

Static Electricity

Static electricity is a common phenomenon in our daily lives. You may ever experience a “shock” when contacting the metallic work cubicle on carpet floor, or combing your dry hair and getting a “hair raising” experience. In more severe scenarios, static electricity has also been known to be the cause of major accidents, such as the Barton Solvents Flammable Liquid Explosion and Fire on 29 October 2007. The giant airship, Hindenburg, explosion back on 6 May 1937 has also been attributed to be caused by static electricity. The risk of static electricity is high in petrochemical industry, especially when it is a hazard which we cannot “physically see” coupled with processing/storage of flammable materials. Therefore, we need to better understand static electricity in order to manage the dangers associated with it.

Sources of Static Electricity

Static electricity is commonly produced when:

- appliances are plugged into electrical outlets
- dry powdered material passes through pneumatic conveyors or chutes
- filling tanks, drums, cans or pails
- liquid flows through a filter or strainer, a pipe or hose, or through an opening in a pipe or hose
- mixing or blending
- moving non-conductive conveyor belts or drive belts
- spraying or coating



Static build-up and discharge

There are 3 basic stages leading up to a potential static hazard:

- i. charge separation/ generation
- ii. charge accumulation
- iii. electrostatic discharge

All 3 of these stages are necessary for an electrostatic ignition.

Hazards of static electricity

The main hazard of static electricity is the creation of sparks in an explosive or flammable atmosphere which can set off an explosion or fire. The danger is greatest when flammable liquids are being poured or transferred.

For static electricity to be a hazard, four conditions must be met:

1. There must be a means for static charge to develop/generate.
2. Enough static charge energy must build up/accumulate for possible ignition.
3. There must be a discharge of this energy (a spark).
4. The spark must occur in a flammable mixture or vapour.

Safety Precautions

Liquid with electrical conductivities less than 50 picoSiemens/metre are considered electrostatic accumulators. They are of primary concern because they can transfer charge to or induce charge on neighbouring insulated conductors, which may then give rise to spark.

Some ways to prevent static charges generation are:

- avoid bubbling
- avoid steaming operations
- reduce splashing and limiting flow velocity
- reducing turbulent flow

Some ways to prevent static charges from accumulating on materials are:

- additives
- grounding and bonding
- humidification
- static dust collectors
- sufficient relaxation time for charge dissipation by design (e.g. filter placement location)

Additional reading material:

- ✓ American Petroleum Institute, **API RP 2003 – Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents**
- ✓ Center for Chemical Process Safety, **Avoiding Static Ignition Hazards in Chemical Operations**

Another way of mitigating static hazard is by eliminating flammable mixture or vapour such as using inert gas to displace flammable materials.

Process Safety is Everybody's Responsibility!

An initiative of the Process & Engineering Committee

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