17/73	12/09/78	04/16/85	11/29/93
Minnesota	06/30/74	12/09/78	07/16/79	12/15/87
Mississippi	05/01/74	01/28/83	05/13/82	09/27/91
Missouri	10/30/74	06/26/79	06/03/81	12/12/85
Montana	06/10/74	06/23/81	--	04/29/83
Nebraska	06/12/74	11/02/79	09/07/84	07/20/89
Nevada	09/19/75	08/31/78	--	07/27/92
New Jersey	04/13/82	04/13/82	04/13/82	04/13/82
New York	10/28/75	06/13/80	--	10/15/92
North Carolina	10/19/75	09/28/84	06/14/82	09/06/91
North Dakota	06/13/75	01/22/90	--	01/22/90
Ohio	03/11/74	01/28/83	07/27/83	08/17/92
Oklahoma	11/19/96	11/19/96	11/19/96	--
Oregon	09/26/73	03/02/79	03/12/81	02/23/82
Pennsylvania	06/30/78	06/30/78	--	08/02/91
Rhode Island	09/17/84	09/17/84	09/17/84	09/17/84
South Carolina	06/10/75	09/26/80	04/09/82	09/03/92
South Dakota	12/30/93	12/30/93	12/30/93	12/30/93
Tennessee	12/28/77	09/30/86	08/10/83	04/18/91
Utah	07/07/87	07/07/87	07/07/87	07/07/87
Vermont	03/11/74	--	03/16/82	08/26/93
Virgin Islands	06/30/76	--	--	--
Virginia	03/30/75	02/09/82	04/14/89	05/20/91
Washington	11/14/73	--	09/30/86	09/26/89
West Virginia	05/10/82	05/10/82	05/10/82	05/10/82
Wisconsin	02/04/74	11/26/79	12/24/80	12/19/86
Wyoming	01/30/75	05/18/81	--	09/24/91
TOTALS	43	37	31	41

Number of Fully Authorized Programs (Federal Facilities, Pretreatment, General Permits) = 27
* New with phased Federal facilities & storm water programs by 2000.

terminated or an application denied if the permittee fails to fully disclose all relevant facts or misrepresents relevant facts at any time. EPA or the State may modify a permit as a minor modification allowing for a change in ownership or operational control of a facility where the Director determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittee has been submitted to the Director as specified in 40 CFR §122.61.

> Specific permit applicability requirements for storm water discharges are identified in 40 CFR §122.26(a). Facilities requesting to be covered under the storm water general permitting program are required to submit a Notice of Intent (NOI) to be covered under the general permit consistent with 40 CFR §122.28.

The evaluation team should be aware that NPDES permits are issued with both an issuance and expiration date and the permits are issued for a period of up to 5 years. In some instances, the NPDES permits issued by EPA or the State remain in effect even after their expiration date, provided that the facility has submitted a timely and complete application (pursuant to 40 CFR §122.21) and EPA or the State, through no fault of the permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit.

Pursuant to 40 CFR §122.21, new dischargers are required to apply at least 180 days before commencing discharge while existing permittees are required to reapply at least 180 days prior to the expiration date of the existing permit, unless a later date has been granted by the Director. In no case may an application be submitted after the expiration date of an existing permit. EPA has specific application forms that are to be used for NPDES permits. Application forms that apply to an organic chemical facility include:

Form	Title	Regulation Cite
1	General Information	122.21(f)
2C	Existing manufacturers	122.21(g)
2D	New manufacturers	122.21(k)
2E	Manufacturers that only discharge non-process wastewater	122.21(h)
2F	Storm water discharges associated with industrial activity and consistent with the requirements of 122.26(c)	122.26(d)

While specific permit conditions might vary from permit to permit, all NPDES permits must contain the conditions specified in 40 CFR §122.41. In general, these include requirements for:

- Reapplication
- Operation and maintenance
- Effluent limitations
- Monitoring and recordkeeping
- Reporting
- Bypass restrictions
- Upset provisions
- Other standard conditions.

All chemical manufacturing facilities are also required to notify the permitting authority as soon as they know or have reason to believe that any activity has occurred or will occur which would result in the discharge, on a routine, non-routine, frequent, or infrequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of specified notification levels as identified in 40 CFR §122.42(a).

For organic chemical facilities considered by this guidance (SIC code 286), both maximum daily and average monthly discharge permit limitations are set for each outfall based on the Part 414 guidelines (i.e., technology-based limitations), water quality considerations, and the permit writer's best professional judgment. When it is impractical to impose permit limitations at the point of discharge, effluent limitations may be imposed on internal wastestreams before mixing with other wastestreams. In these instances, monitoring requirements also apply to these internal streams.

Additionally, environmental laws (as identified in 40 CFR §122.49) may apply to the issuance of NPDES permits. Specific laws that may apply include:

- Wild and Scenic Rivers Act
- National Historic Preservation Act of 1966
- Endangered Species Act
- Coastal Zone Management Act
- Fish and Wildlife Coordination Act
- National Environmental Policy Act.

It is the facility's responsibility to work with the EPA or State NPDES permit writers to ensure that these statutes are adequately addressed during the permitting process. The evaluation of applicability for each of these statutes will occur as part of permit development.

Pretreatment Program

The goals of the pretreatment program are to: (1) prevent damage to municipal wastewater treatment plants that may occur when hazardous, toxic or other wastes are discharged into a sewer system (i.e., interference); (2) prevent pollutants from passing through the treatment plant untreated and violating discharge limitations or causing exceedances of water quality standards; and (3) encourage the reuse and recycling of municipal and industrial sludges (i.e., protect the quality of sludge generated by these plants). Nationwide, approximately 1,500 POTWs have been required to develop and implement local municipal pretreatment programs. The requirement to develop and implement a program is included in the POTW's NPDES permit. Through this program, the POTW is directly responsible for regulation of certain significant industrial users discharging to the POTW wastewater treatment system, including facilities regulated by categorical pretreatment standards. EPA's General Pretreatment Regulations for Existing and New Sources of Pollution (40 CFR Part 403) establish requirements for POTW programs to regulate discharges from industrial facilities to POTWs and establishes certain requirements for industrial users (e.g., monitoring and recordkeeping).

In most instances, chemical facilities discharge to POTWs that are authorized to implement and enforce the pretreatment requirements through an approved pretreatment program. Where this occurs, the facility is required to abide by the terms of a POTW-issued control mechanism (e.g., permit) and the local sewer use ordinance (SUO). It is the POTW's responsibility to appropriately implement and enforce these requirements and its pretreatment program, that must be at least as stringent as the Federal pretreatment requirements specified in 40 CFR Part 403, on its industrial users. However, even if a POTW fails to properly apply Federal or State regulations, the chemical facility has an independent obligation to comply with applicable Federal and State requirements.

Some chemical facilities are located in municipalities that do not have locally-run pretreatment programs. In these areas, permits are generally not issued by EPA or the State, rather these facilities are obligated to comply with Federal and/or State pretreatment requirements as identified in the regulations. Both the general pretreatment regulations (40 CFR Part 403) and any applicable categorical pretreatment standards apply to the facility. Currently, EPA has delegated pretreatment program authority to 29 States (as identified in Exhibit F-2), in which the State directly controls those industries that discharge to municipalities without locally-run pretreatment programs. In all remaining States, unless the POTW is authorized to implement and enforce its own pretreatment program, EPA implements and enforces the program.

The 40 CFR Part 403 pretreatment regulations specify, among other things, requirements for non-domestic sources discharging pollutants into POTWs. The regulations set out three different types of effluent limitations for industrial discharges: prohibited discharge standards, categorical pretreatment standards, and local discharge limitations.

Prohibited discharge standards forbid certain types of discharges to the POTW, including POTWs without approved pretreatment programs. These standards include both general and specific prohibitions. The general prohibitions are national prohibitions against pollutants discharged to a POTW that cause pass through or interference, as defined in §403.3. Specific prohibitions, at 40 CFR §403.5(b), are national prohibitions against pollutants that cause problems at the POTW, such as fire or explosion, harm to worker health and safety, corrosion, obstruction of flow, excessive heat, trucked or hauled waste or excessive mineral or synthetic oil and grease.

As noted earlier in Section 3.1.1.1, effluent guidelines and categorical pretreatment standards apply to specific process water wastestreams from specific industrial processes. The standards are technology-based and apply at the end of the regulated industrial process. Although a number of regulations might apply to a facility manufacturing chemicals, the organic chemicals industry that does not produce pesticide active ingredients, pharmaceutical products, or conduct petroleum refining will generally be regulated by the OCPSF standards at 40 CFR Part 414.

Since National prohibited discharge standards and categorical standards are not POTW-specific, these limitations may not necessarily protect a POTW from pass through or interference. As such, all POTWs authorized to implement and enforce a local pretreatment program, and many other POTWs that have received problematic discharges from their industrial users, are required to develop local discharge limitations to address site-specific concerns regarding interference with the POTW wastewater collection system or treatment plant or pass through of pollutants to the receiving stream or sludge. In addition, local limits translate prohibited discharge standards into numerical limitations that can be more readily evaluated.

The General Pretreatment Regulations (40 CFR Part 403) also specify reporting requirements applicable to industrial dischargers. POTWs may set more stringent requirements in their local sewer use ordinance or in a wastewater discharge permit issued to the chemical facility, but at a minimum, chemical facilities must submit semiannual monitoring reports (403.12(e)), notices of potential problems, including slug loads (403.12(f)), notification of effluent violations (403.12(g)(2)), notification of changed discharge (403.12(j)); must keep records as required (403.12(o)), and must notify of hazardous waste discharges (403.12(p)). The regulations also include upset and bypass provisions, in §403.16 and §403.17, respectively, that apply to industrial dischargers.

Policy on Effluent Trading in Watersheds

The evaluation team should be aware of EPA's draft Framework for Watershed-Based Effluent Trading (May 1996). The fundamental principle of trading within the Clean Water Act framework is that water quality standards must be met and technology-based requirements must remain in place.

Trading is a method to attain and/or maintain water quality standards, by allowing sources of pollution to achieve pollutant reductions through substituting a cost-effective and enforceable mix of controls on other sources of discharge. Effluent trading potentially offers a number of economic, environmental, and social benefits. Proposed types of effluent trading approaches are (1) intra-plant, (2) pretreatment, (3) point/point source, (4) point/nonpoint source, and (5) nonpoint/nonpoint source.

Watershed-based trading will be implemented on a voluntary basis under existing CWA authorities. There will be a substantial public outreach effort to obtain stakeholders' (e.g., regulated sources, non-regulated sources, regulatory agencies, and the public) recommendations and insights on draft portions of the trading policy prior to implementation. Facilities interested in this trading policy should initiate dialogue with their local permitting authority.

Spills of Oil and Hazardous Substances

The regulations at 40 CFR Part 110 apply to the discharge of oil, which is prohibited by Section 311(b)(3) of the CWA. For purposes of this regulation, "discharge" is defined as any spilling, leaking, pumping, pouring, emitting, emptying, or dumping. Prohibited discharges include those into or upon the navigable waters of the United States, adjoining shorelines, or the contiguous zone in such quantities that may be harmful to the public health or welfare of the United States, that violate applicable water quality standards, or cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines. Addition of dispersants or emulsifiers to oil to be discharged that would circumvent these provisions is prohibited. The National Response Center as described in 40 CFR §110.10 must be immediately notified of any discharge in violation of these restrictions.

Oil Pollution Prevention

The regulations at 40 CFR Part 112 establish procedures, methods and equipment, and other requirements for equipment to prevent the discharge of oil into or upon the navigable waters of the United States or adjoining shorelines (i.e., preparation and implementation of Spill Prevention Control and Countermeasure (SPCC) Plans). This part applies to owners or operators of onshore facilities engaged in drilling, producing, gathering, ***storing, processing, refining, transferring, distributing, or consuming*** oil and oil products which could reasonably be expected to discharge oil in harmful quantities, as defined in 40 CFR Part 110. Guidelines for the preparation and implementation of a SPCC Plan are summarized in 40 CFR §112.7, while specific requirements for these Plans are outlined in 40 CFR §112.3.

This Part does not apply to facilities that both (1) have an underground buried storage capacity for oil of 42,000 gallons of oil or less and (2) the storage capacity for oil, which is not buried, is 1,320 gallons or less, provided that no single container has a capacity in excess of 660 gallons.

Reportable Quantities for Hazardous Substances

Parts 116 and 117 of the Federal Water Pollution Control Act (40 CFR Parts 116 and 117) designate hazardous substances and the reportable quantity (RQ) of hazardous substances, respectively. When an amount equal to or in excess of the RQ is discharged into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the contiguous zone, the facility must provide notice to the Federal government of the discharge, following Department of Transportation requirements set forth in 33 CFR §153.203. For purposes of this regulation, "discharge" means any spilling, leaking, pumping, pouring, emitting, emptying, or dumping. This requirement does not apply to facilities that discharge the substance under an NPDES permit or a Part 404 Wetlands (dredge and fill) permit, or to a POTW, as long as any applicable effluent limitations or pretreatment standards have been met. RQs for specific chemicals are listed in 40 CFR §117.3.

CWA Assessment Considerations

To evaluate compliance with effluent limitations and effluent monitoring, the assessor should verify that the facility's operations are properly regulated by the permit and that monitoring results are representative of the facility's operations. One of the unique features of many chemical facilities are their dynamic processing operations. Both production volumes and the types of chemicals produced can vary drastically over the course of a month or year. Many facilities will manufacture a given chemical during a campaign for a few weeks or months and then may never make that chemical again. One of the investigator's responsibilities should be to verify that monitoring results represent these types of activities. Chemical production may also be either a batch or continuous operation. For batch processes, the amount and frequency of wastewater generated is potentially much higher than for continuous processes. Additionally, many specialty chemical manufacturers will use a given reaction vessel to manufacture a variety of different products. Wastes that are generated in that unit will vary, possibly on a daily basis. Also, the investigator should verify that facility operations have not changed such that wastewater characteristics changed significantly, but if so, that proper notification was given to the permitting authority.

One of the fundamental components of the effluent limitations guidelines and categorical standards for facilities regulated by OCPSF regulation (40 CFR Part 414), is that calculated limits (as calculated from concentration standards and process flows) are based on process flows. Final permit limitations are based on the sum of the mass effluent limitations from process wastewaters plus any mass allowances, determined by the permit writer using best professional judgment, to account for nonprocess wastewater pollutant contributions. The assessor needs to understand the basis of the facility's permit limits and the data needed to evaluate compliance (e.g., flow concentration data, standards, regulated flows). Based on permit information and the process flow diagram, investigators should verify that the reported process and non-process flows are accurate and that the facility's limits (based on flows) are representative of the facility's process. Often, a facility will commingle boiler blowdown, cooling tower blowdown, and water treatment regeneration chemicals (i.e., caustics and acids) with process wastewater and identify this combined flow as process wastewater. In most cases, individual wastewater contributions are estimated based on the facility's total plant flow or based upon visual estimates. The assessor should verify that these flows are reasonable. (A simple bucket and stopwatch method may be to estimate the accuracy of the reported flow values.) It is a common mistake for a facility to drastically over- or under-estimate flows when preparing permit applications simply because, estimating flows based on visual observation is very difficult. Of note, process wastewater flows from chemical facilities may be highly variable. As such, wastewater flows may be fairly significantly different during the assessment than the flows used to calculate permit limits.

The assessor should be aware that in States that have high volume storm events (e.g., Texas), permit limitations may be based on a process flow that takes into account storm water flows from process areas during these storm events. As such, permit limitations may be based on flows that are much greater than normal dry weather flows.

The process wastewater flow used to develop mass limitations should be based upon the facility's flow using sound water conservation practices, as applicable. For example, process water use should be minimized, cascading or countercurrent washes or rinses should be used where possible, and intermediate process waters or treated wastewaters should be reused or recycled (e.g., from pump seals and equipment washdowns).

Barometric condensers can generate excessive large volumes of water contaminated at low levels. Replacement of these with surface condensers can reduce wastewater volumes significantly and result in collection of condensates that may be returned to the process.

The assessor team should pay particular attention to treatment system performance at a chemical facility. Where treatment systems are installed, the investigator needs to verify that proper O&M practices are in place to ensure consistent treatment plant performance. O&M should include documentation of all activities performed (e.g., calibrations, inspections, repairs, chemical additions, etc.). Evaluation of trends in monitoring results can indicate improper O&M. For example, steam strippers can lose efficiency due to fouling of the packing material if the equipment is not cleaned at the proper frequency. The investigator should verify that backup systems or procedures exist for the periods when system O&M is being conducted. Also, the investigator should verify that the facility has adequate staff to operate and maintain the treatment system. In many instances, this may require full-time, around the clock staffing.

Because of the vast array of process equipment and piping, it is important that the facility's operation and maintenance (O&M) program include regular facility assessments for leaks, spills, and stressed equipment and a documented procedure for conducting these assessments. In addition, areas that have a high potential for spills or leaks (e.g., pipes, pumps, fittings, etc.) should have spill containment installed to prevent major releases to the environment, to the facility's onsite treatment system, or to the POTW.

Finally, when evaluating compliance with effluent limitations, the investigator should verify that the monitoring results are representative of facility operations and consistent with 40 CFR Part 136 procedures. [Note that "EPA approved methods" does not indicate that proper procedures were followed. EPA has approved methods for drinking water, wastewater, and solid waste which can all be used to analyze pollutant concentrations in wastewater, but only Part 136 regulations apply to CWA regulations.] Because of the variations in production at many chemical facilities, a wastewater sample collected on a given day may not be a fair estimate of typical facility operations. Also, wastewater from chemical manufacturers can be highly complex, causing matrix interferences that can hinder laboratory analysis at the regulatory limitations. Assessor should verify that analytical results reported as "Not Detected" have been analyzed down to the requisite quantification level. In June 1993, EPA published a guidance manual on laboratory protocol to improve analytical performance due to matrix interference and other complications. The manual is called *Guidance on Evaluation, Resolution, and Documentation of Analytical Problems Associated with Compliance Monitoring*.

When evaluating compliance with the oil and hazardous substance regulations, the investigator should inquire about past instances of spills (or leaks, pumping, etc.) and should identify how the facility reacted to each circumstance. Specifically, the assessors should note: what material was spilled; where did the discharge go; what quantity was spilled; what was the reportable quantity; what was the facility's response for containment, clean-up, and notification; any related health and safety issues for the plant, the community, or the environment; and what are the facility's plans to prevent a recurrence of the situation. The assessor should also review the SPCC Plan and any other spill or slug control plan onsite applicable to the facility. As part of the pretreatment program, the facility may be required to implement a spill and slug control plan concurrent with the SPCC plan and reportable quantities regulation.

CWA Regulatory Requirements

The following section provides a summary of the principal regulations developed pursuant to the CWA that are applicable to the organic chemical industry. The regulations included are:

- 40 CFR Part 414 - Organic Chemicals, Plastics, and Synthetic Fibers
- 40 CFR Part 439 - Pharmaceutical Manufacturing
- 40 CFR Part 454 - Gum and Wood Chemicals Manufacturing
- 40 CFR Part 455 - Pesticide Chemicals
- 40 CFR Part 110 - Discharge of Oil

- 40 CFR Part 112 - Oil Pollution Prevention
- 40 CFR Part 116 - Designation of Hazardous Substances
- 40 CFR Part 117 - Determination of Reportable Quantities for Hazardous Substances

The regulatory summaries for applicable effluent guidelines are provided for direct discharges (i.e., facilities that discharge directly to waters of the U.S. and are regulated by an NPDES permit) and those that discharge indirectly (i.e., discharge to a Publicly Owned Treatment Works (POTW) which in turn discharges to waters in the U.S.)

Applicability:

40 CFR Part 414

Organic Chemicals, Plastics, and Synthetic Fibers as administered through 40 CFR Part 122: EPA Administered Permit Programs, The National Pollutant Discharge Elimination System

Discharges from the manufacture of OCPSF products under SIC codes 2821 (Plastic Materials, Synthetic Resins, and Nonvulcanizable Elastomers), 2823 (Cellulosic Man-Made Fibers), 2824 (Synthetic Organic Fibers, Except Cellulosic), 2865 (Cyclic Crudes and Intermediates, Dyes and Organic Pigments), and 2869 (Industrial Organic Chemicals, Not Elsewhere Classfied).

Exemptions:

- Discharge from the manufacture of OCPSF products if the products are included in the following SIC subgroups and in the past have been reported as such:
  - SIC 2843085 - bulk surface active agents
  - SIC 28914 - synthetic resin and rubber resin
  - Chemicals and chemical preparations not elsewhere classified
    - 2899568 - sizes, all types
    - 2899597 - other industrial chemical specialties, including flaxes, plastic wood preparations, and embalming fluids
  - SIC 2911058 - aromatic hydrocarbons manufactured from purchased refinery products
  - SIC 2911632 - aliphatic hydrocarbons manufactured from purchased refinery products

- Discharge for which a different set of previously promulgated effluent limitations guidelines and standards apply, unless the facility reports OCPSF products under SIC codes 2865, 2869, or 2821, and the facility's OCPSF waste waters are treated in a separate treatment system or discharged separately to a publicly owned treatment works

- Process wastewater discharges from the manufacture of organic chemical compounds solely by extraction from plant and animal raw materials or by fermentation processes

- Discharges of chromium, copper, lead, nickel, and zinc in "complexed metal-bearing waste streams," listed in Appendix B of 40 CFR 414

Applicable Subparts:

Subpart B: Rayon Fibers - manufactured by the viscose process only [414.20]

Subpart C: Other Fibers - manufactured under SIC codes 2823 (except rayon) and 2824 [414.30]

Subpart D: Thermoplastic Resins - manufactured under SIC 28213 [414.40]

Subpart E: Thermosetting Resins - manufactured under SIC code 28214 [414.50]

Subpart F: Commodity Organic Chemicals - manufacture of chemicals listed in 414.60 under SIC codes 2865 and 2869

Subpart G: Bulk Organic Chemicals - manufacture of chemicals listed in 414.70 under SIC codes 2865 and 2869

Subpart H: Specialty Organic Chemicals - manufactured under SIC codes 2865 and 2869, not defined as commodity or bulk organic chemicals in 414.60 or 414.70 [414.80]

Subpart I: Direct Discharge point Sources that use End-of-Pipe Biological Treatment [414.90]

Subpart J: Direct Discharge Point Sources that Do Not Use End-of-Pipe Biological Treatment [414.100]

40 CFR Part 414 - Direct Discharges	
Requirements	**Compliance Dates**
Discharge Limitations: • Effluent limitations contained in 40 CFR Part 414 including: - Applicable BPT, BAT, or NSPS discharge limitations (depending on subpart) for BOD, TSS, and pH - Limitations in 414.91 for other pollutants for facilities that use end-of-pipe biological treatment - Limitations in 414.101 for other pollutants for facilities that do not use end-of-pipe biological treatment	Existing Sources: 11/5/90, as required by permit. New Sources: Date source begins operation, as required by permit. Compliance with specific permit limitations upon effective date of the permit.

40 CFR PART 414 - DIRECT DISCHARGES	
REQUIREMENTS	COMPLIANCE DATES
- Limitations in 414.91 and 414.101 are applied on a mass basis (determined by multiplying regulated process wastewater flow times the concentration limits in 414.91 and 414.101)	
• Any other effluent limitation contained in the NPDES permit	
Monitoring and Reporting Requirements:	
Note: All direct dischargers are required to obtain an NPDES permit. The NPDES permit outlines the dischargers specific monitoring and reporting requirements.	
• <u>Permit Applications</u> - containing the information required under 122.21(f), (g), and (k) (application requirements for new sources and new discharges)	Permit applications are to be submitted 180 days prior to the commencement of discharge. Applications for permit renewal are required to be submitted 180 days before the existing permit expires.
• <u>Planned Changes</u> - notification to the Director as soon as possible of any planned physical alteration or addition that meets the criteria in 122.41(l)(1)	As soon as possible, when applicable
• <u>Anticipated Noncompliance</u> - advance notification to the Director of any planned changes that may result in permit noncompliance	In advance of changes, when needed
• <u>Monitoring Reports</u> - monitoring results must be submitted as required by the NPDES permit (at least annually). All monitoring must be conducted using 40 CFR Part 136 methods.	At least annually or more frequently as required by permit
• <u>Compliance Schedules</u> - reports of compliance or noncompliance with compliance schedule requirements	Within 14 days of each compliance schedule date
• <u>24-Hour Reporting</u> - of any noncompliance that may endanger health or the environment, including the information listed in 122.41(l)(6)	Within 24 hours
• <u>Anticipated and Unanticipated Bypass</u> - notification as required under 122.41(m)	At least 10 days prior to anticipated bypass. Within 24 hours of unanticipated bypass
• <u>Discharge of Toxic Pollutants</u> - notification to the Director of activity that results in the discharge of toxic pollutants not limited in the permit, if it exceeds the levels outlined in 122.42(a)(1)	As soon as facility knows or has reason to believe that levels will be exceeded
• <u>Storm Water Permit Applications</u> - submission of either individual permit application or general permit applications	

40 CFR PART 414 - DIRECT DISCHARGES	
REQUIREMENTS	COMPLIANCE DATES
- Individual permit applications must include the information in 122.26(c)(1)	Individual permit applications for existing facilities were due October 1, 1992. New facilities must submit an application 180 days prior to commencement of industrial activity
- Facilities to be covered under a general permit must file a Notice of Intent (NOI)	NOIs from existing facilities were due on October 1, 1992. NOIs from new facilities are due 2 days prior to the commencement of industrial activities.
• <u>Other Storm Water Reports</u> - submission of other reports as required under a facility's storm water discharge permit. These reports may include pollution prevention plans and monitoring reports.	Due dates as required by permits
Record Keeping Requirements:	
• Records of monitoring information as required under 122.41(j) must be kept for at least three years.	

40 CFR Part 414

Organic Chemicals, Plastics, and Synthetic Fibers as administered through 40 CFR Part 403: General Pretreatment Regulations for Existing and New Sources of Pollution

Applicability:

Discharges from the manufacture of OCPSF products under SIC codes 2821 (Plastic Materials, Synthetic Resins, and Nonvulcanizable Elastomers), 2823 (Cellulosic Man-Made Fibers), 2824 (Synthetic Organic Fibers, Except Cellulosic), 2865 (Cyclic Crudes and Intermediates, Dyes and Organic Pigments), and 2869 (Industrial Organic Chemicals, Not Elsewhere Classfied).

Exemptions:

- Discharge from the manufacture of OCPSF products if the products are included in the following SIC subgroups and in the past have been reported as such:

  - SIC 2843085 - bulk surface active agents
  - SIC 28914 - synthetic resin and rubber resin
  - Chemicals and chemical preparations not elsewhere classified
    - 2899568 - sizes, all types
    - 2899597 - other industrial chemical specialties, including flaxes, plastic wood preparations, and embalming fluids
  - SIC 2911058 - aromatic hydrocarbons manufactured from purchased refinery products
  - SIC 2911632 - aliphatic hydrocarbons manufactured from purchased refinery products

- Discharge for which a different set of previously promulgated effluent limitations guidelines and standards apply, unless the facility reports OCPSF products under SIC codes 2865, 2869, or 2821, and the facility's OCPSF waste waters are treated in a separate treatment system or discharged separately to a publicly owned treatment works

- Process wastewater discharges from the manufacture of organic chemical compounds solely by extraction from plant and animal raw materials or by fermentation processes

- Discharges of chromium, copper, lead, nickel, and zinc in "complexed metal-bearing waste streams," listed in Appendix B of 40 CFR 414

Applicable Subparts:

Subpart B-H: As identified for direct discharges

Subpart K: Indirect Discharge Point Sources [414.110]

40 CFR Part 414 - Indirect Discharges	
Requirements	**Compliance Dates**
Discharge limitations: • Limitations contained in 414.111: - Are applied on a mass basis (determined by multiplying regulated process wastewater flow times the concentration limits in 414.111) - Mass limits for lead, zinc, and total cyanide are determined by multiplying the concentration limits in 414.111 times the flow from metal-bearing waste streams for metals and cyanide-bearing waste streams for total cyanide. Appendix A of Part 414 defines metal and cyanide-bearing waste streams. • Prohibited discharge standards (general and specific) in 40 CFR 403.5 • Applicable local limits	PSES: 11/5/90, as required by permit PSNS: Date new source begins operation, as required by permit
Monitoring and Reporting Requirements: Note: Reports must be submitted whether or not the facility has been issued a permit.	
• Baseline Monitoring Reports (BMR) - containing the information required under 40 CFR 403.12(b).	BMRs from existing sources were due by June 20, 1988. BMRs from new sources are due 90 days prior to commencement of discharge.
• Compliance Schedule Progress Reports - containing the information required under 40 CFR 403.12(c)(3)	Due within 14 days of completing compliance schedule milestone or due date
• 90-Day Compliance Report - containing the information required under 40 CFR 403.12(d)	Due within 90 days following date for final compliance (11/5/90) or for new sources, following the commencement of introduction of wastewater to the POTW
• Periodic Reports on Continued Compliance - containing the information in 403.12(e) (including monitoring data for all categorically regulated pollutants) All monitoring must be conducted using 40 CFR Part 136 methods.	Must be submitted at least semiannually
• Notice of Potential Problems Including Slug Loadings	Due to the Control Authority immediately upon identification of discharges that could cause problems to the POTW

40 CFR Part 414 - Indirect Discharges	
Requirements	**Compliance Dates**
• Notice of Changed Discharge - advanced notification of any substantial change in the volume or character of pollutants in the discharge (including hazardous wastes)	Prompt notification in advance of any substantial change
• Notice of Violations and Resampling - notification due to the Control Authority within 24 hours of noting a violation; results of resampling must be submitted within 30 days	Notice within 24 hours, results of resampling within 30 days
• Notification of Hazardous Waste Discharge - notification to the POTW, EPA, and the State of the hazardous wastes discharged to the POTW	One time notification, unless changes to discharge
Record Keeping Requirements:	
• Monitoring records including the information listed in 403.12(o) must be maintained for at least 3 years	

40 CFR Part 439

Pharmaceutical Manufacturing as Administered Through 40 CFR Part 122: EPA Administered Permits Programs, The National Pollutant Discharge Elimination System

Applicability:

Any pharmaceutical manufacturing facility discharging process waste waters to water, of the United States.

Exemptions:

None

Applicable Subparts:

Subpart A: Fermentation Products

Subpart B: Extraction Products

Subpart C: Chemical Synthesis Products

Subpart D: Mixing, Compounding, and Formulating

Subpart E: Research

40 CFR PART 439 - DIRECT DISCHARGES	
REQUIREMENTS	**COMPLIANCE DATES**
Discharge Limitations: • Effluent limitations contained in 40 CFR Part 439 including: - BOD, COD, and TSS limits based on required removal efficiencies (Subparts A, B, C, D, E) - Allowable pH range (Subparts A, B, C, D, E) - BPT, BAT and NSPS cyanide limits (Subparts A, B, C, D) Relate to May 2, 1995, proposed rule: - BPT end-of-pipe limits for BOD, TSS, COD, and pH (Subparts A, B, C, D) - BPT, BAT, or NSPS cyanide limits at in-plant monitoring points (Subparts A,C)	Existing Sources: 10/27/86 (under current regulations as required by permit). New Sources: Date source begins operation, as required by permit. Compliance with specific permit limitations upon effective date of the permit.

40 CFR PART 439 - DIRECT DISCHARGES	
REQUIREMENTS	COMPLIANCE DATES
- BAT or NSPS end-of-pipe limits for priority and nonconventional pollutants (Subparts A, B, C, D) - BOD, COD and TSS limits based on required removal efficiencies and allowable pH range (Subpart E) • Any other effluent limitation contained in the NPDES permit. Monitoring and Reporting Requirements: Note: All direct dischargers are required to obtain an NPDES permit. The NPDES permit outlines the dischargers' specific monitoring and reporting requirements.	
• Permit Applications – containing the information required under 122.21(f), (g), and (k) (application requirements for new sources and new discharges) Permit applications are to be submitted 180 days prior to the commencement of discharge. Applications for permit renewal are required to be submitted 180 days before the existing permit expires.	Permit applications are to be submitted 180 days prior to the commencement of discharge for new sources and 180 days before the existing permit expires for existing sources.
• Planned Changes – notification to the Director as soon as possible of any planned physical alteration or addition that meets the criteria in 122.41(l)(1). As soon as possible, when applicable.	As soon as possible, when applicable.
• Anticipated Noncompliance – advance notification to the Director of any planned changes that may result in permit noncompliance.	In advance of changes, when needed.
• Monitoring Reports – monitoring results must be submitted as required by the NPDES permit (at least annually). All monitoring must be conducted using 40 CFR Part 136 methods. Permittees not using or generating cyanide may certify in lieu of monitoring. (Section 439.2 specifies required monitoring frequencies for each regulated pollutant generated or used at a facility.)	At least annually or more frequently by permit.
• Compliance Schedules – reports of compliance or noncompliance with compliance schedule requirements	Within 14 days of each compliance schedule date
• 24-Hour Reporting – of any noncompliance that may endanger health or the environment, including the information listed in 122.41(l)(6)	Within 24 hours
• Anticipated and Unanticipated Bypass – notification as required under 122.41(m)	At least 10 days prior to anticipated bypass. Within 24 hours of unanticipated bypass.

40 CFR Part 439 - Direct Discharges	
Requirements	**Compliance Dates**
• Discharge of Toxic Pollutants – notification to the Director of activity that results in the discharge of toxic pollutants not limited in the permit, if it exceeds the levels outlined in 122.42(a)(1)	As soon as facility knows or has reason to believe that levels will be exceeded
• Storm Water Permit Applications – submission of either individual permit application or general permit applications	
– Individual permit applications must include the information in 122.26(c)(1)	Individual permit applications for existing facilities were due October 1, 1992. New facilities must submit an application 180 days prior to commencement of industrial activity.
– Facilities to be covered under a general permit must file a Notice of Intent (NOI)	NOIs from existing facilities were due on October 1,1992. NOIs from new facilities are due 2 days prior to the commencement of industrial activities.
• Other Storm Water Reports – submission of other reports as required under a facility's storm water discharge permit. These reports may include pollution prevention plans and monitoring reports.	Due dates as required by permits.
Record Keeping Requirements: • Records of monitoring information as required under 122.41(j) must be kept for at least three years.	

Applicability:

Any pharmaceutical manufacturing facility discharging process wastewater to a POTW

40 CFR Part 439

Pharmaceutical Manufacturing as Administered Through 40 CFR Part 403: General Pretreatment Regulations for Existing and New Sources of Pollution

40 CFR PART 439 - INDIRECT DISCHARGES	
REQUIREMENTS	COMPLIANCE DATES
Discharge limitations *(text in italics relates to May 2, 1995, proposed regulations)*:	PSES: 10/27/86, as required by permit
• Limitations contained in 40 CFR Part 439 including: – Cyanide limits (Subparts A, B, C, D)	PSNS: Date new source begins operation as required by permit
• Prohibited discharge standards (general and specific) in 40 CFR 403.5	
• Applicable local limits	
Relates to May 2, 1995, proposed rule: – Priority and non-conventional pollutants limits at in-plant and end-of-pipe monitoring points (Subparts A, B, C, D)	
Monitoring and Reporting Requirements:	
Note: Reports must be submitted whether or not the facility has been issued a permit	
• Baseline Monitoring Reports (BMR) – containing the information required under 40 CFR 403.12(b)	BMRs from existing sources due within 180 days of effective date of categorical pretreatment standard (June 9, 1984, for current regulations) BMRs from new sources are due 90 days prior to commencement of discharge
• Compliance Schedule Progress Reports – containing the information required under 40 CFR 403.12(c)(3)	Due within 14 days of completing compliance schedule milestone or due date

40 CFR Part 439 - Indirect Dischargers

40 CFR PART 439 - INDIRECT DISCHARGES	
REQUIREMENTS	COMPLIANCE DATES
• 90-Day Compliance Report – containing the information required under 40 CFR 403.12(d)	Due within 90 days following date for final compliance (10/27/86 under current regulations) or for new sources following the commencement of introduction of wastewater to the POTW
• Periodic Reports on Continued Compliance – containing the information in 403.12(e) (including monitoring data for all categorically regulated pollutants). All monitoring must be conducted using 40 CFR Part 136 methods. Dischargers not using or generating cyanide may certify in lieu of monitoring. (Section 439.2 specifies required monitoring frequencies for each regulated pollutant generated or used at a facility.) [1]	Must be submitted at least semiannually
• Notice of Potential Problems Including Slug Loadings	Due to the POTW immediately upon identification of discharges that could cause problems to the POTW
• Notice of Changed Discharge – advanced notification of any substantial change in the volume or character of pollutants in the discharge (including hazardous wastes)	Prompt notification in advance of any substantial change
• Notice of Violations and Resampling – notification due to the POTW within 24 hours of noting a violation; results of resampling must be submitted within 30 days	Notice within 24 hours, results of resampling within 30 days
• Notification of Hazardous Waste Discharge – notification to the POTW, EPA, and the State of the hazardous wastes discharged to the POTW	One time notification, unless changes to discharge

[1]The June 8, 1995 (Pesticide Chemicals) supplemental notice to the proposed April 1994 rule provides a Pollution Prevention Alternative for facilities regulated under Subpart C and proposed Subpart E. In lieu of meeting the zero discharge of process wastewater requirement, these facilities could demonstrate that the requirements of the Pollution Prevention Alternative listed in Tables B-1 and B-2 are met, notify the NPDES permit writer or pretreatment authority, and keep necessary paperwork onsite.

40 CFR Part 439 - Indirect Discharges	
Requirements	Compliance Dates
Record Keeping Requirements • Monitoring records including the information listed in 403.12(o) must be maintained for at least 3 years	

40 CFR Part 454

Gum and Wood Chemicals Manufacturing as Administered through 40 CFR Part 122: EPA Administered Permits Programs, The National Pollutant Discharge Elimination System

Applicability:

Discharges from the manufacture of gum and wood chemicals as described by applicable subparts.

Exemptions:

None

Applicable Subparts:

Subpart A: Char and Charcoal Briquets

Subpart B: Gum Rosin and Turpentine

Subpart C: Wood Rosin, Turpentine, and Pine Oil

Subpart D: Tall Oil Rosin, Pitch, and Fatty Acids

Subpart E: Essential Oils

Subpart F: Rosin-Based Derivatives

40 CFR Part 454 - Direct Discharges	
Requirements	**Compliance Dates**
Discharge Limitations: • Effluent limitations contained in 40 CFR Part 454 including: - Applicable BPT production-based limitations (Subparts B, C, D, E, and F) - Prohibition on discharge of process wastewater (Subpart A) • Any other effluent limitation contained wastewater (Subpart A)	Compliance with specific permit limitations upon effective date of permit.

40 CFR PART 454 - DIRECT DISCHARGES	
REQUIREMENTS	**COMPLIANCE DATES**
Monitoring and Reporting Requirements: Note: All direct dischargers are required to obtain an NPDES permit. The NPDES permit outlines the dischargers specific monitoring and reporting requirements.	
• Permit Applications - containing the information required under 122.21(f), (g), and (k) (application requirements for new sources and new discharges)	Permit applications are to be submitted 180 days prior to the commencement of discharge. Applications for permit renewal are required to be submitted 180 days before the existing permit expires.
• Planned Changes - notification to the Director as soon as possible of any planned physical alteration or addition that meets the criteria in 122.41(l)(l)	As soon as possible, when applicable.
• Anticipated Noncompliance - advance notification to the Director of any planned changes that may result in permit noncompliance	In advance of changes, when needed.
• Monitoring Reports - monitoring results must be submitted as required by the NPDES permit (at least annually). All monitoring must be conducted using 40 CFR Part 136 methods.	At least annually or more frequently by permit.
• Compliance Schedules - reports of compliance or noncompliance with compliance schedule requirements.	Within 14 days of each compliance schedule date.
• 24-Hour Reporting - of any noncompliance that may endanger health or the environment, including the information listed in 122.41(l)(6)	Within 24 hours
• Anticipated and Unanticipated Bypass - notification as required under 122.41(m)	At least 10 days prior to anticipated bypass. Within 24 hours of unanticipated bypass.
• Discharge of Toxic Pollutants - notification to the Director of activity that results in the discharge of toxic pollutants not limited in the permit, if it exceeds the levels outlined in 122.42(a)(1)	As soon as facility knows or has reason to believe that levels will be exceeded.

40 CFR Part 454 - Direct Discharges	
Requirements	Compliance Dates
Record Keeping Requirements: • Records of monitoring information as required under 122.41(j) must be kept for at least three years.	

Applicability:

Any gum and wood chemicals manufacturing facility discharging process wastewater to a POTW

40 CFR Part 454

Gum and Wood Chemicals Manufacturing as Administered through 40 CFR Part 403: General Pretreatment Regulations for Existing and New Sources of Pollution

40 CFR PART 454 - INDIRECT DISCHARGES	
REQUIREMENTS	**COMPLIANCE DATES**
Discharge limitations: • Prohibited discharge standards (general and specific) in 40 CFR 403.5 • Applicable local limits	As required by permit.
Monitoring and Reporting Requirements:	
• Periodic Compliance Reports	As required by permit.
• Notice of Potential Problems Including Slug Loads	Due to the Control Authority immediately upon identification of discharges that could cause problems to the POTW
• Notice of Changed Discharge - Advanced notification of any substantial change in the volume or character of pollutants in the discharge (including hazardous wastes)	Prompt notification in advance of any substantial change.
• Notification of Hazardous Waste Discharge - notification to the POTW, EPA, and the State of the hazardous wastes discharged to the POTW	One time notification, unless changes to the discharge.
Record Keeping Requirements:	
• Monitoring records including the information listed in 403.12(o) must be maintained for at least 3 years.	

40 CFR Part 455

Pesticide Chemicals as Administered through 40 CFR Part 122: EPA Administered Permits Programs, The National Pollutant Discharge Elimination System

Applicability:

Discharge from the manufacture of pesticide chemicals (*text in italics relates to April 14, 1994, proposed regulations)*

- 455.20 (Subpart A) specifies effluent limitations for the manufacture of listed organic pesticide active ingredients.
- 455.30 (Subpart B) applies to discharges from the manufacture of metallo-organic active ingredients containing mercury, cadmium, arsenic, or copper.
- *455.40 (Subpart C) does not apply to wastewater discharges from employee showers, fire equipment test, and laundry facilities. Discharges resulting from the formulating, packaging or repacking of bleach is also exempt.*[2]

Exemptions:

None

Applicable Subparts

Subpart A: Organic Pesticide Chemicals

Subpart B: Metallo-Organic Pesticide Chemicals

Subpart C: Pesticide Chemicals Formulation and Packaging *and Repacking*

Subpart D: Test Methods for Pesticide Pollutants

Subpart E: Repackaging of Agricultural Pesticides Performed by Refilling Establishment Whose Principal Business is Retail Sales

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[2]The June 8, 1995 (Pesticide Chemicals) supplemental notice to the proposed April 1994 rule also exempts wastewater from safety showers and eye washers, storm water, DOT aerosol leak test bath water (batch), and laboratory wastewater from cleaning analytical equipment. The supplemental notice also includes exception of wastewater discharges from formulation, packaging, and/or repacking of sanitizer products, pool chemicals, and microorganisms and mixtures.

40 CFR Part 455 - Direct Discharges	
Requirements	**Compliance Dates**
Discharge limitations • Effluent limitations contained in 40 CFR Part 455 including: – BPT, BCT, and NSPS limits for COD, BOD, TSS, organic pesticide chemicals, and pH (Subpart A) – BAT and NSPS limits for pesticide active ingredients listed in Table 2 or Table 3 of 40 CFR Part 455 if that pesticide active ingredient is manufactured and listed in Table 1 of 40 CFR Part 455 (Subpart A) – BAT and NSPS limits for priority pollutants listed in Table 4 (if end-of-pipe biological treatment is used) and 5 (if end-of-pipe biological treatment is used) of 40 CFR Part 455, if the facility manufactures a pesticide active ingredient listed in Table 1 (Subpart A) – No discharge of process wastewater pollutants (Subparts B, C, and E)[3]	Existing sources: 9/28/96 (under existing regulations), as required by permit. New sources: Date source begins operation, as required by permit. Compliance with specific permit limitations upon effective date of permit.

[3]The June 8, 1995 (Pesticide Chemicals) supplemental notice to the proposed April 1994 rule provides a Pollution Prevention Alternative for facilities regulated under Subpart C and proposed Subpart E. In lieu of meeting the zero discharge of process wastewater requirement, these facilities could demonstrate that the requirements of the Pollution Prevention Alternative listed in Tables B-1 and B-2 are met, notify the NPDES permit writer or pretreatment authority, and keep necessary paperwork onsite.

40 CFR PART 455 - DIRECT DISCHARGES (CONTINUED)	
REQUIREMENTS	COMPLIANCE DATES
Monitoring and Reporting Requirements: Note: All direct discharges are required to obtain an NPDES permit. The NPDES permit outlines the dischargers specific monitoring and reporting requirements.	
• Permit Applications – containing the information required under 122.21(f), (g), and (k) (application requirements for new sources and new discharges)	Permit applications are to be submitted 180 days prior to the commencement of discharge. Applications for permit renewal are required to be submitted 180 days before the existing permit expires.
• Planned Changes – containing the information required under 122.21(f), (g), and (k) (application requirements for new sources and new discharges)	As soon as possible, when applicable.
• Anticipated Noncompliance – notification to the Director as soon as possible of any planned physical alternation or addition that meets the criteria in 122.41(l)(1)	In advance of changes, when needed.
• Monitoring Reports – monitoring results must be submitted as required by the NPDES permit (at least annually)(. All monitoring must be conducted using 40 CFR Part 136 methods. Discharge parameter values must be determined using the analytical methods in Table 7 of 40 CFR part 455	At least annually or more frequently as required by permit.
• Compliance Schedules – reports of compliance or noncompliance with compliance schedule requirements	Within 14 days of each compliance schedule date
• 24-Hour Reporting – of any noncompliance that may endanger health or the environment, including the information listed in 122.41(l)(6)	Within 24 hours
• Anticipated and Unanticipated Bypass – notification as required under 122.41(m)	At least 10 days prior to anticipated bypass. Within 24 hours of unanticipated bypass.

40 CFR Part 455 - Direct Discharges (continued)	
Requirements	**Compliance Dates**
• Discharge of Toxic Pollutants – notification to the Director of activity that results in the discharge of toxic pollutants not limited in the permit, if it exceeds the levels outlined in 122.42(a)(1)	As soon as facility knows or has reason to believe that levels will be exceeded
• Storm Water Permit Applications – submission of either individuals permit application or general permit applications	
– Individual permit applications must include the information in 122.26(c)(1)	Individual permit applications for existing facilities were due October 1, 1992. New facilities must submit an application 180 days prior to commencement of industrial activity.
– Facilities to be covered under a general permit must file a Notice of Intent (NOI)	NOIs from existing facilities were due on October 12, 1992. NOIs from new facilities are due 2 days prior to the commencement of industrial activities.
• Other Storm Water Reports – submission of other reports as required under a facility's storm water discharge permit. These reports may include pollution prevention plans and monitoring reports.	Due dates as required by permits
Record Keeping Requirements:	
• Records of monitoring information as required under 122.41(j) must be kept for at least three years.	

Applicability:

Any pesticide chemical manufacturing facility discharging process wastewater to a POTW

40 CFR Part 455

Pesticide Chemicals as Administered through 40 CFR Part 403: General Pretreatment Regulations for Existing and New Sources of Pollution

40 CFR PART 455 - INDIRECT DISCHARGES	
REQUIREMENTS	COMPLIANCE DATES
Discharge limitations	PSES: 9/28/96 (under current regulations), as required by permit
• Limitations contained in 40 CFR Part 455 including:	
– PSES and PSNS limits for pesticide active ingredients listed in Table 2 or Table 3 of 40 CFR Part 455, if that pesticide active ingredient is manufactured and listed in Table 1 (Subpart A)	PSNS: Date new source begins operation, as required by permit
– PSES and PSNS limits for priority pollutants listed in Table 6 of 40 CFR Part 455 (Subpart A)	
– No discharge of process wastewater pollutants (Subparts C and *E*)[4]	
Monitoring and Reporting Requirements:	
Note: Reports must be submitted whether or not the facility has been issued a permit.	
• <u>Baseline Monitoring Reports (BMR)</u> – containing the information required under 40 CFR 403.12(b).	BMRs from existing sources are due within 180 days of effective date of categorical pretreatment standard for BMRs from new sources are due 90 days prior to commencement of discharge.

[4]The June 8, 1995 (Pesticide Chemicals) supplemental notice to the proposed April 1994 rule provides a Pollution Prevention Alternative for facilities regulated under Subpart C and proposed Subpart E. In lieu of meeting the zero discharge of process wastewater requirement, these facilities could demonstrate that the requirements of the Pollution Prevention Alternative listed in Tables B-1 and B-2 are met, notify the NPDES permit writer or pretreatment authority, and keep necessary paperwork onsite.

40 CFR Part 455 - Indirect Discharges	
Requirements	**Compliance Dates**
• Compliance Schedule Progress Reports – containing the information required under 40 CFR 403.12(c)(3)	Due within 14 days of completing compliance schedule milestone or due date
• 90-Day Compliance Report – containing the information required under 40 CFR 403.12(d)	Due within 90 days following date for final compliance or for new sources following the commencement of introduction of wastewater to the POTW
• Periodic Reports on Continued Compliance – containing the information in 403.12(e) (including monitoring data for all categorically regulated pollutants). All monitoring must be conducted using 40 CFR Part 136 methods.	Must be submitted at least semiannually
• Notice of Potential Problems Including Slug Loadings	Due to the Control Authority immediately upon identification of discharges that could cause problems to the POTW
• Notice of Changed Discharge – advanced notification of any substantial change in the volume or character of pollutants in the discharge (including hazardous wastes)	Prompt notification in advance of any substantial change
• Notice of Violations and Resampling – notification due to the Control Authority within 24 hours of noting a violation; results of resampling must be submitted within 30 days	Notice within 24 hours, results of resampling within 30 days
• Notification of Hazardous Waste Discharge – notification to the POTW, EPA, and the State of the hazardous wastes discharged to the POTW	One time notification, unless changes to discharge
Record Keeping Requirements	
• Monitoring records including the information listed in 403.12(o) must be maintained for at least 3 years	

40 CFR Part 110

Discharge of Oil

Applicability:

Prohibited discharges include certain discharges to U.S. Navigable water, adjoining shorelines, or to waters of the contiguous zone, occurring in connection with activities under the Outer Continental Shelf Lands Act of the Deepwater Port Act, or those that may affect U.S. natural resources.

May be applicable to OCPSF facilities using oil and that are either located by a municipal storm sewer that discharges to waters or near streams or bodies of water.

40 CFR Part 110	
Requirements	**Compliance Dates**
• Discharge of oil is prohibited that: – Violates applicable water quality standards, or – Causes a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines • Notification must be provided immediately to the National Response Center at (800) 424-8802 or (202) 426-2675 in the Washington, DC, metropolitan area of any discharge of oil in violation of the prohibition	

40 CFR Part 112

Oil Pollution Prevention

Applicability:

Non-transportation related onshore and off-shore facilities engaged in drilling, producing, gathering, storing, processing, refining, transferring, distributing, or consuming oil and oil products that could reasonably discharge oil in harmful quantities, as defined in Part 110

Exemptions

- Facilities with underground buried oil storage capacity of ≤ 42,000 gallons; and
- Storage capacity that is not buried ≤ 1,320 gallons, with no single container capacity > 660 gallons

40 CFR Part 112	
Requirements	**Compliance Dates**
Reporting Requirements:	Existing sources: Plans in effect
Prepare and implement Spill Prevention Control and Countermeasure plans meeting the requirements of 112.3 and 112.7	New sources: Prepare plan within 6 months of beginning operation and fully implement in no later than 1 year
• Submit report as described in 112.4 when discharged oil > 1,000 gallons in single spill event or discharged oil in harmful quantities in two spill events	Within 60 days of becoming subject to reporting requirements
• Review, evaluate, and update plan as required under 112.5	Review plan once every 3 years, amend plan within 6 months, if needed
• Submit facility response plan as described in 112.20 and develop and implement facility response training and drill exercise as described in 112.21	Existing sources: as described in 112.20 New source: prior to start of operations

40 CFR Part 116 and 117

Designation of Hazardous Substance and 40 CFR Part 117 Determination of Reportable Quantities for Hazardous Substances

Applicability:

40 CFR Part 117 does not apply to facilities that discharge the substance under an NPDES permit or to a POTW, as long as any applicable effluent limit or pretreatment standard is met.

Requirements:

40 CFR 116.4 designates hazardous substances and 40 CFR 117.3 establishes the Reportable Quantity (RQ) for each substance listed in Part 116. When an amount equal to or in excess of the RQ is discharged, the facility must provide notice to the Federal government following DOT requirements in 33 CFR 153.203.

Appendix G — Toxic Substances Control Act (TSCA)

The Toxic Substances Control Act (TSCA) authorizes EPA to test chemicals prior to and after introduction into commerce based on their potential human health and environmental effects and to regulate these chemicals at any point during the chemicals' life cycles as necessary to minimize risks to human health and the environment. TSCA authorizes EPA to regulate the manufacturing, processing, distribution in commerce, use, and disposal of chemical substances and mixtures. The term "chemical substance" is broadly defined under TSCA to include organic and inorganic chemicals, with several exclusions. Namely, pesticides, tobacco and tobacco products, nuclear material and byproducts, food, food additives, drugs, cosmetics, or devices (as defined in Section 201 of the Federal Food, Drug, and Cosmetic Act) are not subject to TSCA requirements.

While TSCA is composed of four Titles, the inspection information in this guidance is only described for the control and regulation of chemical substances and mixtures (i.e., Title I). The major requirements that have the potential to impact chemical facilities are summarized below. The detailed regulatory requirements are provided later in this appendix.

Testing - §4

Section 4 provides EPA the authority to require (by rule) that testing be conducted by manufacturers, importers, or processors of a chemical substance or mixture. The purpose of such testing is to allow EPA to determine if manufacturing, distribution, processing, use or disposal of the chemical substance or mixture presents an unreasonable risk to health or the environment. Another objective of TSCA §4 is that facilities comply with Good Laboratory Practice (GLP) standards which represent the quality control aspects of a TSCA §4 test rule. In general, 40 CFR Parts 790-799 regulations provide the "guidelines" on how tests are to be performed and results and

Toxic Substances Control Act (TSCA)

Exhibit G-1. TSCA Statutes and Regulatory Requirements for Organic Chemical Facilities

Toxic Substances Control Act	
Section 4	Testing of Chemical Substances and Mixtures
Section 5	Manufacturing and Processing Notices
Section 6	Regulation of Hazardous Substances and Mixtures
Section 8	Reporting and Retention of Information
Section 12 & 13	Exports and Imports

Section 4
- 40 CFR Parts 790-799

Section 5
- 40 CFR Part 720 Premanufacture Notification
- 40 CFR Part 721 Significant New Uses of Chemical Substances

Sections 12 & 13
- 40 CFR Part 707 Chemical Imports and Exports

Section 6
- 40 CFR Part 747 Metal Working Fluids
- 40 CFR Part 749 Water Treatment Chemicals
- 40 CFR Part 750 Procedures for Rulemaking Under TSCA Section 6
- 40 CFR Part 761 Polychlorinated Biphenyls
- 40 CFR Part 762 Fully Halogenated Chlorofluoro Alkanes
- 40 CFR Part 763 Asbestos

Section 8
- 40 CFR Part 704 Reporting and Record Keeping Requirements
- 40 CFR Part 710 Inventory Reporting Regulations
- 40 CFR Part 712 Chemical Information Rules
- 40 CFR Part 716 Health and Safety Data Reporting
- 40 CFR Part 717 Records and Reports of Allegations that Chemical Substances Cause Significant Adverse Reactions to Human Health or the Environment
- 43 FR Part 11110 Policy Statement

procedures documented, and develops standards for all laboratories to follow. The rules establish procedures for gathering information, developing and implementing test rules or consent agreements regarding chemicals regulated under TSCA §4 and establishing reimbursement for testing costs incurred under TSCA; codify GLPs for conducting studies and guidelines for health effects, environmental effects, and chemical fate testing; and identify the chemical substances and mixtures for which data must be developed, and the specific tests required for each substance and mixture.

Also pursuant to §4, as well as §8, are the Federal regulations at 40 CFR Part 766. This part identifies testing and reporting requirements for facilities that manufacture (and/or import) or process specific chemical substances identified in 40 CFR §766.25 or a chemical substance from a precursor chemical substance identified in 40 CFR §766.38. EPA has found that these specific chemical substances may be contaminated with halogenated dibenzodioxins or dibenzofurans. The applicable TSCA titles and the regulations developed pursuant to TSCA are illustrated in Exhibit G-1 and are discussed below.

Premanufacture Notice Requirements - §5

Manufacturers and importers of new chemical substances are required to comply with Premanufacture Notice (PMN) procedures and requirements as identified in 40 CFR Part 720. [PMN exemptions are itemized in 40 CFR Part 723.] New chemicals include any chemical substance not listed on the TSCA Inventory, as maintained pursuant to §8(b) of TSCA.

Manufacturers of chemicals that are not excluded or exempt from TSCA requirements or from the PMN requirements must submit a PMN at least 90 days prior to commencing commercial manufacturing or importing activities. Information that must be provided on the PMN to the extent that it is known or reasonably ascertainable includes the submitter's identity; the specific chemical identity; production, import, and use; worker, user, and consumer exposure; and environmental fate.

EPA must review and take action on the PMN within 90 days (may be extended to 180 days for cause), and if no action is taken, the submitter may commence manufacture or importation. Based on the PMN submission, EPA may issue a proposed order pursuant to §5(e) to prohibit or limit the manufacture, import, processing, distribution in commerce, use and/or disposal if the available information is insufficient to permit a reasoned evaluation of the health or environmental effects of the substance. TSCA §5(f) also provides EPA with the authority to issue an order or propose a rule to limit or condition the manufacture, processing, distribution in commerce, use and/or disposal, if there is a reasonable basis to conclude that such activities would pose an unreasonable risk to health or the environment.

Within 30 days after commencing the manufacture or import, the manufacturer or importer must submit a Notice of Commencement (NOC). This NOC prompts the addition of the chemical substance to EPA's TSCA Inventory.

Significant New Uses of Chemical Substances - §5(a)(2)

Reporting requirements for chemical facilities that manufacture, import, or process chemical substances that EPA determines have significant new uses are identified in 40 CFR Part 721 pursuant to TSCA §5(a)(2). Chemical facilities that manufacture, import, or process a chemical substance for a use that EPA has determined is a significant new use, as identified in 40 CFR Part 721, Subpart E, must submit a Significant New Use Notice (SNUN) 90 days prior to such activity. A SNUN is equivalent to a PMN and is even submitted on the same form. Chemical facilities that submit a SNUN are required to maintain SNUN documentation for at least 5 years.

EPA can apply any of five categories of standardized significant new uses as identified in 40 CFR Part 721, Subpart B to any existing chemical. These categories include:

- Protection in the workplace,
- Hazard communication program,
- Industrial, commercial, and consumer activities,
- Disposal, and
- Release to water.

As such, EPA can define certain actions or omissions of an action to be a significant new use. For example, failure to use impervious gloves where the worker is reasonably likely to be exposed could constitute a significant new use.

Subpart C of 40 CFR Part 721 establishes additional recordkeeping that EPA may impose on chemical manufacturers, importers, and processors of specific chemical substances with significant new uses. The specific recordkeeping requirements identified in 40 CFR §721.125 only apply as identified in Subpart E individually for each specific chemical substance with a significant new use.

In addition, the authorities provided to EPA [§5(e) and §5(f) as discussed above] also are applicable to SNUNs.

Hazardous Chemical Substances and Mixtures - §6

EPA has promulgated several regulations under TSCA specific to an individual chemical or class of chemicals. It is possible that a chemical facility may be subject to one or more of these regulations; however, the discussion regarding these regulations is limited in this guidance. Facilities that meet the applicability of any of these regulations must be evaluated against the specific requirements. Chemical-specific regulations are as follows:

Metalworking Fluids

Facilities that produce or use metal working fluids or produce a product that could be used in or as a metalworking fluid containing any of the following chemical substances are subject to use limitations and warnings/instructions requirements under 40 CFR Part 747: mixed mono and diamides of an organic acid, triethanolamine salt of a substituted organic acid, triethanolamine salt of a tricarboxylic acid, and tricarboxylic acid.

Water Treatment Chemicals

Federal regulations at 40 CFR Part 749 prohibit the use of hexavalent chromium (usually in the form of sodium dichromate) in comfort cooling towers (i.e., cooling towers that are dedicated exclusively to and are an integral part of heating, ventilation, and air conditioning or refrigeration systems).

Polychlorinated Biphenyls (PCBs)

Facilities that manufacture, process, distribute, use, dispose, or store PCBs must comply with regulations established in 40 CFR Part 761. These regulations identify storage, disposal, spill cleanup, disposal, labeling, recordkeeping, and reporting requirements.

Fully Halogenated Chlorofluoroalkanes

Federal regulations at 40 CFR Part 762 prohibit the manufacture, processing, or distribution in commerce of fully halogenated chlorofluoroalkanes for specific aerosol propellant uses which are subject to TSCA. The 40 CFR Part 762 regulations specify exemptions to the prohibitions and annual reporting requirements.

Record Keeping and Reporting Requirements - §8(a)

Under Section 8(a), EPA has the authority to establish, by rule, recordkeeping and reporting requirements for manufacturers, importers, and processors of chemical substances. To date, EPA has established three such rules: the Preliminary Assessment Information Rule (PAIR), the Comprehensive Assessment Information Rule (CAIR) and the Inventory Update Rule (IVR). The CAIR requirements were rescinded in 1995.

The PAIR requires manufacturers and importers to submit a 2-page form with information about any chemical listed in 40 CFR §712.30. The PAIR may be submitted through company headquarters or the site where the chemical is being manufactured or imported, but a separate form is required for each site where the chemical is being manufactured or imported. The major elements of the PAIR form include the quantity of chemical manufactured or imported for sale or use, the quantity lost to the environment and in wastes, manufacturing processes and worker exposure, customer uses and products, trade names and customer's process categories. Specific reporting dates are identified individually for each chemical substance in 40 CFR §712.30.

IUR requires manufacturers and importers of chemicals on the TSCA Inventory to report current data on chemical identity, production volume, plant site, and site-limited status (unless exempt). Regulated facilities include those that manufacture at, or import to, any single site

10,000 pounds or more during the latest complete corporate fiscal year immediately prior to the reporting period. Reporting requirements include an initial report following by recurring reports at four-year intervals thereafter. Regulated facilities must retain records for a period of four years beginning with the effective date of that reporting period.

Significant Adverse Reactions - §8(c)

Section 8(c) of TSCA, codified at 40 CFR Part 717, establishes requirements for manufacturers and processors as specified in 717.5(b), chemical substances and mixtures to keep records of significant adverse reactions to health or the environment alleged to have been caused by the substance or mixture and to permit inspection and submit copies of such records as requested by EPA.

Manufacturers and processors (including formulators and repackagers) are required to compile allegations regarding chemicals that are manufactured or processed. Certain manufacturers are exempt from this part if the chemical substance meets one of the conditions specified in 40 CFR §717.7(a), including, but not limited to manufacture of chemical substances that result from incidental chemical reactions, chemical substances that occur incidental to storage or disposal of other chemical substances, and chemical substances that result from chemical reactions that occur upon end use of other chemical substances, mixtures, or articles (e.g., adhesives, paints).

An allegation may be written or oral and consists of a statement made from any source, without formal proof or evidence, that a chemical substance or mixture has caused a significant adverse reaction to health or the environment. Known human health effects are exempt from these requirements as are environmental impacts that are directly attributable to a spill, discharge, permit violation, or other incident that must by law be reported to the Federal government. Records of significant adverse reactions are to be kept at the firm's headquarters or at any other appropriate location central to the firm's chemical operations. These records must be retained for 30 years for employee allegations or 5 years for other allegations.

Health and Safety Data Reporting - §8(d)

Chemical facilities that manufacture, import, or process, or propose to manufacture, import, or process a substance or mixture listed in 40 CFR §716.120 are required to submit any unpublished health and safety studies, as described in 40 CFR §716.3, pursuant to TSCA §8(d). Reports on these studies must be submitted on, or subsequent to, the date the substance was listed, as well as any studies conducted for 10 years prior to the substance being listed. These reports are due 60 days after the effective date of the listing of a substance or listed mixture or within 60 days of proposing to manufacture, import, or process one of these substances or mixtures. Several exemptions exist at 40 CFR §716.20 for the submission of studies that have already been submitted.

Persons manufacturing, importing, or processing, or proposing to manufacture, import, or process, the substances and mixtures identified in 40 CFR §716.120 must also submit, subject to exclusions, lists of studies that are ongoing, initiated, known but not in possession, and unpublished studies sent to a Federal agency without a claim of confidentiality. Lists of initiated studies must be submitted within 30 days of initiation while copies of ongoing studies must be submitted within 30 days of completing the study.

Notification of Substantial Risks - §8(e)

A chemical facility that (1) manufactures, imports, processes, or distributes in commerce a chemical substance or mixture, and (2) obtains information that reasonably supports the conclusion that such substance or mixture presents a substantial risk of injury to health or the environment, must immediately report that information to EPA pursuant to the self-implementing provisions of TSCA §8(e). EPA considers "immediate" to be within 15 days for non-emergency situations and 24 hours for emergency situations. In general, the chemical industry derives its §8(e) report from two sources: (1) results of human, animal, and environmental studies, and (2) incidents involving chemicals, mixtures, effluents, or processes. Records are not required to be maintained pursuant to §8(e).

Chemical Exports and Imports - §§12 and 13

Pursuant to 40 CFR Part 707, Subpart B, chemical facilities that import chemical substances, mixtures, or articles must comply with TSCA rules or are in violation. Under U.S. Customs Service rules (19 CFR §12.121), importers must certify either that the importation is being undertaken in compliance with TSCA requirements or that it is not subject to such requirements. Since TSCA Section 13 defines manufacturers as importers, importers may also be subject to TSCA testing requirements.

TSCA §12 and Subpart D of 40 CFR Part 707 identifies applicable regulations for exporters. Specifically, any person who exports or intends to export a chemical substance or mixture must submit a notice of export to EPA in writing if any of the following actions have been undertaken with respect to that chemical or mixture:

- Data are required under TSCA §4 (Testing) or §5(b) (Submission of Test Data),
- An order has been issued under TSCA §5 (Manufacturing and Processing Notices),

- A rule has been proposed or promulgated under TSCA §5 or §6 (Hazardous Chemical Substances), or

- An action is pending or relief has been granted under TSCA §5 or §7 (Imminent Hazards).

Export notices are required for the first export to each country in each calendar year (except for TSCA §4, that requires one-time notification only). Subpart D of 40 CFR Part 707 specifies the timing and contents of these notices which must be postmarked within 7 days of acceptance of a definite contractual obligation to export. Where the actual export occurs less than 7 days after the export obligation, the notice must be submitted to EPA no later than the same day as the export.

TSCA Assessment Considerations

TSCA regulations focus specifically on manufacturing, importing, or processing chemical substances and mixtures, making this statute of primary importance to chemical facilities. A self-assessment of a chemical facility to determine compliance with TSCA requires that the assessor be familiar, at least in general, with all regulations developed under the Act. Because of the focus of TSCA on chemical substances and mixtures, inspection guidance, namely the *Toxic Substance Control Act §§5/8 Inspection Guidance*, U.S. EPA, November 1992, is an excellent industry-specific resource when evaluating compliance with Title I requirements at chemical facilities. Also, it is helpful for the assessor team to have lists of chemical substances regulated by the Act. In this way, the assessor can identify activities that may trigger TSCA regulatory requirements during pre-inspection activities and the self-assessment.

The key to a successful TSCA self-assessor is a comprehensive pre-assessment records review. Assessor should be aware that many TSCA reports may be submitted by the firm, corporate headquarters, or office for the manufacturing facility as opposed to the specific manufacturing plant submitting this information. It is also important for the assessment to ascertain from facility representatives if the chemical facility is aware of requirements under TSCA. One of the biggest reasons for TSCA violations is ignorance of the specific requirements.

It may also be useful for an assessor to target one or more specific TSCA regulations that are likely to apply at a facility rather than attempting to evaluate compliance with all requirements. For example, specialty organic chemical manufacturers may manufacture hundreds of different products, using hundreds of different raw materials. Attempting to evaluate compliance with all applicable TSCA requirements at these types of facilities can be extremely time consuming.

One of the most egregious TSCA violations is failure to submit a PMN. The purpose of the PMN is to provide EPA with the opportunity to determine whether the uncontrolled manufacture, importation, processing, use, distribution in commerce, or disposal will present an unreasonable risk of injury to health and the environment. Failure to submit the PMN prevents EPA from making this critical evaluation. As such, an inspection team may try to focus only on new chemicals and determine if TSCA §5 requirements are being met.

Focusing on high risk chemicals during compliance assessments is also a useful mechanism for targeting TSCA compliance evaluations. Knowledge of the chemical substances regulated by PAIR addresses this concern to a certain extent. Also, the Interagency Testing Committee (ITC) as established by TSCA §4(e), as well as EPCRA Section 313, the CAA Amendments, and the CWA (i.e., priority pollutants) represent additional sources for identifying high-risk chemicals. High risk chemicals may also be identified by the inspection team based on the health and safety precautions that are being taken at the chemical facility for specific process operations or production areas.

TSCA Regulatory Requirements

The following sections provide a summary of the principal regulations developed pursuant to TSCA that are applicable to the organic chemical industry. The regulations included are:

- TSCA Section 4 - 40 CFR Parts 790-799 - Subchapter R - Toxic Substance Control Act
- TSCA Section 5(a)(1) - 40 CFR Part 720 - Premanufacture Notification
- TSCA Section 5(a)(2) - 40 CFR Part 721 - Significant New Uses of Chemical Substances
- TSCA Section 5(c) - Regulation Pending Development of Information
- TSCA Section 5(f) - Protection Against Unreasonable Risks
- TSCA Section 6
  - 40 CFR Part 747 - Metalworking Fluids
  - 40 CFR Part 749 - Water Treatment Chemicals
  - 40 CFR Part 750 - Procedures for Rulemaking under TSCA Section 6
  - 40 CFR Part 761 - Polychlorinated Biphenyls
  - 40 CFR Part 762 - Fully Halogenated Chlorofluoroalkanes
  - 40 CFR Part 763 - Asbestos

- TSCA Section 8(a) - 40 CFR Part 704 - Reporting and Recordkeeping Requirements
  - Subpart A General Provisions
  - Subpart B Chemical Specific Rules

- TSCA Section 8(a) PAIR - 40 CFR 712 - Chemical Information Rules
  - Subpart B Manufacturers Reporting - Preliminary Assessment Information

- TSCA Section 8(a) IUR - 40 CFR Part 710 - Inventory Reporting Regulations

- TSCA Section 8(c) - 40 CFR Part 717 - Records and Reports of Allegations that Chemical Substances Cause Significant Adverse Reactions to Human Health or the Environment

- TSCA Section 8(d) - 40 CFR Part 716 - Health and Safety Data Reporting

- TSCA Section 8(e) - 43 FR Part 11110 - Policy Statement

- TSCA Section 12 - 40 CFR Part 707 - Chemical Imports and Exports
  - Subpart D Notices of Export Under Section 12(b)

- TSCA Section 13 - 40 CFR Part 707 - Chemical Imports and Exports
  - Subpart B General Import Requirements and Restrictions

TSCA Section 4 - 40 CFR Parts 790-799

Subpart R - Toxic Substance Control Act

Affected Facility:

Persons that manufacture or intend to manufacture and/or process or intend to process a substance subject to a test rule or testing requirements of a consent agreement.

Date of Applicability:

Substance-specific

Exemptions:

- Persons who manufacture less than 500 kg annually must comply only if directed to do so by notice or test rule
- Persons who manufacture small quantities solely for research and development must comply only if directed to do so by notice or test rule

Affected Chemicals:

1) Chemicals listed in 40 CFR 799

2) Also, dibenzo-para-dioxins and dibenzofurans (40 CFR 766)

Requirements:

1) Submit letter of intent to conduct testing or exemption application no later than 30 days of date of test rule

2) If a letter of intent is submitted, conduct tests listed in 40 CFR 799 for appropriate substance

3) If testing is conducted, comply with Good Laboratory Practice Standards (40 CFR 792), including retention of records for 10 years

TSCA Section 5(a)(1) - 40 CFR Part 720
Premanufacture Notification

Affected Facility:

Persons who intend to manufacture or import a new chemical substance into the U.S. for commercial purposes, or who contract with a manufacturer as outlined in 40 CFR 720.22(a)(2).

Date of Applicability:

July 12, 1983

Exemptions:

As listed in 40 CFR 720.30, 720.36, 720.38 and 40 CFR 723 (low volume, test marketing, instant photographic film, and polymers)

Affected Chemicals:

New chemical substances; i.e., substances not listed on the Inventory

Requirements:

1) Submit Premanufacture Notification (PMN) at least 90 days before manufacture or import

2) PMN to include information in Subpart C, and test data as outlined in 40 CFR 720.50

3) Submit Notice of Commencement (NOC) no later than 30 days after commencement of manufacture or import

Record Keeping Requirements:

Keep records described in 40 CFR 720.78 for 5 years

TSCA Section 5(a)(2) - 40 CFR Part 721

Significant New Uses of Chemical Substances

Affected Facility:

Persons who:

1) Intend to manufacture, import or process for commercial purposes a chemical substance identified in Subpart E, and

2) Engage in a significant new use of the substance or intend to distribute the substance in commerce [subject to the exemption outlined in 40 CFR 721.5(a)(2)].

Date of Applicability:

Substance-specific

Exemptions:

As specified in 40 CFR 721.45

Affected Chemicals:

Chemical substances identified in 40 CFR 721 Subpart E

Requirements:

Submit Significant New Use Notice (SNUN) at least 90 days before commencing manufacture, import, or processing, using Appendix A of 40 CFR 720, and including test data specified in Section 5(d)(1)

Record Keeping Requirements:

5 years

Affected Facility:

Persons engaged in, or intending to engage in, manufacture, processing, distribution in commerce, use, or disposal of the substance.

TSCA Section 5(e)

Regulation Pending Development of Information

Date of Applicability:

Substance-specific

Exemptions:

None

Affected Chemicals:

As stated in order or injunction

Requirements:

Comply with order or injunction (in response to a PMN or SNUN) prohibiting or limiting the manufacture, processing, distribution in commerce, use, or disposal of a specific substance

TSCA Section 5(f)
Protection Against Unreasonable Risks

Affected Facility:

Persons engaged in, or intending to engage in, manufacture, processing, or distribution in commerce of the substance

Date of Applicability:

Substance-specific

Exemptions:

None

Affected Chemicals:

As stated in order or injunction

Requirements:

1) Comply with order or injunction (in response to a PMN or SNUN) prohibiting the manufacture, processing, or distribution in commerce of a specific substance, or

2) Comply with proposed rule issued under Section 6(a), effective as of publication, limiting the amount of a specific substance that may be manufactured, processed, or distributed in commerce, or requiring one or more actions from Section 6(a)(2) through (7)

TSCA Section 6 - 40 CFR Parts 747, 749, 750, 762, 763

Affected Facility:

Persons engaged in, or intending to engage in, manufacture, processing, or distribution in commerce of the substance

- 40 CFR Part 747 - Metalworking Fluids
- 40 CFR Part 749 - Water Treatment Chemicals
- 40 CFR Part 750 - Procedures for Rulemaking under TSCA Section 6
- 40 CFR Part 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
- 40 CFR Part 762 - Fully Halogenated Chlorofluoroalkanes
- 40 CFR Part 763 - Asbestos

Date of Applicability:

Varies based on rule.

Exemptions:

None

Affected Chemicals:

As stated in order or rule. Includes:

- PCBs (40 CFR 761)
- Fully halogenated chlorofluoroalkanes (40 CFR 762)
- Asbestos (40 CFR 763)
- Metalworking fluids (40 CFR 747)
- Hexavalent chromium (e.g., sodium dichromate) (40 CFR 749)

Requirements:

Dependent on substance-specific rule or order:

- Comply with prohibition against or limits on manufacturing, processing, or distributing in commerce
- Comply with prohibition against manufacturing, processing, or distributing in commerce for a particular use or a particular use above a specified concentration
- Label substances or articles with adequate warnings and instructions
- Make and retain records or processes used and monitor or test to assure compliance with rule
- Comply with prohibitions or regulations on specified commercial uses
- Comply with prohibitions or regulations on specified methods of disposal
- Give notice of risks to distributors, persons in possession of substance, and general public, and replace or repurchase substance

TSCA Section 8(a) - 40 CFR Part 704

Reporting and Requirements

Subpart A - General Provisions
Subpart B - Chemical Specific Rules

Affected Facility:

Manufacturers, importers, and processors

Date of Applicability:

Substance-specific

Exemptions:

As in 40 CFR 704.5

Affected Chemicals:

Chemical substances listed in 40 CFR 704 Subpart B

Reporting and Record Keeping Requirements:

Dependent on chemical

TSCA Section 8(a) PAIR - 40 CFR Part 712

Chemical Information Rules

Subpart B - Manufacturers Reporting - Preliminary Assessment Information

Affected Facility:

Manufacturers and importers

Date of Applicability:

June 1982 (Substance specific)

Exemptions:

As described in 40 CFR 712.25

Affected Chemicals:

Chemical substances listed in 40 CFR 712.30

Reporting Requirements:

1) 2-page report for each plant manufacturing a chemical listed in 40 CFR §712.30
2) Cover latest complete corporate fiscal year as of the effective date
3) Due 60 days from effective date

TSCA Section 8(a) IUR - 40 CFR Part 710
Inventory Reporting Regulations

Affected Facility:

Manufacturers and importers that manufacture at, or import to, any single site 10,000 lbs. or more during the latest complete corporate fiscal year immediately prior to the reporting period.

Date of Applicability:

August 25 - December 23, 1986, and subsequent reporting periods

Exemptions:

- Substances exempted in 40 CFR 710.26
- Persons exempted in 40 CFR 710.29 (small manufacturers)
- Activities exempted in 40 CFR 710.30

Affected Chemicals:

Any chemical on TSCA Inventory.

Reporting Requirements:

Initial and recurring (every 4 years) reporting to TSCA Inventory

Record Keeping Requirements:

1) All TSCA Inventory data submissions and records that document submission information (kept for 4 years after reporting period)

2) Site-specific production or import records to verify reporting exemption

TSCA Section 8(c) - 40 CFR Part 717

Records and Reports of Allegations that Chemical Substances Cause Significant Adverse Reactions to Health or the Environment

Affected Facility:

Manufacturers and processors meeting criteria in 40 CFR 717.5

Date of Applicability:

1983

Exemptions:

As stated in 40 CFR 717.7

Affected Chemicals:

Any chemical substance or mixture

Reporting Requirements:

Regarding allegations that substances cause significant adverse reactions to health or the environment:

Records must be reported when required by letter to firms or notice in the *Federal Register*

Record Keeping Requirements:

1) Record of all employee allegations (the original document and abstract) kept for 30 years

2) All other allegations kept for 5 years.

TSCA Section 8(d) - 40 CFR Part 716

Health and Safety Data Reporting

Affected Facility:

Persons who, from 10 years prior to the effective date that a substance or mixture is added to 40 CFR 716.120 to the present, manufactured, imported, or processed the substance or proposed to do so.

Date of Applicability:

1982 (Substance specific)

Exemptions:

Studies not subject to reporting requirements as defined in 40 CFR 716.20.

Affected Chemicals:

Chemicals listed in 40 CFR 716.120

Requirements:

1) Submission of any unpublished health and safety studies as described by 40 CFR 716.3

2) Submit information within 60 days after effective date of chemical placed on 40 CFR 716.120 list

3) 10-year continuing obligation to report certain information

Record Keeping Requirements:

None

Affected Facility:

Manufacturers, importers, processors, and distributors

TSCA Section 8(e) - 43 Federal Register 11110 Policy Statement

Date of Applicability:

- Statute:
  - January 1977
- Policy Statement:
  - March 1978

Affected Chemicals:

Chemical substances and mixtures for which there is information that reasonably supports the conclusion that the substance or mixture presents a substantial risk of injury to health or the environment.

Requirements:

- Substantial risk to health or environment information reported immediately:
  - Emergency - within 24 hours (oral)
  - Nonemergency - within 15 working days (written)

TSCA Section 12 - 40 CFR Part 707

Chemical Imports and Exports

Subpart D - Notices of Export Under Section 12(b)

Affected Facility:

Persons who export or intend to export a chemical substance for which:

- Data are required under Section 4 or 5(b)
- An order has been issued under Section 5
- A rule has been proposed or promulgated under Section 5 or 6
- An action is pending or relief has been granted under Section 5 or 7

Date of Applicability:

1980

Exemptions:

40 CFR 707.72

Affected Chemicals:

As set out in 40 CFR 707.60, including PCBs and PCB articles [40 CFR 707.60(c)]

Reporting Requirements:

Submit notice of export:

- Within 7 days of definite contractual obligation to export; or
- Actual date of export

Whichever is earlier. If in response to an EPA proposed rule, requirement to submit notice begins 30 days after publication of proposed rule.

Contents of notice:

- Name of chemical, name and address of exporter, country of import, date of export, section of TSCA applicable to substance

Affected Facility:

Importers

Date of Applicability:

1980

TSCA Section 13 - 40 CFR Part 707

Chemical Imports and Exports

Subpart B: (General Import Requirements and Restrictions), §707.20 Chemical Substance Import Policy (referring to 19 CFR Parts 12 and 127 (U.S. Customs Service)

Exemptions:

None

Affected Chemicals:

Any chemical substance, mixture or article

Reporting Requirements:

Submit statement of compliance with TSCA or that import is not subject to TSCA

Appendix H References and Resources

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- 57 FR 11394 (April 2, 1992)
- 57 FR 41836 (September 11, 1992)
- 58 FR 36872 (July 9, 1993)
- 59 FR 61488 (November 30, 1994)

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RESOURCES

Readers are referred to several Federal resources that provide a wealth of information useful for performing facility self-assessments. Contact the resources identified below for more information on specific titles available.

National Technical Information Service (NTIS)
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650 (to order)
(703) 487-4680 (to identify a title for sale)

Center for Environmental Research Information (CERI)
26 West Martin Luther King Drive
Cincinnati, OH 45268
(513) 569-7562 (phone)
(513) 569-7566 (fax)

Pollution Prevention Information Clearinghouse (PPIC)
401 M Street, SW (3404)
Washington, D.C. 20460
(202) 260-1023 (phone)
(202) 260-0178 (fax)

Federal Register/Code of Federal Regulations (Title 40 - The Environment)
New Orders
Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250-7954