

Before you begin

Survey your facility to identify activities that have potential to create static electricity sparking. Review safety procedures your company has to prevent static electricity hazards. If available, bring examples of bonding and grounding devices to demonstrate their use.



Introduction

Under certain conditions, liquids, solid objects, and people can become charged with static electricity. If these charges cannot move or flow to ground, they continue to accumulate, and eventually develop enough energy to jump as a spark to another nearby object. If flammable gas, vapor, or dust are present when this occurs, it can ignite a fire or cause an explosion.

Everyone has experienced a static electricity spark (and shock) at one time or another. This usually happens in the winter when the air is dry (humidity is low), but it can occur any time of year.

Definitions

Review the sources of static electricity with the group. Write these terms on a white board or flipchart for later reference.

- **Triboelectrification** – Occurs when two different materials make contact and then separate. For example, walking across a carpet.
- **Liquid shear charging** – Created by the flow of liquids through a pipe, hose, or vessel (filling a tank truck through a loading pipe). Free falling liquids through air can also generate a static charge.
- **Induction charging** – Occurs when a neutral ungrounded object moves into the electric field that surrounds a highly charged object. For example, walking on a wood floor and touching a charged object.
- **Corona charging** – Caused when spraying a nonconductive object with a stream of electrically charged material. For example, electrostatic paint spraying.

Discussion – types of static discharges

Ask the group to identify situations at your facility where static discharges may occur.

- **Capacitive discharge** – Sparks that occur between conductive objects, such as a metal drum and a metal container.
- **Brush discharge** – May occur when a grounded conductor comes close to a charged non-conductive object. For example, removing a sweater and putting it on a metal hanger rod.

Note: there are other types of discharges associated with powders and powder-coating operations. See reference materials for more information.

Conclusion

Methods to prevent static electricity discharge

Discuss with the group each of these seven ways to reduce or eliminate static electricity. Ask them to identify locations in the facility where examples may be found.

1. **Bond** – Connect two or more conductive objects together with a conductor (like a wire) to equalize the potential charge between them.
2. **Ground** – Connect one or more conductive objects directly to the earth with a conductor (like a wire or steel rod).
3. **Humidification** – Moisture in the air (humidity above 60%) can help dissipate static charges on objects.
4. **Ionizers** – Make the air sufficiently conductive to dissipate static charge on both insulators and isolated conductors. All air ionization systems work by flooding the atmosphere with positive and negative ions. As a result, the static electricity that has built up on products and equipment is neutralized.
5. **Additives** – Certain fuel additives increase the conductivity of the liquid.
6. **Static collectors** – Highly conductive devices that collect static charges from non-conductive sources and safely channel it to ground.
7. **Materials** – Conductive flooring and shoe soles help dissipate static charges away from the person. Minimize splash filling and free-fall of low conductivity flammable liquids.

Group Activity

Preventing fires and explosions

Discuss with the group the safety precautions listed below for working with flammable liquids, gases, vapors, and dusts to minimize generation of static electricity. Review any areas within the workplace that have static electrical potential and review these safety procedures. Ask if they can think of any other ways to prevent static sparking.

- Bond and ground all metallic equipment.
- Bonding and grounding are both required when handling flammable liquids.
- You cannot bond and ground non-metallic piping and containers. If possible, do not use these materials to handle flammable liquids.
- Use special care when dispensing flammable liquids.
- Minimize splash filling and free fall as much as possible.
- Reduce the flow rate of the liquid. A slower liquid velocity helps minimize agitation and turbulence.
- Increase conductivity of a liquid by using anti-static additives or mixing in other more conductive liquids (e.g., ethanol, acetone).
- In-line microfilters can cause rapid charging of low conductivity liquids.
- Enclose filters in a grounded metal enclosure.
- Plastic bags and drum liners can generate static charges when pulled apart or across other materials.
- Static-dissipating soles on shoes and treated or cotton clothing can help reduce static buildup.
- Inspect and repair grounding wires, straps, connections, clamps, etc. to ensure a good path to ground.

Resources

- [Static Protection through Bonding and Grounding \(IAEI\) Magazine](#)
- [Stop Static Campaign \(Petroleum Equipment Institute\)](#)
- [Recommended Practice on Static Electricity, NFPA 77, National Fire Protection Association](#)
- [Safety and Regulatory Overview for Powder Coating –The Fabricator Magazine](#)