Static electricity dangerous when transferring flammables

By Brian A

Static electricity is known to most of us as the annoying phenomenon that we experience when we shuffle our feet along the carpet and then touch a door knob. The momentary spark is alarming, but it doesn't cause any real damage to us. For those people that work in jobs that require handling bulk flammable liquids or gases and transferring them to storage tanks, the dangers of static electricity are quite different.

A static spark can ignite flammable vapours, causing fires, explosions and loss of life and equipment. Yet, many people are not practicing proper safe static bonding and grounding techniques to avoid these issues. They are putting themselves in harm's way on a daily basis.

Static electricity is the culprit in many industrial fires and explosions every year, and it is much more pervasive than most people think. According to the National Fire Prevention Association, in the U.S. alone, at least 280 industrial accidents are caused annually by static electricity. And only those accidents that were reported to fire and emergency personnel (i.e., the big fires and explosions) are accounted for in this statistic.

These accidents can occur in almost any industry that deals with flammables. However, industries such as chemical processing or oil and gas are often the most at risk, as they deal with large amounts of flammable liquids that are transferred into and out of storage tanks.

Extensive studies by the Chemical Safety and Hazard Investigation Board and the National Transportation Safety Board helped to raise awareness of the risks within a storage tank from static electricity. Less well known (or at least less well practiced) are safety issues relating to static electricity in a truck or rail car that is transporting flammables to and from the storage tank.

The risk of igniting flammable material with static electricity is so high, that the National Fire Code of Canada mandates that anyone who handles flammables must drain the static electricity away safely. However, the Code does not provide guidelines on *how* to properly and safely drain static electricity from bulk trucks or rail cars. This leads many people to try different approaches, which may be flawed or dangerous.

Cutline here

A recent study of 310 accidents in the chemical industry showed that 70% of the static electricity incidents were caused by improper grounding. Operators, maintenance personnel, and plant electricians are simply not trained in the proper way to ground static electricity and/or maintain static grounding systems.

Common static grounding mistakes

The most common mistake made, when designing a static grounding system for bulk trucks or rail cars to interface with storage tanks, is to use clamps that are not designed for static discharge. For example, battery clips are used extensively. The problem with these is that they have sharp points, but weak springs that will not withstand regular use. Quite quickly, the spring will cease to provide a strong grip, which will mean that there is no good metal-to-metal contact on the truck or rail car. The ground point and the clip may even be prone to falling off, during bulk transfer operations.

Another incorrect choice is to use welding clamps. While these have stronger springs than battery clips, they are built with flat ends that cannot ensure good metal-to-metal contact. Without strong sharp points on the end, the clamp may not be able to penetrate paint, rust, or dirt, that has accumulated on the truck or rail car.

The second most common mistake is lack of verification for the static grounding system. Most operators do not know if their static grounding clamps and wires will actually drain static electricity. Typically, the static grounding clamp that is connected to the truck or rail car is attached to a plated steel or copper cable that then terminates at a known ground point (e.g., ground rod). The idea is that the static electricity will flow through the clamp and cable to ground. However, wear and tear, weather, corrosion and other factors can quickly degrade the connection between the clamp and the known ground point, especially outdoors.

Many facilities do not have proper maintenance procedures in effect to verify this connection. This is typically done with an ohm-meter, measuring the resistance from the known ground point to the tip of the clamp.

More often, even if there is a maintenance program in place, the verification is done intermittently. This can result in a problem with a static grounding sys-

tem that goes undetected for months. Recently, a facility verified an outdoor static grounding assembly for their bulk truck to storage tank transfers. It was connected to a known ground point using very thick insulated copper cable. It was always assumed that the cable could not fail,.as it was mechanically very robust.

Visual inspections confirmed that the system was in place and should operate. However, the ohm-meter showed that there was no electrical continuity between the clamp and the known ground point. Hence, the static grounding system was completely ineffective. Upon removing the insulated jacket, it was discovered that the cable had been severed. If the assembly were being monitored by a static monitoring system, workers would have been aware of the danger.

Ideal static grounding system

An ideal static bonding and grounding system uses properly designed and regularly maintained static grounding clamps, robust cabling, and a real-time monitoring system. This real-time monitoring system would warn users immediately if there was improper connection to the known ground point.

A properly designed static grounding clamp has a very strong spring to provide pressure on the points so that they are pushing against the metal surface. The points themselves are typically made out of stainless steel and sharpened to cut through paint, rust and dirt. These clamps will last a long time, but must be regularly checked to ensure the spring is still strong and that the points are still sharp.

Clamps should be connected to the known ground point, using robust cables appropriate for the environment in which they are being used. Aviation grounding, for example, will often use plated steel cable, that is coated in a special plastic to resist UV and chemical degradation. This will also be coloured yellow, to provide a trip warning to operators.

At bulk unloading sites, a retractable grounding reel is often used to provide up to 125 ft of cable that can ground any size truck, regardless of its orientation or position. Drum filling operations will often use coated, coiled, plated steel cable, that coils back up when not in use, keeping it out of the way. Copper cable can be used as well, but should be properly insulated to avoid damage to the conductors inside.

Lastly, the static grounding operation will ideally have a monitoring system in place that will warn operators if there is no safe connection. These systems work by sending an intrinsically safe signal through the entire length of the static grounding assembly. It then confirms that the clamp is connected properly to the truck or rail car, and that the cable will carry electricity all the way to the known ground point.

Static monitoring systems

Traditionally, static monitoring systems have been large, expensive, permanently fixed point solutions, that are used at bulk loading and unloading bays. However, new technology solutions are small, inexpensive, portable battery-operated units that can be used anywhere. These are small enough to be stored in a truck cab and be available whenever the need arises, at any location. This is particularly helpful for independent transport companies which travel to storage tank farms that have static monitoring infrastructure of varying quality in place, or none.

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