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OIL SPILL PREVENTION MEASURES:

TACKLING THE TOUGH SPCC ISSUES

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Preface

Some of the specifics of this paper are likely to change because of pending lawsuits against the United States Environmental Protection Agency (EPA) that challenge several issues of the July 2002 Spill Prevention, Control, and Countermeasure (SPCC) rule discussed herein, among others.

This paper is concerned with the regulations that pertain to non-transportation-related onshore facilities. Specifically excluded from this paper is a discussion of off-shore facilities, oil production facilities, onshore drilling and workover facilities, and substantial harm facilities (those requiring facility response plans).

Abstract

Amended Spill Prevention, Control, and Countermeasure (SPCC) regulations, effective August 16, 2002, brought about a flurry of activity from the regulated community to meet the (then) impending deadline of February 17, 2003, to update their existing plan(s) and August 18, 2003, for plan implementation. Because of a change in the regulatory language from "should" to "must," there was a rush to meet the imposed deadlines. In an effort to provide relief to the regulated community and avoid being overwhelmed with extension requests, the United States Environmental Protection Agency (EPA) extended the deadlines 18 months. This paper offers a discussion of some of the more challenging rule requirements (e.g., appropriate containment, loading/unloading rack containment, and container integrity testing), and various solutions to satisfy some of these requirements.

At the time of this writing, two industry associations and an individual company have pending lawsuits against the EPA. Therefore, the outcome of these lawsuits may change some of the regulations referenced in this paper.

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1. Background and History

In 1974, the United States Environmental Protection Agency (EPA) published the Oil Pollution Prevention rule requiring preparation and implementation of spill prevention, control, and countermeasure (SPCC) plans. The original SPCC rule stated that owners or operators of applicable facilities “shall” prepare SPCC plans and the plans “shall” follow a specified sequence. Other than that, the original rule stated that the owners or operators “should” implement oil spill prevention measures, such as secondary containment, engineering controls, loading/unloading rack containment, etc. Some of the regulated community interpreted the original rule’s use of the word “should” as an indication that compliance with the applicable provisions of the rule was optional. The EPA, on the other hand, intended “should” to mean mandatory.

After three draft revisions (1991, 1993, and 1997), final amendments to the SPCC rule were published July 17, 2002.

Throughout the 2002 SPCC rule the language changed from “should” to “must,” thus ending confusion over requirements. This generated a flurry of activity to prepare initial plans for facilities that previously did not have one, and to update existing plans to incorporate the 2002 SPCC rule requirements and/or implement elements that were previously thought to be optional. Even facilities with existing plans that exceeded the implementation requirements of the 2002 SPCC rule were required to have their plans updated. The reason for this is that the 2002 SPCC rule now requires the certifying engineer to certify that industry standards were considered in preparation of the plan.

The revised rule generated such a reaction that the EPA realized an extension of the effective date was warranted for several reasons:

- The EPA was concerned that they would be overwhelmed with individual extension requests (April 17, 2003, Federal Register p. 18890).
- Additional time was necessary to allow the remaining regulated community to undertake the various activities required to update (or prepare) their plans (April 17, 2003, Federal Register p. 18891).
- There were concerns about a possible shortage of professional engineers in some areas (April 17, 2003, Federal Register p. 18892).
- Questions existed about arguably ambiguous requirements.

Another factor of the deadline extension is likely a result of lawsuits filed against the EPA by two industry associations and an individual company to prevent some of the provisions of the 2002 SPCC rule from taking effect.

On April 17, 2003, the EPA extended the revised rule’s effective date to August 17, 2004, for existing facilities to prepare a plan and until February 18, 2005, to implement the plan.

2. Tough SPCC Issues

Given the events that have transpired to date, the regulated community is now focusing on SPCC compliance issues, including appropriate containment, loading/unloading rack containment, and container integrity testing.

2a. Appropriate Containment

40 CFR Part 112.7(c) requires regulated facilities to "*provide appropriate containment and/or diversionary structures or equipment to prevent a discharge*." The containment system must be capable of capturing oil that may discharge from a primary storage system (i.e., tank or pipe) such that the oil will not escape to the environment before cleanup occurs. Compliance requires the use of dikes, berms, retaining walls, curbing, spill diversion or retention ponds, sorbent materials, or other equivalent measure. Under different sections of the rule, a quick drainage system is required for tank car or tank truck loading/unloading racks (§112.7(h) (1)), and secondary containment is required for all bulk storage containers (§§112.8(c) (2) and 112.8 (c) (11)).

The challenge for the regulated community is determining what appropriate containment is for certain containers. Bulk storage containers (i.e., any container used to store oil, except for oil-filled operational equipment such as electrical, operating, or manufacturing equipment) must be constructed with a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. Secondary containment of bulk storage containers is typically accomplished by concrete or steel dikes, earth berms, double-wall tanks, or remote impoundments. The remainder of this section however, pertains to operational equipment containment.

This provision presents a significant challenge for facilities that use operational equipment, including electrical substations, facilities containing electrical transformers, and certain hydraulic or manufacturing equipment. The EPA has made a distinction between operational equipment and bulk storage because the primary purpose of operational equipment is not the storage of oil in bulk. The EPA has therefore made it the responsibility of the certifying engineer to determine if the containment measure is consistent with the rule. As opposed to bulk storage containers, operational equipment containment does not have to capture all of the stored product plus precipitation. Rather, appropriate containment for operational equipment must prevent a discharge as described in §112.1(b).

One example of a facility challenged by this requirement is a college in Upstate New York that has an off-campus student housing complex. This complex does not have any bulk storage containers, but it does have approximately 30 oil-filled electrical transformers whose aggregate capacity exceeds the 1,320-gallon threshold. Most all of these transformers are pad-mounted, are located outdoors, and currently have no containment measures. The college must consider installing containment measures.

Examples of common appropriate containment measures for operational equipment include the following methods:

- Absorbent material—In the case of indoor hydraulic reservoirs (e.g., elevators, vehicle hoists, dock levelers, machinery, etc.), appropriate containment may be achieved by placing absorbent materials around equipment to prevent spilled oil from reaching a floor drain or other drainage inlet (see Figure 1). Absorbent materials are readily available in a variety of shapes and sizes and typically cost under $100 (DAWG, Inc.).

Figure 1. Absorbent material (photograph courtesy of DAWG, Inc.)

- Concrete curbing—In the case of outdoor electrical equipment, appropriate containment may be achieved by constructing concrete curbing around the equipment to prevent the lateral migration of oil from reaching a drainage inlet before cleanup occurs (see Figure 2). Curbing constructed around common outdoor-pad-mounted transformers is typically less than $1,000 (C&S Engineers, Inc.). Such curbing would not be constructed to contain 100 percent of a spill that, by also containing storm water, might create an electrical safety hazard.

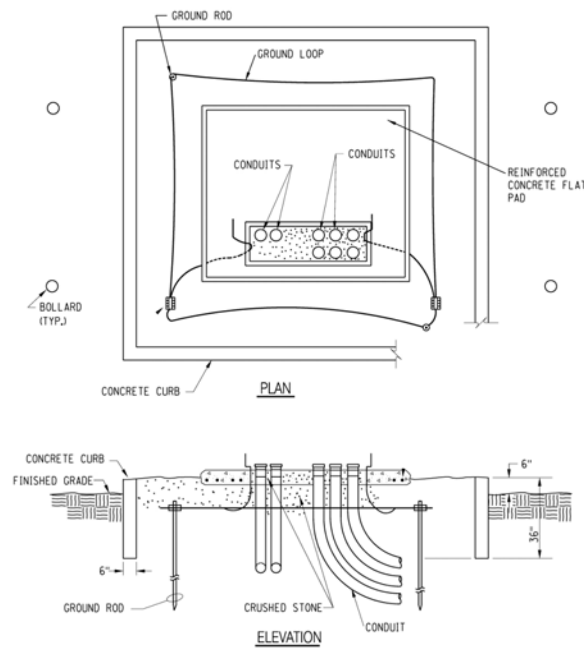

Figure 2. Concrete curbing (Drawing courtesy of C&S Engineers, Inc.)

- Drainage inlet cover—These are placed over drainage inlet structures to prevent spilled oil from entering the drainage system and discharging to the environment (see Figure 3). This option requires keeping the drainage inlet covered all of the time, except when properly supervised and inspected consistent with the rule. Drainage inlet covers are most effective when the surrounding surface is conducive to a tight seal and the area is free of debris (e.g., grit, snow, ice, sand, etc.). Drainage inlet covers typically cost less than $100 (New Pig Corporation).

Figure 3. Drainage inlet cover (Photo courtesy of New Pig Corporation)

- Drain plugs—These are similar to drainage inlet covers except that they typically have a better seal because they fit inside of a drainage pipe, typically a floor drain, rather than on top of the inlet. They are usually expandable or inflatable to plug most any diameter piping. On average, drain plugs cost less than $100 (New Pig Corporation).

In all cases, a pathway analysis should be conducted to evaluate the potential for oil to reach a watercourse. Factors to consider in the pathway analysis include container oil-holding capacity, distance and slope to the target water body, groundcover, soil types, and rainfall.

The New York college that needs to contain approximately 30 transformers has the following options:

- Because the transformers are located outdoors, concrete curbing can be installed for an approximate cost of $1,000 each.
- Perform a pathway analysis of each transformer to calculate the probability of a discharge as described in §112.1(b). A common tool for this is the Electric Power Research Institute's (EPRI) Mineral Oil Spill Evaluation System—Multiphase (MOSES-MP) software program. Some level of containment is required if the model demonstrates a finite probability that a spill could discharge as described in §112.1(b). This model is licensed for $10,000 (EPRI Technical Contact).
- If it is determined that installation of appropriate containment is not practicable (costs and economic impacts may not be considered in determining practicability), the facility may provide a contingency plan and take other measures required under §112.7(d).

2b. Loading/Unloading Rack Containment

Regarding loading/unloading rack containment, 40 CFR Part 112.7(h)(1) states, "*where loading/unloading area drainage does not flow into a catchment basin or treatment facility designed to handle discharges, use a quick drainage system for tank car or tank truck loading and unloading areas. You must design any containment system to hold at least the maximum capacity of any single compartment of a tank car or tank truck loaded or unloaded at the facility*." The requirement for loading/unloading rack containment applies to all bulk storage facilities, whether they have aboveground or completely buried containers (July 17, 2002, Federal Register p. 47110). This requirement does not apply to operational equipment.

This provision requires loading/unloading rack containment, regardless of cost or economic impact. One problem is the EPA has not defined what a "rack" is. Without guidance, a conservative interpretation must be made, which would mean containment of the car or truck is required for all bulk storage tank loading/unloading areas, regardless of whether the transfer is made via conventional rack-style loading arm, or simply dispensing into a tank-top spill container/catch basin. This also means that loading/unloading rack containment is required regardless of the capacity of the tank, tank throughput, or frequency of transfers.

For example, loading/unloading rack containment is required whether a facility has a 200,000-gallon jet fuel storage tank loaded and/or unloaded every day, or a 275-gallon emergency generator diesel-fuel storage tank that is filled once a year. Even a 100-gallon used-oil container that is pumped out for recycling once a year is required to have containment if it is pumped out via tank car or tank truck. This has proven to be a difficult provision to meet because construction of a permanently installed loading/unloading area containment system may cost over $50,000 (C&S Engineers).

Generally, there are two types of permanent transfer area containment systems. One is the flat pad design; the other is a depressed basin design. These systems may discharge either into a holding tank or to the storm sewer system.

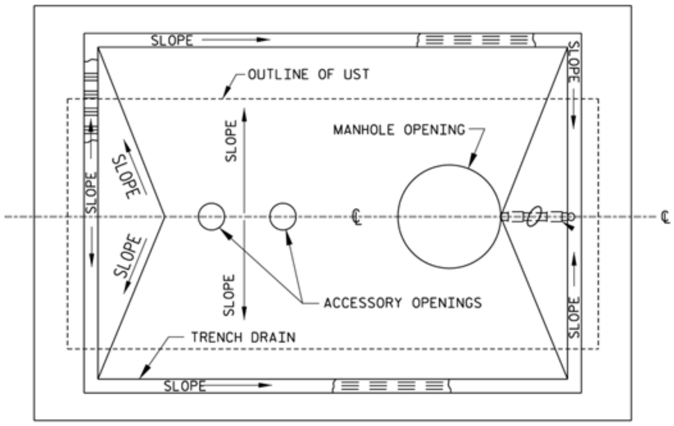

Figure 4. Plan view of flat pad with underground holding tank for truck containment. (Drawing courtesy of C&S Engineers, Inc.)

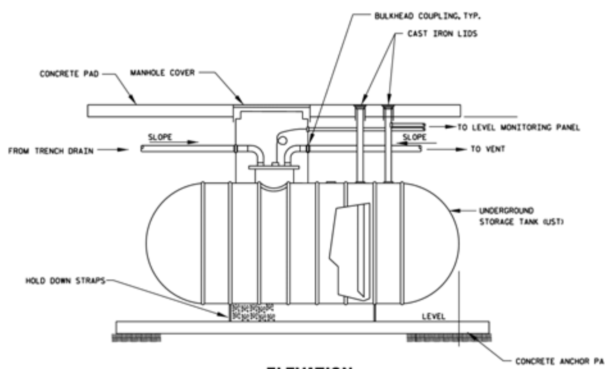

Figure 5. Elevation view of flat pad with underground holding tank for truck containment. (Drawing courtesy of C&S Engineers, Inc.)

Figure 6. Flat pad containment system (Photograph by C&S Engineers, Inc., courtesy of New York State Department of Correctional Services.)

A flat pad containment system consists of a flat, reinforced-concrete pad designed to capture a spill from the area of the tank truck most likely to have a spill (i.e., the pump and transfer hose connections area). Typically, an approximately 10-foot-by-20-foot area, with associated underground holding tank, is sufficient to capture spills and allows for error if the truck is not parked exactly on center of the pad (see Figures 4 – 6). This system can be constructed with perimeter trench drains or with a center drainage inlet and a slightly sloped pad in toward the center.

Another effective containment system is the depressed basin design. As shown on Figures 7 - 8, this type of system consists of a reinforced-concrete depression with perimeter

Figure 7. Depressed basin containment system. (Photograph courtesy of Syracuse Executive Air Service, Inc.)

Figure 8. Depressed basin containment system. (Photograph by C&S Engineers, Inc., courtesy of Syracuse Executive Air Service, Inc.)

curbing and a drainage inlet structure of either trench drains or a catch basin. A depressed basin is typically designed to accommodate the entire tank truck, which may be as long as 60 feet. Actual containment capacity is provided via the volume of the basin, or an associated underground holding tank.

An advantage of the flat pad design over the depressed basin design is, since it is constructed relatively flat, it avoids undue stress on vehicles, and it facilitates snow clearing activities. Another advantage is that it is typically constructed in a smaller area, saving space and construction costs.

As noted above, drainage from these systems may discharge either into an underground holding tank, or to the storm sewer system. A holding tank can be large or small diameter, steel, concrete, or fiberglass-reinforced plastic material, and single-wall construction. A valve can be used to divert drainage directly to the storm sewer system when the transfer facility is not in use (see Figure 9).

A disadvantage of the underground holding tank system is that it requires periodic pumping out of the tank contents, typically storm water, and proper disposal. One way to minimize collection and disposal of storm water is the installation of an overhead canopy, but a simple one can cost as much as $30,000 (C&S Engineers).

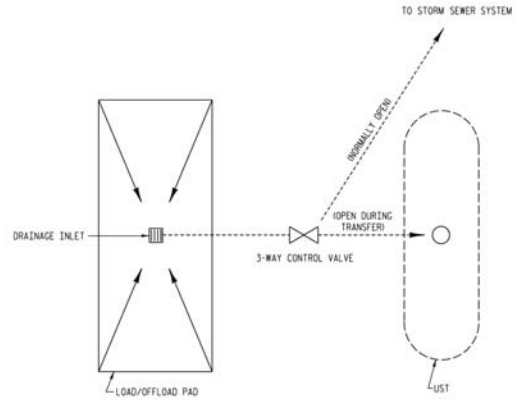

Figure 9. Storm water diversion schematic. (Drawing courtesy of C&S Engineers, Inc.)

Although a system that discharges to the storm sewer is typically less expensive to construct than one that discharges into an underground holding tank, it usually requires a National Pollution Discharge Elimination System (NPDES) or state equivalent permit. These permits typically have initial and annual fees, reporting requirements, and periodic monitoring and/or sampling. More importantly, failure to operate the drain valve properly may result in inadvertent discharges to the environment.

The flat pad design that discharges into an underground holding tank is becoming the design of choice. In some situations, using a single transfer station to fill (or empty) a number of storage tanks may provide a cost-effective solution.

It should be noted that regulations do not require the containment system to be permanently installed. An example of a temporary transfer station containment system may include placement of a portable containment structure that is manually deployed beneath a tank car or tank truck to catch spills (Figure 10). These systems are available for less than $10,000 (Environmental Safety Products, Inc.), but they are also more likely to fail because of human error and their temporary nature.

Figure 10. Portable transfer area containment system. Photograph courtesy of Environmental Systems International LLC

If it is determined that installation of loading/unloading rack containment is not practicable (costs and economic impacts may not be considered in determining practicability), the facility may provide a contingency plan and take other measures required under §112.7(d).

One Upstate New York business has six 275-gallon aboveground storage tanks located throughout the facility for the purpose of storing diesel fuel for emergency generators. Even though these tanks may only be topped-off once a year, the SPCC rule requires containment of the tank truck at each location. Since a contingency plan is not an option because the facility has ample space, tank truck secondary containment may be installed for a budget cost of approximately $300,000, or perhaps less if implementation of temporary/portable systems meet the requirements of the rule.

2c. Container Integrity Testing

Section 112.8(c) (6) states, "*Test each aboveground container for integrity on a regular schedule, and whenever you make material repairs. The frequency of and type of testing must take into account container size and design*." This applies to all aboveground containers, large and small, on or off the ground, and any type of oil. The preamble to the 2002 SPCC rule states, "*because electrical, operating, and manufacturing equipment are not bulk storage containers, the requirement is inapplicable to those devices or equipment. 56 FR 54623*."

Tank testing requires a combination of visual inspection and another testing technique, such as hydrostatic testing, radiographic testing, ultrasonic testing, acoustic emissions testing, or another system of non-destructive shell testing. Facilities typically have to take the tank out of service for a period of time for cleaning and inspection, and often have to provide a temporary product storage system.

For facilities with aboveground containers, implementing a tank testing program can be time consuming and costly, particularly when direct costs (e.g., tank cleaning and inspection, waste transportation and disposal, etc.) and indirect costs (e.g., planning and administration, lost revenue from disposal of product below the draw-off point, storage and handling of temporary storage, etc.) are factored into the cost analysis.

Depending on tank diameter, product stored, and depth of sludge buildup, tank cleaning and testing can cost anywhere from a few thousand dollars to millions of dollars for a single tank (InTANK Services, Inc.).

InTANK Services, Inc. offers a service to clean and/or test tanks while they remain in service by utilizing robotic technology. This method has shown to reduce costs, and mitigate safety issues and environmental impacts. This is accomplished by lowering into the tank a custom-designed track mechanism that has the ability to vacuum sludge, and perform ultrasonic testing of the tank bottom by utilizing immersion ultrasonic transducers (InTANK Services, Inc.).

Some tanks are exempt from integrity testing. The preamble to the 2002 SPCC rule states, "*For certain smaller shop-built containers in which corrosion poses minimal risk of failure; which are inspected at least monthly; and, for which all sides are visible (i.e., the container has no contact with the ground), visual inspection alone might suffice, subject to good engineering practice (July 17, 2002, Federal Register p. 47120)*." This would eliminate most tanks on saddles, legs, and skids.

Tanks subject to integrity testing must be tested on a regular schedule, meaning testing per industry standards or at a frequency sufficient to prevent discharges. For example, for tanks not constructed consistent with current state standards, New York requires an initial integrity test when a tank is ten years old and again no later than ten years from the date of the previous test.

Other industry standards commonly applied include the American Petroleum Institute's (API) API 653, "Tank Inspection, Repair, Alteration, and Reconstruction;" API Recommended Practice 575, "Inspection of Atmospheric and Low-Pressure Tanks;" and the Steel Tank Institute Standard SP001-00, "Standard for Inspection of In-Service Shop Fabricated Aboveground Tanks for Storage of Combustible and Flammable Liquids."

These standards are helpful because some provide specific criteria for internal inspection frequencies based on calculated corrosion rate, rather than an arbitrary time period. Some also establish a minimum and maximum interval between internal inspections. Another benefit from the use of industry standards is they specify when and where specific tests may and may not be used. For example, API Standard 653 is very specific as to when radiographic tests may be used and when a full hydrostatic test is required after shell repairs (July 17, 2002, Federal Register p. 47119).

3. Recap

The EPA has made it clear that facilities regulated by the 2002 SPCC rule are not only required to prepare a SPCC plan, but implement the plan as well. If there is no change to the 2002 SPCC rule as a result of the pending lawsuits, regulated facilities have much work to do in order to comply with appropriate containment, loading/unloading rack containment, and/or container integrity testing requirements. As discussed herein, there are several alternatives available to regulated facilities to meet these requirements. By working with an experienced professional engineer, and considering the advantages and disadvantages of these alternatives, solutions can be tailored to fit your facility and be consistent with the rule.