NTTC’s Safety & Security Council Annual Meeting

Tank Trailers & Static Electricity: The Shocking Truth
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Static Electricity

Grounding & Bonding

Regulations, Standards and Recommended Practice.

Mobile and Fixed Truck Applications
What is static electricity?
Whenever two dissimilar materials come in contact with each other, touch or rub and separate it is likely that one will leave with more electrons than it started with...the other will leave with less. ....and eventually discharge in the absence of a low resistance path to earth.
Static Hazard = Situation where the rate of charge accumulation exceeds the rate of charge dissipation
For any person responsible for the safety of employees, one of the most potentially confusing aspects of providing a safe operating environment is trying to determine if that site’s manufacturing or handling processes have the potential to discharge static sparks into flammable or combustible atmospheres.

Static Hazard = Situation where the rate of charge accumulation exceeds the rate of charge dissipation
Could there be a flammable Atmosphere?
Accessing Electrostatics

- Could there be a flammable atmosphere?  YES / NO
- Can charge be generated?  YES / NO
- Can charge accumulate?  YES / NO
- Could there be a spark risk?  YES / NO
- Could the spark have enough energy to ignite a flammable atmosphere?  YES / NO
Truck of Propanol @ 0.65mj
Potential Charge of 1000mj
Problem with Static Electricity:

“*It won’t happen to me*”

Can’t Smell it

Can’t Touch it

Can’t See it
Discharges of static electricity
Mass of Earth
Grounding

An object can be prevented from accumulating electrostatic charge, and a voltage, if the object has a direct connection to the general mass of the earth.
Grounding (Earthing)

- Grounding is connecting one or more conductive objects directly to the earth:
  - Grounding buss to Ground rods (preferred)
  - Building steel to a verified earth ground (acceptable)
Bonding

Effect of bonding conductors together is that they both share charge.

Because they are at the same voltage sparking between the bonded objects cannot occur.

It does not mean that the bonded objects will not acquire a voltage and discharge a spark to uncharged objects or grounded objects.
Bonding

• Bonding is connecting two or more conductive objects with a conductor, such as a copper wire, that equalizes the potential charge between them.

**Bonding does NOT eliminate static charge**
Grounding (Earthing) vs. Bonding

- Grounding dissipates to ground
- Bonding dissipates to another object
- Bonding alone does NOT eliminate charge
- Bonding to a grounded object WILL eliminate charge IF the object is also conductive or semi-conductive
Optimum Solution:

Direct connection between potentially charged equipment and ground (earth)

Resistance to Earth should be less than 10 ohms
Which standards should I follow to control static electricity in ignitable atmospheres?

- **NFPA 77**: Recommended Practice on Static Electricity (2007).
- **Cenelec CLC/TR 50404**: Code of practice for the avoidance of hazards due to static electricity (2003).
- **API RP 2003**: Protection against Ignitions Arising out of Static,
- **API RP 2219**: Safe Operation
What do the standards recommend for specific applications?

- **Tank Trucks: NFPA 77, CLC TR: 50404** and **API RP 2003** recommend that the first procedure in tank truck material transfer operations is to ground the tanker prior to any other operation being carried out by the driver. Interlocking static grounding systems, with ground status indicators, should also be specified so that if the tank truck is not protected from static discharges due to incorrect grounding, the system will not permit the flow of product thereby eliminating the generation of electrostatic charges. The static grounding system should monitor the resistance in the grounding circuit ensuring it does not rise above 10 ohms.

- **CLC TR: 50404** specifies 10 ohms or 100 ohms as being suitable for convenience in monitoring, however 10 ohms would be the established standard for large companies with a good track record in static control safety.
Grounding of tank truck is critical to ensuring static charges do not accumulate on the tank body.

**Vacuum Trucks: API 2219** provides guidance on the protection of vacuum trucks when they are used to suck up flammable or combustible products.

- Examples include waste collection during storage tank cleaning operations and the suction of combustible powders from dust collection chambers.

- Of the many recommendations outlined in API 2219, the most relevant instruction is to fully ground the truck by connecting it to “a designated, proven ground source”, before commencing with transfer operations. The “ground source” describes an object with a low resistance connection to ground (earth).

- The standard also states the importance of confirming that the connection resistance between the truck and the designated grounding point is less than 10 ohms and that this resistance should be verified with the use of an ohm meter (or some other type of measurement device).
NFPA 77, API RP 2003: Requirement for grounding Tank Trucks

• ...all bonding and grounding should be in place prior to starting operations.

• Ground indicators, often interlocked with the filling system, frequently are used to ensure bonding is in place.

• Where the bonding / grounding system is all metal, resistance in continuous paths typically is less than 10 ohms.
Mobile Grounding Verification Solution
Vacuum trucks and tank trucks including their hoses and hose connections, are susceptible to static charge accumulation during the transfer of product into or out of the truck’s containment system.

This accumulation of static charge is equivalent to a hidden source of ignition and is discharged as a static spark can lead to the ignition of the product or the atmosphere in which the truck and material handling team is operating.

To eliminate the risk of static spark discharges the API standard 2219: Safe Operation of Vacuum Trucks in Petroleum Service recommends that vacuum truck operators transferring flammable and combustible product in hazardous locations must fully ground the truck prior to any other task in the transfer operation by connecting the truck to a “proven ground source”.
With a mobile grounding verification system vacuum truck service providers and bulk transporters can now match the levels of control and safety that have been available to loading rack operators ensuring their employees, trucks, customer employees and customer properties are fully protected from the ignition hazards associated with static electricity.

If the validity of primary grounding points is not fully known, or secondary grounding points must be used. A verified resistance will safely allow the rapid transfer of static charging currents to a True earth ground, ensuring the truck, hoses and any other equipment used in the transfer process are protected from incentive static spark discharges within a potentially combustible atmosphere.
Typical Mobile Grounding Applications:

- Cleaning & material recovery operations for on-site cleaning of storage tanks and chemical spills.
- Transporting chemicals to various stages of production on chemical manufacturing sites.
- Transporting flammable product to external sites where installed grounding systems are not present or have not been verified by the supplier.
- Hazmat Recovery operations recovering flammable spillages following transportation and loss of containment incidents.
The loading and unloading of tank trucks with large quantities of chemicals and powders generates static electricity which, if left to accumulate on a tank truck, could discharge electrostatic sparks with energies far in excess of the minimum ignition energies of a vast range of combustible gases, vapors and dusts.

The ignition of such atmospheres by static electricity can be prevented by ensuring the tank truck is grounded. Grounding ensures there can be no build of static electricity on the tank and chassis of the tank truck and the most reliable way of grounding your tank trucks.
As the product (liquid or powder) moves through the transfer system and interacts with pumps, valves, filters meshes and pipe walls, the product will be building up the amount of electrostatic charge it carries. In electrical terms this is commonly described as static charge accumulation.

When the charged product is transferred into the tank truck, the tank truck will become electrified and be subjected to a rising voltage.
1) Ensures connection to road tanker.

2) Ensures good ground connection and electrical continuity throughout tanker.

3) Process can only begin once good connection to road tanker is established and maintained.
Summary

• Identifying and controlling electrostatic hazards can be a challenging process for those responsible for ensuring colleagues, employees, equipment and property are fully protected from electrostatic ignition hazards.

• When an audit of a process or procedure has identified an electrostatic ignition hazard, it is important to specify grounding and bonding systems that can demonstrate compliance with the standards.

• Where possible, static grounding instruments that can demonstrate resistance levels recommended by the standards will ensure companies are protected from this ever-present and hazardous ignition source.
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Included in our Cen-Stat™ formulation is static dissipative material that prevents the cable from carrying an electrostatic charge and additives that provide protection against exposure to ultra-violet light.

The conductor is composed of multi-stranded galvanized steel threads providing a conductor cross-sectional area of 11 AWG (4 mm²), and with the coating included provides a cable diameter of 0.25” (6 mm).

Cen-Stat cable is supplied in standard retractable spiral lengths of 10 ft. (3 m), 16 ft. (5 m), and 32 ft. (10 m). Cen-Stat™ is supplied with Newson Gale’s X45 and X90 heavy duty clamps. Other lengths are available on request.

ANY QUESTIONS OR TO LEARN MORE...CONTACT

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