SECTION 11 CONTENTS

11. POLLUTION PREVENTION TECHNIQUES

11.1 Introduction

Pollution prevention (P2) is a simple idea: it means you eliminate pollution ***before it is created*** at your food processing facility rather than controlling the pollution from your processes and then treating and disposing of the wastes that you generate. P2 techniques that food processing facilities can use range from placing catch pans near equipment hydraulic lifts to making fundamental changes in the way food is cleaned and prepared. This section discusses the benefits and incentives, costs of compliance, and techniques that may work at your facility. ***Keep in mind that all P2 activities should be carried out in accordance with food safety requirements of the U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA).***

The U.S. Environmental Protection Agency (EPA) defines P2 as the use of materials, processes, or practices that reduce or eliminate the generation of pollutants or waste at the source. The direct benefits of P2 are:

- Decreased waste management costs
- Decreased input materials costs and energy consumption
- Decreased environmental compliance costs
- Decreased liability
- Increased compliance
- Increased worker safety
- Improved corporate image.

What will these benefits mean to your food processing facility?

- ***Reduction in the cost of operating your food processing facility***

  The creation of waste that impacts the water, land, or air, and the use of certain chemicals, translates into additional dollars you must spend. When you generate waste, your operating costs increase since you must pay for items, such as hazardous waste disposal, the installation and operation of pollution control equipment, and permit fees. By reducing wastestreams, you can cut the cost of operating your facility. And these cost savings should translate to **lower operating costs and increased profits**.

- ***A more efficient and productive business***

  In order to maintain compliance with environmental regulations, you and your staff must conduct a great number of environmental management activities. These activities cost your facility time and money. More often than not, these costs are hidden in your facility's overhead. The more waste you generate, the more your facility is regulated. So, if you spend less time on compliance activities because you have less waste to manage, your facility will have more time to process foods.

- ***Reduced Risk of Liability***

  You will decrease your risk of liability by reducing the volume and the potential toxicity of the vapor, liquid, and solid discharges you generate. As a food processing facility, you should look at all types of waste, not just those that are currently defined as hazardous (see Section 8.0 *How Do I Comply With the Hazardous Waste Regulations?* for a definition of hazardous waste). Since toxicity definitions and regulations change, reducing volumes of wastes in all categories is a sound long-term management policy.

- ***Prevent pollution***

  If there are fewer hazardous materials at your food processing facility, your compliance obligations will be fewer. If your workers are exposed less frequently to hazardous materials, their health and safety will not be as much at risk. In addition, you will not have to be concerned about their well being -- or your liability. Furthermore, the environment will be cleaner and you will be prepared for a regulatory agency's inspection.

  Successful implementation of pollution prevention techniques can reduce worker exposure and liability.

11.2 What Pollution Prevention Techniques Can I Use?

This section presents an overview of P2 techniques that can be incorporated into your major process activities (e.g., storage, receiving and preparation, processing and filling, packaging, and storage and distribution), as well as your ancillary operations (e.g., refrigeration, cleaning, maintenance, and laboratory activities). The techniques shown in *Table 11-1 Overview of Pollution Prevention Techniques* provide a general overview of several of the options available to you.

Section 11.3 Pollution Prevention Techniques for the Food Processing Industry presents detailed descriptions of each P2 technique. It is important to remember that not every P2 technique will work at every food processing facility. You should compare and evaluate these P2 techniques to identify those that may help you meet your P2 goals. You will then need to try a select few to determine what works in your facility, but does not compromise the quality and safety of your product. *Consultation with the agencies regulating food safety is critical during the planning and evaluation of any pollution prevention technique(s) that you may adopt*.

Some P2 techniques will assist you in reducing your fresh water use and wastewater generation. This will result in cost savings to your facility and decreased demands on the POTW to process your wastewater.

As shown in Table 11-1, there are many different kinds of P2 techniques. These techniques can be divided into categories, including process or equipment modification (primarily involving utilizing water conservation methods); operational and housekeeping changes; recycling/reuse; and material substitution and elimination. For the purposes of this document, each technique is placed under one of these categories. However, you may categorize a particular technique

Table 11-1. Overview of Pollution Prevention Techniques

Type of P2 Technique	Technique	Process or Ancillary Activity	Ease of Implementation
Process/ equipment modification	Replacing traditional faucets	Receiving and preparation	Easy - Moderate
	Dry caustic peeling of fruits and vegetables	Receiving and preparation	Difficult
	Water shutoff during breaks	Processing and filling	Easy
	Water control units	Processing and filling	Moderate
	Installing flow meters	Processing and filling	Easy
	Exterior area water use reduction	Storage and distribution	Easy
Operational and housekeeping changes	Placing catch pans under potential overflows/leaks	Storage	Easy
	Covering outside storage areas	Storage	Easy
	Inspections and preventive maintenance of potential discharge areas	Storage	Easy
	Secondary containment	Storage	Easy - Moderate
	Monitor liquid fill machines	Processing and filling	Easy - Moderate
	Covering outside drains during loading and unloading	Storage and distribution	Easy
	Covering inside floor drains (in non-production areas only)	Maintenance	Easy
	Cleaning prevention	Cleaning	Easy - Difficult
	Precleaning and dry cleanup	Cleaning	Moderate
	Skim grease traps regularly	Cleaning	Easy
	Screening	Cleaning	Moderate
	Minimizing pests	Cleaning	Easy - Moderate
Recycling/reuse	Countercurrent washes	Processing and filling	Moderate
	Process water reuse	Processing and filling	Easy - Moderate
	Water recirculaton units	Processing and filling	Moderate
	Water used to chill products	Processing and filling	Moderate
	Residuals management	Processing and filling, storage and distribution	Easy - Moderate
	Recycling refrigerants	Refrigeration	Moderate
	Reducing/recycling/reusing packaging	Processing and filling	Easy - Moderate

Table 11-1. Overview of Pollution Prevention Techniques

Type of P2 Technique	Technique	Process or Ancillary Activity	Ease of Implementation
Material substitution and elimination	Laboratory inventory reduction	Laboratory	Easy
	General inventory control	Purchasing	Easy
	Using alternative refrigerants	Refrigeration	Moderate

differently for your operation. The table also indicates the ease of implementation of each technique. While some P2 techniques are easy; others are more challenging. However, they all involve changes in how you do business. When you understand how much it costs to comply with all the regulations that apply to your facility, you will see that changing your operations makes good business sense.

11.3 Pollution Prevention Techniques for the Food Processing Industry

This section describes P2 opportunities that could be implemented at your facility. Information on whether the technique is easy or more difficult to use is included next to each listing, followed by a description of the technique. The ease of implementation can be determined by many factors, such as cost, adding new equipment, substituting materials, and if necessary, making associated process changes. ***Food processors should evaluate these P2 techniques before use to assure they do not compromise the safety of their product.***

11.3.1 Techniques for Process/Equipment Modification

Replacing Traditional Faucets — Easy- Moderate

As a food processing facility, you have probably found that traditional faucets can be one of the highest water users in your facility. Traditional faucets are often large water users because they have a high flow rate, and they can be left on while unattended, sometimes for hours at a time. By replacing the faucets with modified flow faucets, flow rates can be reduced by over 80%. By retrofitting faucets with on-demand foot or knee control devices or automatic shutoff nozzles, flow can be reduced even further. An example of such savings is presented below.

At a Kentucky Poultry plant[1], 44 faucets were replaced and upgraded leading to an annual savings of $37,174. The plant's cost of installing 44 restricted flow faucets was $1,100 at $25 per faucet. The new faucets had flow rates of 0.5 gpm compared to 1.5 - 3.5 gpm for the old faucets. The change reduced the process line's flow rate by 83.5 gpm (from 87.5 gpm to 4 gpm). Total savings were calculated as follows:

83.5 gpm x 60 min/hr x 16 hr/day (work day) x 265 days/yr (operating days) = 21,424,400 gal/yr x $1.75/1,000 gal = ***$37,174/yr savings***

$37,174/yr / 265 days/yr = $101.85/day
$1,100(total cost) 101.85/day = ***11 day payback period****.*

Note: An additional step for water conservation can be the use of automatic shutoff valves which can stop sprays when conveyor belts stop.

Dry Caustic Peeling of Fruits and Vegetables — Difficult

As a food processing facility, you may have problems with high levels of product residue in the water generated during the steam peeling process. In conventional steam peeling operations, potato peels may contribute up to 80 percent of the total plant wastewater biochemical oxygen demand (BOD). However, peeling processes can be modified so that the peel waste can be removed without using excessive amounts of water. One option is the "dry" caustic peeling process.

In a dry caustic system, peels are softened by caustic, and then a machine uses very thin soft rubber discs to remove the peels. These rubber disks are placed on rotating cylindrical rolls arranged in a circular revolving cage containing a feed screen through the center. The feed rate is controlled by the central screw conveyor. A final rinse to remove the last traces of peel and caustic is the only fresh water used.

Table 11-2 Comparison of the Average Liquid Effluent for Caustic and Dry Peeling Operations presents a comparison of effluent from conventional caustic and dry caustic peeling operations, based on a demonstration of peach peeling at a canning facility.

[1] U.S. Environmental Protection Agency. Climate Wise - Economic and Environmental Impact Case Studies: Food Processing. "Case Study: Waste Reduction Opportunity Assessment. Seaboard Kentucky Poultry Processing Facility. Hickory, Kentucky. February 1994."

Table 11-2. Comparison of the Average Liquid Effluent for Caustic and Dry Peeling Operations (Del Monte Demonstration Project)[1]

Wastewater Characteristics	Conventional Caustic Peeling	Dry Caustic Peeling
Water Usage	850 gallons/ton[2]	90 gallons/ton
COD	10.8 (1500 ppm)	4.2 (5600 ppm)
BOD	6.7 (940 ppm)	2.8 (3700 ppm)
Suspended Solids	5.6 (790 ppm)	1.9 (2500 ppm)
Total Solids	17.8 (2500 ppm)	4.0 (5300 ppm)
pH range	6-9	4-6

[1] Carawan, Roy et al., "Spinoff On Fruit and Vegetable Water and Wastewater Management," presented in *Industrial Water Conservation References of Food Processing*, California Department of Water Resources, 1989.

[2] Assumes countercurrent rinse. Without countercurrent rinse, this number could be as high as 2,000 gallons per ton for peaches.

Water Shutoff During Breaks — Easy

If your food processing facility does not have on demand faucets and hoses, water shut off during breaks can save thousands of dollars each year, without any capital investment. For example, shutting off water during breaks at the Kentucky poultry plant discussed earlier saved $23,964 per year. Based on its previous water use of 344.5 gpm during breaks, its savings were calculated as:

344.5 gpm x 60 min/hr x 2.5 hr/day (break time) x 265 day/yr = **13, 693,875 gal/yr**
13, 693,875 gal/yr x $1.75/1,000 gal = **$23,964/yr**.

Water Control Units — Moderate

Your food processing facility may provide a continuous flow of fresh water for the raw product prior to and during preparation, or you may require continuous replenishment of a wash bath for each new batch of product. A water control unit can be added to the automatic process to reduce fresh water use. Wall-mounted control units, which control the flow and temperature of the water to the wash bath, can be installed. A water control unit costs approximately $1,200. The benefits of this technique are in the cost savings which can be realized from decreased fresh water use and reduced wastewater discharge.

Installing flow meters — Easy

When combined with education and training, flow meters can help all employees become involved in your facility's water reduction program. Food processing facilities have found that flow meters allow them to measure and monitor water use on a constant basis. This technique is especially useful in cooking operations, where any excess water that enters the process is excess water that is heated. Thus by preventing excess water from entering the process, you can save energy costs of heating excess water. Flow meters allow all employees to monitor water use and help reduce water usage on a facility-wide basis.

Exterior Area Water Use Reduction — Easy

In addition to the pollution prevention techniques directly related to your production process, you have additional opportunities to reduce water usage. By educating all employees about the costs of water use and the benefits of reduction, your facilities can maximize cost savings. Some options for reducing non process-related water use include:

- **T** Wash vehicles used outside the facility less often (Vehicles used inside the facility must be washed after use for safety.) 40 CFR

- **T** Recycle wastewater from vehicle washing. (Your facility may want to evaluate technologies to recycle this wastewater.)

- **T** Design and maintain landscapes requiring less water

- **T** Reduce irrigation water use by:
  - Installing timers on sprinkler systems
  - Watering in the early morning or evening when evaporation is lowest
  - Making sure irrigation equipment applies water uniformly
  - Installing drip irrigation systems
  - Using rain sensors.

11.3.2 Techniques for Operational and Housekeeping Changes

The following section describes P2 techniques that pertain to minimizing or eliminating wastes during waste segregation, separation, and preparation processes.

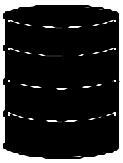
Placing Catch Pans Under Potential Overflows/Leaks — Easy

Placing catch pans or other mini-containment devices near hydraulic lifts, liquid drum storage or dry product storage areas at your food processing facility is an excellent technique to:

(1) Prevent waste from entering drains
(2) Reduce the use of cleanup materials
(3) Reduce wet washing.

While product that hits the ground is generally disposed of as waste or washed down drains, spilled product caught by catch pans can be recycled as animal feed. Catch pans located in a food production area must be cleared regularly and should be removed from the production area for cleaning.

Cover Outside Storage Areas — Easy



Covering outside storage areas such as waste containers, product storage bins, or cleaning chemical containers is a relatively easy pollution prevention technique that you can implement at your facility. This technique can reduce contaminants in storm water discharges, and help you comply with the Best Management Practice requirements in your facility's storm water permit.

Simple methods of coverage include:

- Moving chemicals inside the plant
- Covering containers with a waterproof tarp when not in use
- Replacing old dumpster covers with new watertight covers
- Replacing or repairing leaking dumpsters.

A pollution prevention technique of moderate expense is to construct an aluminum panel roof under which waste containers, product storage bins, or chemical containers can be stored.

Inspections and Preventive Maintenance of Potential Discharge Areas — Easy

You may find that routine inspections uncover potential problems before they lead to water discharges. Preventive maintenance of outdoor processes can prevent discharges, thus reducing the need for cleanup water and subsequently reducing discharges to storm sewers.

Secondary Containment — Easy - Moderate

Both outdoor and indoor storage facilities should be equipped with secondary containment, which is any device or structure that prevents a spill or leak from reaching the environment. One of the most effective secondary containment methods that can be used in an outdoor storage area is a concrete or asphalt pad surrounded by a berm or curb. The pad and berm prevent any spilled or leaked material from coming in contact with the soil. If a berm is not available, sandbags, or absorbent socks around the perimeter of the area will provide some containment for a short period of time after a spill. Within buildings, depending on construction of the building, the walls and floor provide secondary containment for preventing spills or releases. One of the least expensive secondary containment devices consists of a metal tray covered by a metal grate, which can be used for 55-gallon drums and smaller containers. The container sits on top of the metal grate so that any material or waste that is

released from the container simply falls through the grate and is collected by the metal tray underneath. The tray must be large enough to hold the entire volume of the container and should be protected from rainfall.

Monitor Liquid Fill Machines — Easy - Moderate

Ensure liquid fill machines operate correctly and do not overfill cans, jars, etc. Overfill will end up on the floor and be washed down the drain, thereby increasing BOD levels in wastewater. Ways to eliminate overfills include changing the speed at which the machine is operated, adding sensors, and ensuring that the containers flow smoothly through the machine (eliminating jarring movements which could cause spillage).

Cover Outside Drains During Loading and Unloading — Easy

Covering outside drains during loading processes at your food processing facility can prevent spills from reaching storm or process water drains with minimal costs. Preventing spills from entering the wastewater system has several benefits including:

- Preventing potential unauthorized discharges to storm drains
- Preventing high pollutant concentration discharges to treatment plants
- Allowing for a dry precleaning prior to washing a spill area.

Covering Inside Floor Drains (In Non-production Areas Only) — Easy

As with outside drains, covering floor drains can prevent spills from adding pollutants to wastewater. ***This should be done only in areas where food is not handled***. Covering drains prevents spills and leaks from flowing directly to the wastewater system. This method provides additional benefits for your facility such as:

- Encouraging dry cleanup by making it more difficult to wash spills down the drains
- Reducing/eliminating non-emergency use and replacement costs of spill equipment (e.g., booms, drying materials) used to prevent spills from reaching floor drains.

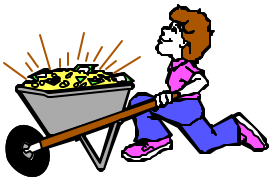
Cleaning Prevention — Easy - Difficult

The best way to reduce water use for cleaning spills is to avoid the need for cleaning. Preventing spills from reaching the floor reduces or eliminates water in cleanup. Conducting regular inspections of storage areas and potential spill sites (machines, ovens, conveyors) can prevent spills from occurring, and thus from reaching the wastewater system. Dedicating mixing lines to specific products can reduce changeover cleanups. However, implementation of these lines may be difficult and expensive.

Precleaning and Dry Cleanup — Moderate

For equipment or machinery cleaning, cleaning techniques that reduce water use can save money on water and sewer charges. Techniques such as using squeegees or other dry cleaning equipment prior to wash down, followed by initial rinses with recycled water, have the benefit of allowing you to reduce the time and volume of water in final cleaning. The most important phase of precleaning, however, is dry cleanup.

Dry cleaning is a relatively simple process that involves removing a spill or spent product before washing a surface or container. Many food processing facilities have found dry cleanup to be an easy low cost alternative to hosing spills or unusable product down the drain. They have found that dry cleanup can significantly reduce BOD loading in wastewater discharges, reduce onsite treatment, and reduce the frequency of screen cleaning. When done thoroughly, dry cleanup can prevent all but waste residuals from reaching your facility's wastewater system.



To most effectively conduct dry cleanup, it is important to consider the following:

- All dry wastes should be protected and kept dry to prevent water from contacting the waste, or from entering the drains directly.
- Employees should remove food waste and debris from the production areas and associated equipment with dry methods before using water.
- Solids should be collected from the floor and machines by sweeping and vacuuming into a sanitary container which is kept out of the production area when not is use.
- A stiff broom which is kept sanitized and is cleaned regularly should be used to sweep materials off the floor; scraping and then brushing may be the only effective way to recover some materials from under equipment.
- To allow reuse, clean and store dry cleanup tools and utensils separate from regular wet cleanup gear and in a manner that will not jeopardize the safety of your product.
- Water hoses should be used only as a final alternative to a cleaning task. Any materials on the floor should be removed prior to hose down or wash down.

Dry cleaning can also be used as part of regular washdowns. When emptying cooking ovens or tanks, wastewater pollutants can be reduced by:

- Emptying waste products into barrels instead of pumping down the drain
- Emptying machines by hand rather than hoses.

Skim Grease Traps Regularly — Easy

Skimming grease traps regularly reduces the amount of contaminants entering wastewater. Many facilities hire outside contractors to remove contaminants from grease traps on a periodic basis. For most effective use, however, more frequent skimming as part of regular housekeeping not only ensures that discharged wastewater has reduced contaminants, but also improves your ability to recycle and reuse process waters before discharge.

Screening — Moderate

Placing screens in all drains is an easy pollution prevention technique to collect and prevent solids from entering the wastewater stream. Screening can reduce BOD and solids levels in wastewater, reducing loads on your treatment plant. However, screening should be done only with food safety in mind. Screens need to be cleaned regularly to prevent residue buildup and must be removed from the production area to be cleaned. Cleaning must be done in a sanitary fashion.

Minimizing Pests — Easy - Moderate

When you generate waste, your operating costs increase since you must pay for items, such as hazardous waste disposal which includes waste pesticide, herbicide, and insecticide disposal. By reducing these wastestreams, you can cut the cost of operating your facility. In order to maintain compliance with waste pesticide disposal regulations, you and your staff must conduct a great number of environmental management activities. Instead, your facility can reduce the amount of pesticides, herbicides, and insecticides used at your facility "by design."

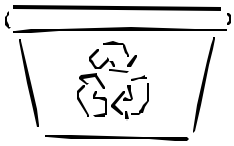
Pest prevention by design is the engineering science which will help reduce the need for chemical control of rodents, insects, birds and other vermin. This involves landscape design, building design or remodeling and equipment layout and design. For example, short grass, neatly trimmed shrubs, paved access ways and proper drainage reduce or eliminate shelter areas for pests. Rodents are further discouraged by surrounding the building foundation with an 18 to 24 inch strip of 1/8 inch pebbled rock in a trench approximately 4 inches deep. This makes an excellent area for traps and bait stations.

Other pest control P2 techniques include:

- Eliminating improperly stored equipment, litter, waste, refuse, and uncut weeds or grass within the immediate vicinity of plant buildings or structures to reduce pest harborages.
- Properly sloping, and adequately draining the grounds to avoid contamination of food products through seepage or foot-borne filth. Poor drainage provides a breeding place for insects and microorganisms.
- Positioning outside lighting and focusing it away from buildings to attract night flying insects away from doors and windows.
- Reducing potential bird harborages by screening off harborage areas.
- Eliminating food that may accumulate near malfunctioning exhaust systems.

- Considering various types of rodent, insect, and bird traps. Trapped protected birds must be released.
- Maintaining adequate housekeeping programs.

11.3.3 Techniques for Recycling/Reuse



While reducing the input materials to your food processing operations is the most effective means of pollution prevention, recycling/reusing materials in your operations can be an equally effective way of reducing your solid wastestream. Try using returnable materials containers ***(except for food contact materials***) and returnable plastic or wood pallets. Check with your suppliers for other suggestions on how you can recycle/reuse materials that end up in your trash bin. Examples of pollution prevention that involve reduction in waste cleanup that also could be considered methods of recycling are summarized below.

Countercurrent Washes — Moderate

Commonly used in food processing, countercurrent washing can replace parallel tank systems. Countercurrent systems are multistage (tank) systems in which water gets reused in preceding steps. In a three-stage countercurrent wash system, water from the third (final) stage is reused as make-up water for the second stage. Clean water is then used to replenish the final stage. Water from the second stage is reused as make-up water for the first stage. Water from the first stage, which is the dirtiest, is commonly discarded. The countercurrent washing system requires more space and equipment. The benefits of this technique are that it reduces the volume of fresh water used and reduces the volume of wastewater generated. Compared to a non-countercurrent rinse system, this method can reduce water usage by over 50%.

Process Water Reuse — Easy-moderate

Your food processing facility can reuse process water in several applications without compromising food safety. Be sure you comply with all FDA and USDA regulations regarding water reuse. Generally process water that has not been filtered or treated can be used as a first rinse in wash cycles, or for primary cleaning of floors and gutters.

Examples of potential sources of water to be reused include final rinses from tank cleaning; refrigeration defrost; cooler effluent, and sterilizer effluent. Potential opportunities for water reuse include as boiler makeup and caustic dilution.

Water Recirculation Units — Moderate

Water recirculation units can be installed to reuse food processing wash water. The benefits of this technology are that it reduces fresh water use, wastewater discharge, and energy consumption. "Off-the-shelf" units (1) reduce fresh water use because wash bath water is reclaimed and reused and (2) reduce energy use associated with heating the washwater baths. Reclaimed water is already warm so less energy is required to heat it to the required

temperature. Filters from the water recirculation units require disposal and are generally considered nonhazardous solid wastes. ***Food companies which contemplate installing water recirculation units should consult and comply with all appropriate FDA/USDA regulations concerning such a practice.***
The costs associated with installing water recirculation units vary between food processing facilities. Capital expenditures are required for:

- **T** The water recirculation unit (a minimum of $500);
- **T** Replumbing of the washwater bath system; and
- **T** Ongoing operation and maintenance.

Water Used to Chill Products — Moderate

When recycling and recirculating water used to chill products, ***it is important that the water meets FDA and/or USDA standards***. The FDA specifies that any water that contacts foods or food-contact surfaces shall be safe and of adequate sanitary quality. This standard applies to non-meat and non-poultry processing operations and allows for water to be recycled. (Water is recycled through a product cooler, which contains either a refrigerated chiller or a cooling tower to continuously cool the water between cycles.) For these operations, cooling water can be used for initial product washing; however, final washing must be conducted with potable water.

USDA is responsible for meat and poultry processing operations, and has identified three acceptable processes for prechiller water recycling:

- C Ozonation in a countercurrent flow contact column
- C Screening, ozonation, sand filtration, and ozonation
- C Screening, diatomaceous earth (DE) filtration and ozonation.

You will find that any of these processes can significantly improve water quality, reducing solids from between 28% (ozonation alone) and 65% (screen and filtration processes), and COD between 38% and 87%. In addition, these processes have reduced microbial loads by more than 99.9%.

An example of the significant savings you can achieve by recirculating chiller water is provided by the North Carolina Agricultural Extension Service.

If a food processing facility uses 120,000 gallons of water daily to chill its products, it could save 96,000 gallons daily by reconditioning 80% of its waste chiller water. At $1.90 per thousand gallons for water and sewer charges, this plant could save more than 24,000,000 gallons of water valued at more than $45,000 per year. In addition, COD and TSS loads in the effluents could also be reduced by approximately 200,000 lb/yr (assuming an initial average of 1,000 mg/L of COD and TSS, respectively, in the untreated chiller water).

If the surcharge on excess COD is $0.20/lb, the surcharge savings could be almost $40,000 per year. Thus the potential savings for water, sewer,

and surcharges could total as much as $85,000 per year. Other savings might be realized though by-product recovery and reductions in energy costs.[2]

Residuals Management — Easy - Moderate

Residues are defined as solid by-products that have some positive value or represent no cost for disposal. Food processing residues typically have nutrient/organic matter content that makes them economically recyclable. Some of the more recent technologies for reclaiming by-products for utilization include (1) recovering by-products for use in human food; (2) recovering by-products for animal feeds; (3) use as fertilizers for crop production; and (4) recovery for energy generation.

Recycling Refrigerants — Moderate

If refrigerants are recycled or reclaimed, they are not considered hazardous under federal law. As a food processing facility, recycling or reclaiming your refrigerants will reduce your hazardous waste disposal costs. If you have not done so already, it is important that you consider recycling your refrigerant or contracting a service to reclaim used refrigerant. To assist owners of commercial refrigeration, EPA has published a series of short fact sheets that outline regulations and pollution prevention techniques. For further information, call the Stratospheric Ozone Hotline at 1-800-296-1996.

Reducing/Recycling/Reusing Packaging — Easy

Many businesses across the U.S. generate extremely large amounts of nonhazardous solid waste daily. Much of the waste is from product packaging (e.g., plastic, cardboard, and aluminum). Incinerators and landfills, most often, are the final destination for most of this waste. There are, however, many avenues for diverting the solid waste from a solid waste disposal facility. Inefficiently managed solid waste can lead to excessive and unnecessary expenses for your facility. The following list provides several suggestions and resources to help you better handle your facility's solid waste.

- **Reduce Materials Used.** You can reduce or eliminate a number of input materials to reduce solid wastes generated by your facility. These materials include excess cardboard and plastic packaging.

- **Reuse Materials.** While reducing the input materials to your packaging process is the most effective means of pollution prevention, reusing materials in your operations can be an equally effective way of reducing your solid waste stream. Using returnable materials such as plastic crates or wooden pallets will reduce the amount of waste that ends up in the trash. ***Use of returnable materials for food contact should be avoided.***

[2] North Carolina Agricultural Cooperative Extension Service. "Bank or Drain: Cut Waste to Reduce Surcharges for Your Dairy Plant." North Carolina Pollution Prevention Pays Program. CD-26. March 1996 (JWM). **http:\\www.bae.ncsu.edu/baeprograms/extension/publicat/wqwm/cd26.html**

- **Recycle Scrap.** Many materials in the packaging process can be recycled, which will prevent them from ending up in the local landfill. They include paper, empty containers, cardboard, pallets, glass, and aluminum. Consult your vendors or local recycling companies for more ideas.

11.3.4 Techniques for Material Substitution and Elimination

As a food processing facility, you should research materials that are safe for the environment (without compromising the safety and quality of your product) and cost less (e.g., by weight or usage amount) that you can use in food processing operations. If it is determined that a material is not needed for a process, eliminate its usage to reduce extra costs in production. By educating all employees about the costs of waste disposal and the benefits of reduction, you can maximize cost savings by implementing pollution prevention techniques throughout your facility.

Laboratory Inventory Reduction — Easy

Keeping laboratory materials to a minimum can benefit your facility by reducing accumulation of unusable chemicals and preservatives. It can also provide incentives to minimize use where possible.

General Inventory Control — Easy

Ordering of Materials. Minimize wastes by ordering quantities of materials that match your needs. When ordering input materials, avoid overstocking by ordering according to usage demands. A good unit price is meaningless if the material goes bad on your shelf and you then have to dispose of it. Buy the largest container that allows you to use all of the contents before they go bad. This minimizes solid waste from packaging.

Inventory Control. Chemical containers labels list the shelf life for the material. You should follow these dates and keep inventories using first-in, first-out practices, which will help you reduce the amount of materials with expired shelf lives.

Using Alternative Refrigerants — Moderate

Your facility should consider using alternative refrigerants for your equipment. Many new alternative refrigerants are being marketed for use in stationary refrigeration equipment. You should ask your refrigerant supplier if an alternative is available and whether it is on EPA's Significant New Alternatives Policy (SNAP) program list. EPA's SNAP program determines what risks alternatives to refrigerants pose to human health and the environment. EPA evaluates the alternative refrigerant's ozone-depleting potential, global warming potential, flammability, and toxicity. The SNAP evaluation, however, does not determine whether the alternative will provide adequate performance or will be compatible with the components of a refrigeration system. ***Food processors should consult with their refrigeration supplier/engineer prior to considering a SNAP refrigerant to ensure that safe temperature parameters for their product will not be compromised***. To assist owners

of commercial refrigeration, EPA has published a series of short fact sheets that outline regulations and pollution prevention techniques. For further information, call the Stratospheric Ozone Hotline at 1-800-296-1996.

11.4 Voluntary Programs

Over the last several years, an important change has been taking place in EPA's national strategy for protecting the environment. Through an array of partnership programs that EPA collectively refer to as *Partners for the Environment*, EPA is demonstrating that voluntary goals and commitments achieve real environmental results in a timely and cost-effective way. In addition to traditional approaches to environmental protection, EPA is building cooperative partnerships with a variety of groups, including small and large businesses, citizen groups, state and local governments, universities and trade associations.

The results of the *Partners for the Environment* effort are impressive. Thousands of organizations are working cooperatively with EPA to set and reach environmental goals such as conserving water and energy, and reducing greenhouse gases, toxic emissions, solid wastes, indoor air pollution and pesticide risk. EPA's partners are making pollution prevention a central consideration in doing business. Partnership also means that EPA is working cooperatively with the private sector to provide stakeholders with effective tools to address environmental issues. And these partners are achieving measurable environmental results often more quickly and with lower costs than would be the case with regulatory approaches. EPA views these partnership efforts as key to the future success of environmental protection.

EPA's voluntary pollution prevention programs, such as the Environmental Leadership Program (ELP), Project XL, and WasteWi$e, are designed to promote industrial environmental excellence. Some programs offer opportunities for both trade association and individual companies to participate. As of 1996, trade associations representing the food processing industry and/or individual companies were participating in most of these voluntary programs. Several federally sponsored demonstration programs (e.g., Climate Wise, Green Lights, and NICE^3) focus on energy savings in industrial operations. Although energy use is not regulated, energy conservation and pollution prevention are interrelated. As of 1996, a small number of food processing companies were participating in these programs.

EPA has produced a reference guide that describes 38 of its voluntary pollution prevention programs, entitled "Partnerships in Prevention Pollution: A Catalogue of the Agency's Partnership Programs" (1996). This document can be accessed at **http://www.epa.gov/partners/**.

11.4.1 EPA Programs

Environmental Leadership Program

From 1994 to 1996, EPA's Office of Compliance tested a national initiative, the Environmental Leadership Program (ELP), with twelve industrial facilities (e.g. printing, waste management services, etc.) and federal installations. Note: No food processing facilities participated in the pilot phase of this initiative.

The program provided recognition and certain other benefits to facilities that demonstrated strong commitments to continued compliance and "beyond compliance" efforts. Two of the criteria for participation were that the facility had to have a good record of compliance with environmental laws, regulations and permits, and the facility had to demonstrate it had an environmental management system (EMS) that met ELP requirements. EPA is reviewing the ELP's results before further action on this program. For additional information, visit the ELP Home Page at **http://es.epa.gov/elp/.**

Project XL

Project XL was initiated in March 1995 as a part of President Clinton's *Reinventing Environmental Regulation* initiative. Project XL, which stands for "e**X**cellence and **L**eadership," is a national initiative that tests innovative ways of achieving better and more cost-effective public health and environmental protection. The information and lessons learned from Project XL will be used to assist EPA in redesigning its current regulatory and policy-setting approaches. Project XL encourages testing of cleaner, cheaper, and smarter ways to attain environmental results superior to those achieved under current regulations and policies, in conjunction with greater accountability to stakeholders.

EPA and program participants will negotiate and sign a Final Project Agreement, detailing specific objectives that the participant (regulated entity) shall satisfy. In exchange, EPA will allow the participant a certain degree of regulatory flexibility and may seek changes in underlying regulations or statutes. Participants are encouraged to seek stakeholder support from local governments, businesses, and environmental groups. EPA hopes to implement fifty pilot projects in four categories including facilities, sectors, communities, and government agencies regulated by EPA. Applications will be accepted on a rolling basis and projects will move to implementation within six months of their selection.

JACK M. BERRY INC. Jack M. Berry Inc. is a mid-sized juice-processing facility in LaBelle, Florida.

Innovative Approach: Jack M. Berry Inc. is developing a facility-wide comprehensive operating plan that consolidates environmental permits and all operating procedures into a single manual for the facility. The project builds in stakeholder participation, and will be evaluated with appropriate public notices every five years. The project may be consolidating seven Federal, State, and local environmental permits by developing and gaining approval for just one comprehensive operating permit instead of many each year. It is also improving compliance with environmental requirements by involving staff in the development of the facility-wide operating plan and by using simple language to describe more clearly what is required by law.

Benefits for the Environment: In the first year of the project, the facility eliminated several hazardous wastestreams, and an 88-acre area previously used to disperse wastewater, which relieved the community of irritating odor problems. The facility is also expected to: (1) reduce air emissions of volatile organic compounds, sulfur dioxide, and nitrogen oxides; and (2) further reduce the number and types of solvents and lubricants used onsite and replace them with a number of environmentally-friendly materials.

Benefits to the Facility: Jack M. Berry Inc. will save significant expenditures by eliminating the costly requirement of preparing multiple permit applications every few years. This results in reduced lender concern about future operational status, which, in turn, can translate into lower interest rates for long-term loans. In addition, as a result of audits during the project's first year, the company's new work procedures are expected to result in 50 percent savings in environmental control investments, improved worker safety, and substantially reduced employee training costs.

Stakeholder Involvement: Jack M. Berry Inc. has been working to ensure that those parties with a stake in the environmental concepts of its project are informed and have had an opportunity to participate in the development of the project.

As of March 1998, more than 50 proposals have been reviewed to date. Seven pilot projects, including Jack M. Berry Inc. of Labelle, Florida (see box below), have signed final project agreements and are being implemented, and twenty proposals are in the development stage. More information on the Jack M. Berry pilot project can be found at **http://yosemite.epa.gov/xl/xl_home.nsf/all/berry.html/**.

For additional information on Project XL, including application procedures and criteria, see the April 23, 1997 Federal Register Notice, call the Project XL Information Line at (703) 934-3239, or use the Project XL fax-on-demand line at (202) 260-8590. Additional information can be obtained from EPA's fact sheet entitled, "What Is Project XL? Excellence and Leadership in Environmental Protection" (EPA 231-F-97-001), March 1998, and other project-specific fact sheets, all of which are available on the Internet at **http://yosemite.epa.gov/xl/xl_home.nsf/all/homepage/** or via Project XL's fax-on-demand line.

WasteWi$e Program

The WasteWi$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste minimization, recycling collection, and the manufacturing and purchase of

recycled products. As of January 1998, the program had about 700 partners spanning more than 35 industry sectors. Partners include large corporations, as well as small and medium-sized businesses. WasteWi$e has 59 endorsers, mainly membership-based organizations, from more than 15 industry sectors. Partners agree to identify and implement actions to reduce their solid wastes and must provide EPA with their waste reduction goals along with yearly progress reports. EPA, in turn, provides technical assistance to partner companies and allows the use of the WasteWi$e logo for promotional purposes. For more information, contact the WasteWi$e Hotline at 800-EPA-WISE (372-9473) or access the WasteWi$e Home Page via the Internet at **http://www.epa.gov/epaoswer/non-hw/reduce/wstewise**.

Climate Wise

Climate Wise, a unique, government-industry partnership jointly sponsored by the U.S. Department of Energy (DOE) and EPA, helps businesses turn energy efficiency and environmental performance into a corporate asset. Climate Wise, a voluntary program, was designed to help the United States honor its international commitment to reducing greenhouse gas emissions to 1990 levels by the year 2000. Climate change prevention measures can continue to be a prime focus of international negotiations in the future.

Companies participating in Climate Wise are finding that improving energy efficiency and reducing greenhouse gas emissions save them money and boost productivity. Climate Wise Companies already expect to save more than $300 million by the year 2000. Becoming a partner is easy. To join, companies must complete a one-page partnership agreement; submit a Climate Wise Action Plan within six months that identifies specific cost-effective energy efficiency and pollution prevention measures; and report results annually while striving for continuous improvement. In return, participants in the Climate Wise program receive DOE and EPA help in identifying actions that both save energy and reduce costs. For example, Climate Wise partners receive an innovative action plan development software program that provides more than 50 case studies, a list of proven energy efficiency technologies, and tools to quantify the results of their actions. Also, Climate Wise companies can receive access to free pollution prevention and energy efficiency assessments. In addition, companies receive public recognition for their efforts.

Over 300 current partners have taken advantage of the program's many service offerings, including financial information sources, supporting documents, and peer exchange opportunities. For more information, call 202-260-4407 or access the ClimateWi$e Home Page via the Internet at **http://www.epa.gov/climatewise/**.

Green Lights Program

Green Lights is an innovative, voluntary pollution prevention program sponsored by EPA. The primary purpose of the Green Lights Program is to encourage U.S. organizations to install energy-efficient lighting, in order to prevent the creation of air pollution (including greenhouse gases, acid rain emissions, air toxics, and tropospheric ozone), solid waste, and other environmental impacts of electricity generation. As of April 1998, the program had over 2,500 members which included major corporations; small and medium sized businesses; federal,

state and local governments; non-profit groups; schools; universities; and health care facilities.

By joining Green Lights, partners agree to install energy efficient lighting where profitable as long as lighting quality is maintained or improved. EPA agrees that your commitment to survey buildings and complete lighting upgrades is contingent upon the availability of appropriated funds or third-party financing resources. EPA provides technical assistance to the participants through a decision support software package, workshops and manuals, and a financing registry. EPA's Office of Air and Radiation is responsible for operating the Green Lights Program. For additional information, contact Green Light/Energy Star Hotline at 202-775-6650 or call toll-free at (888) STAR-YES (782-7937)]. Information can also be accessed using the fax-back system at 202-564-9659 or by accessing the Green Lights Home Page via the Internet at **http://www.epa.gov/greenlights.html/**.

NICE^3

The U.S. Department of Energy (DOE) and EPA's Office of Pollution Prevention are jointly administering a grant program called The National Industrial Competitiveness through Energy, Environment, and Economics (NICE^3). By providing grants of up to 50 percent of the total project cost, the program encourages industry to reduce industrial waste at its source and become more energy-efficient and cost-competitive through waste minimization efforts. Grants are used by industry to design, test, demonstrate, and assess the feasibility of new processes and/or equipment with the potential to reduce pollution and increase energy efficiency. The program is open to all industries; however, priority is given to proposals from participants in the pulp and paper, chemicals, primary metals, and petroleum and coal products sectors. For more information, contact DOE's Golden Field Office at 303-275-4729 or access **http://www.oit.doe.gov/Access/nice3/basicbody.html/**.

11.4.2 Trade Association/Industry Programs

Trade associations and other industry-related groups are developing programs that promote pollution prevention opportunities. The following are examples of these programs developed for the food processing industry.

Food Manufacturing Coalition for Innovation and Technology Transfer

Initiated on January 23, 1996, the Food Manufacturing Coalition (FMC) is an ongoing, industry-driven technology transfer program. The objectives of the FMC are to (1) improve the food manufacturing industry's productivity and environmental quality through technological innovation and commercialization, and (2) address and solve high priority, industry-wide environmental problems. The program is open to companies of all sizes.

Members of the FMC discussed and selected specific high priority areas initially identified through surveys conducted by 8 national trade associations partnering in the project. A total of 20 potential projects directed toward maximizing air and water quality, minimizing sold waste and toward increased control and processing efficiencies were designated for further analysis and effort. These topic areas were further refined into detailed needs statements that are being broadly disseminated to the research and development community asking for technical ideas and interest in joint efforts. The needs and suggested technological approaches will result in State-of-the Art reports that document alternative technologies available for follow-up in the form of co-development, licensing, Small Business Innovation Research Grants, or other strategies leading to potential commercialization.

For more information on the FMC program, contact R.J. Phillips & Associates, Inc. at (703) 406-0072 or send e-mail to rphil1140@aol.com. Additional information can also be obtained by accessing the FMC webpage at **http://ceres.esusda.gov/fmc/**.

Communicating CAA Section 112 (r) Risk Management Program Requirements

The Food Industry Environmental Council (FIEC) a coalition of more than 50 food processors and trade associations, has developed materials to assist food processors in communicating with the public about risk management programs covered under the CAA Section 112(r). These communication materials include the following:

- "Backgrounders" on ammonia, chlorine and propane;
- A computer disk with the shell of a tri-fold brochure and filler language;
- Communication guidelines;
- A question and answer document; and
- A resource and reference document.

The communication packages are available from your food trade association.