

Good Design Practices for Tanker Truck Unloading

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Introduction

Spills are a common occurrence in tanker truck unloading. Spills, both small and large, are so common that Environment Canada reported that there are an estimated 20,000 spills per year, although the majority of them are minor and have a marginal impact on the environment. The design of spill mitigation measures, therefore, needs to be considered early in the design process.

Water and wastewater treatment plants typically receive chemicals—such as sodium hypochlorite, alum, hydrofluosilicic acid, or diesel fuel—delivered by tanker trucks. If the liquid level in the tank is higher than the unloading point, then the truck driver will be required to pump the liquid, followed by blowing low pressure air to empty the truck hose and the fill pipe to the tank. If the driver fails to empty the hose correctly prior to disconnecting it, any liquid in the pipe will come flooding out and spill to the ground.

Even if the proper procedures are followed, other smaller spills may still occur when the hose is disconnected. It is common to find evidence of past spills when examining any tanker truck loading area. In addition, catastrophic spills may occur due to failure of equipment like a hose, coupling, or pump.

Design Practices

A good design of a tanker truck unloading station will include various elements to help mitigate spills. Elements that should be considered include:

Tanker Truck Positioning & Site Drainage

During the initial site plan and building floor plan layout, the position of the tanker truck during the unloading process needs to be identified. This is important since it allows the site drainage to be reviewed relevant to potential spill pathways.

If possible, manholes and either storm or sanitary sewers should not be located in the potential path of a spill. If not possible, it is important to install appropriate devices in manholes to minimize the ingress of a spill, such as a watertight, bolted-down, and gasketed manhole cover, as detailed in Ontario Provincial Standard Drawing (OPSD) 401.03.

For diesel fuel, the trunk unloading surface should be constructed of concrete, which is inert, since asphalt will quickly dissolve and allow a spill to enter the surface below.

Remote Tank Level Readouts

A tank level readout is a gauge that shows the level of liquid in the facility's storage tank. These readouts should be located within sight of the truck driver so that the driver never has to leave the truck unloading area to check on the tank level. This is critical to reduce the likelihood of a catastrophic spill.



Spill Alarm Buttons

Another good spill mitigation device is to have a “Spill Alarm” button located close to the unloading area, and possibly included as part of the local tank level readout panel. This spill alarm can be activated by the tanker truck driver to notify relevant facility personnel or the local SCADA system that a spill has occurred and help is urgently required.

Oil-Grit Separators

Near diesel systems, an oil-grit separator device may be used to help mitigate spills. Oil-grit separators work well to capture hydrocarbons, such as gasoline or diesel fuel, that have a specific gravity of 0.85. However, they do not work well for substances with heavier specific gravities, such as sodium hypochlorite, which has a specific gravity of 1.2.

An oil-grit separator may look like a regular catchbasin from above, but they are designed settle the sand and grit while allowing the lighter weight contaminant, such as oil, to float and accumulate on the top. Yearly maintenance is recommended to remove the floatables and sand from the system, and to ensure that such devices work as expected in the case of a spill.

Oil grit separators are commonly located just before the stormwater line leaves the property, and are designed according to the expected rainfall events and the desired oil retention. They have an added benefit of cleaning the site runoff from parking lots and driveways, which is why some municipalities have mandated their use before site plan approval can be obtained.

Specially-Designed Catch Basins

Specially-designed catch basins for truck unloading areas have drain pipes that contain motorized valves that close when a tanker truck is present. The volume of the catchment area and catch basin is sized to accommodate a large spill, and can be sized to capture the whole truck.

When a tanker truck begins its unloading process, the valve in the chamber closes, thereby preventing a spill from entering the drainage system. This process could be done automatically or manually, although automation is generally better since it removes the human error potential from the equation. When the truck has completed its unloading, the valve is either allowed to reopen or remain closed if a spill occurred during the unloading process.

Containment Boxes

Since the majority of spills occur in small volumes, one of the most effective devices is one that captures the spill at the source. As mentioned earlier, spills typically occur when the hose of the tanker truck is disconnected from the storage tank or from the fill coupling. To mitigate this risk, it is recommended to install the coupling for the hose in a wall-mounted containment box with a shutoff valve.

This box needs to be protected from vandalism and should be locked. It also should be made from a material suitable for the chemicals in question. For example, a stainless steel box would be appropriate for diesel fuel, while a fibre-glass reinforced plastic box would work best for sodium hypochlorite.

The bottom of the box should be leak-tight, and drained to the inside of the building (preferably to the containment area of the in-house bulk tank). Having a properly designed containment box will ensure that spills associated with truck connection and disconnections will be fully contained within the containment box and safely drained inside the building.



Building Vestibules

For large facilities, a vestibule within the building can accommodate the fill point. In this vestibule, the truck operator connects his hose to the system located within the building. This vestibule would be self-contained, and capture all spills related to the connection and disconnection from the storage tank piping.

Spill Kits

Other commonly used spill containment devices include spill kits, which contain key spill control devices such as absorbent socks, pads, mats, and sacks of absorbent material. However, for these spill kits to be effective, it is important that they contain sufficient quantities of materials and that employees receive proper training in the safe use of the spill containment devices.

Conclusion

In conclusion, negative environmental impacts of truck unloading-related spills can be minimized through the proper design of the tanker truck unloading site, as well as proper spill containment procedures, equipment, and training of relevant staff.