Leading the way in hazardous area static control

Application Spotlight

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NewsonGale
HOERBIGER Safety Solutions

Earth-Rite® MULTIPOINT II
Controlling Static Electricity on Interconnected Plant Assemblies

Static electricity introduces a broad spectrum of operational problems during manufacturing and handling processes in flammable and combustible atmospheres across a wide-range of industries.
In potentially explosive atmospheres, the amount of energy contained in spark discharges from plant equipment, and even people, may be sufficient to ignite a wide variety of processed material during handling operations, such as fine dusts, powder granules, liquids and vapours. The extent of damage where static is the source of ignition, ranging from small scale unreported occurrences right through to devastating explosions, can cause injuries or fatalities, lost production through plant downtime and business losses.

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Chemical processing plants and oil refineries are characterised by long lengths of continuously welded pipework connecting mobile and fixed process vessels and installations. Piping is used for moving raw and semi-processed materials for refining into more useful products. Systems that control the flow of such materials during production have the ability to generate vast quantities of electrostatic charge via the movement of product through the pipework connected to the associated plant equipment. The nature of powder processing operations means that the generation of static electricity is to be expected in all parts of the system because of the movement of particles through the equipment. Constant charging occurs extensively in powders, for example during mixing, grinding, sieving, pouring, micronizing and pneumatic transfer.

In pharmaceutical operations, equipment like powder conveying systems, micronizers, blenders and sieve stacks all make up multiple component assemblies that can accumulate high levels of electrostatic charge should any of the components be isolated from a true earth.

Static hazards associated with isolated conductors

Mitigating all potential ignition sources in hazardous atmospheres is the obvious starting point for designing plant and machinery. The main areas for concern are what are often termed as “isolated conductors”. These conductors are electrically conductive objects that are either inherently or accidentally insulated from earth.

The isolation effectively keeps any static electricity build-up from safely dissipating to earth, thereby resulting in accumulation of charge on the object. If the isolated conductor comes into close proximity with another object at a lower potential, energy could be released in the form of an incendive spark. Interconnected plant assemblies, such as powder processing equipment, present more of a challenge compared to standard applications as there are many metal parts that can make up larger assemblies that are electrically isolated from each other. Isolated sections of pipework can act as isolated conductors, resulting in the generation and subsequent accumulation of a static charge. If there is a lack of continuity to a true earth, this charge will not be able to dissipate, allowing an excessively high voltage potential to develop on the section of pipework which will look to discharge at the earliest opportunity. Build up and retention of charge on the powder therefore creates a hazard if it is released in a discharge that is capable of causing an ignition.

Isolated conductors may be any from a large list of commonly used items, including metal couplings, flanges, fittings or valves in piping and ducting systems, portable drums, containers, hoppers, and even people. During day-to-day operations at industrial facilities, such as chemical, pharmaceutical, paints, coatings, food and beverage, isolated conductors are considered the most likely source of static ignition incidents.

Specifying a static grounding system

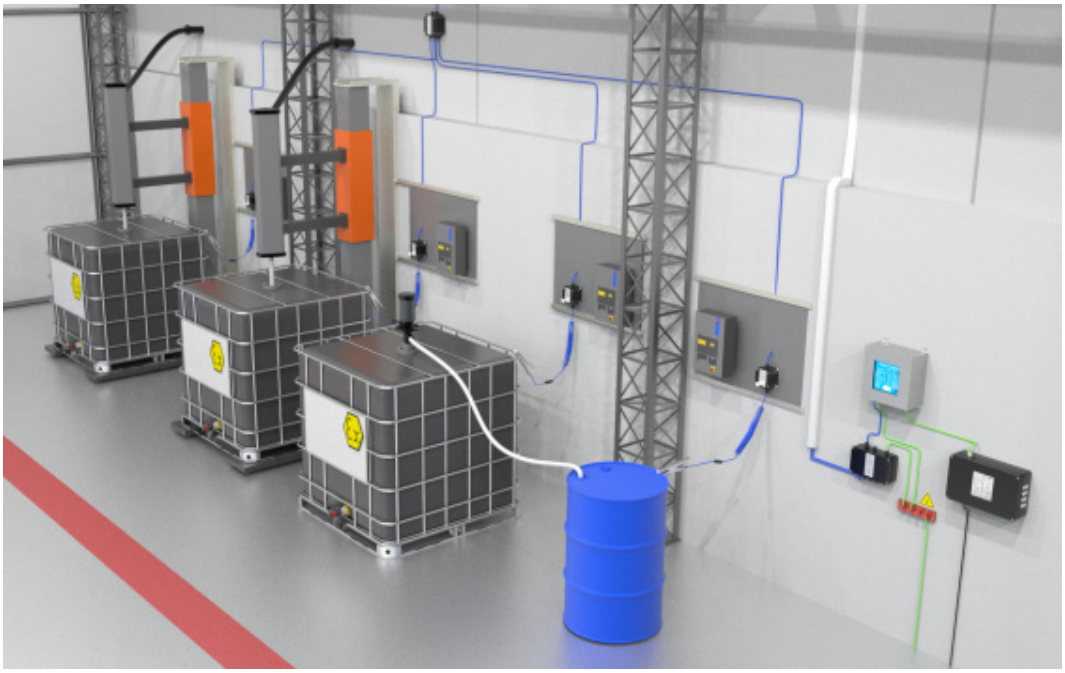
The most effective way of ensuring complex equipment used in flammable or combustible atmospheres cannot accumulate static electricity is to provide a dedicated static grounding solution that is capable of monitoring the ground connection to components at risk of isolation. Such a solution should also be able to control the flow of product and alert personnel to a potential hazard, should a component lose its connection to ground.

Newson Gale recommends the Earth-Rite® MULTIPOINT II system due to its

> ***"unique ability to monitor the simultaneous grounding of up to eight individual pieces of equipment at risk of discharging electrostatic sparks."***

The system has cCSA, ATEX and IECEx approvals for use in hazardous atmospheres and meets all current EC directives. The Earth-Rite MULTIPOINT II is capable of multiple grounding of potentially isolated conductive components of manufacturing and processing systems. These can be individual plant items such as drums and IBCs, or multiple sections of equipment at risk of isolation on a single plant process such as a fluid bed drier, ducting or pipework.

The system's unique flexibility allows the benefits of eight discrete static grounding systems rolled up into a single package, enabling installers to monitor a combination of plant items and display their grounding condition through a wall mounted unit containing eight ground status indicators.



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NFPA 77, 15.3.1 & 15.3.2
"Mechanisms of Static Electric Charging" states:

Contact static electricity charging occurs extensively in the movement of powders, both by surface contact and separation between powders and surfaces and by contact and separation between individual powder particles.

Charging can be expected any time a powder comes into contact with another surface, such as in sieving, pouring, scrolling, grinding, micronizing, sliding and pneumatic conveying.

IEC TS 60079-32-1, 13.4.1
"The establishment and monitoring of earthing systems" states:

Where the bonding/earthing system is all metal, the resistance in continuous earth paths typically is less than 10 Ω. Such systems include those having multiple components. A greater resistance usually indicates that the metal path is not continuous, usually because of loose connections or corrosion. An earthing system that is acceptable for power circuits or for lightning protection is more than adequate for a static electricity earthing system.

** Always check for and read the latest version of the International Standards and or Recommended Practices.*

In addition, the system will continuously check that all components are connected to a verified earth, thus ensuring that the ground path resistance between the process equipment and the reference ground never exceeds 10 Ohms. A monitored ground path resistance of 10 Ohms or less is what is recommended in NFPA 77, "Recommended Practice on Static Electricity" and IEC TS 60079-32-1, "Explosive atmospheres – Part 32-1: Electrostatic hazards – Guidance".

Principles of operation

If the monitoring unit detects that an assembly component is not grounded, it will send a signal to the controller, which if interlocked with the circuit, the system will go non-permissive and the operation will cease to continue. The system only permits the product transfer process when the ground loop resistance of each utilised channel is less than 10 Ohms, as recommended in the various international guidelines for the control of undesirable static electricity. If such an event does occur, the plant's technicians can rapidly identify which connection needs to be investigated. They can do this by referencing the MULTIPOINT II's monitoring unit's ground status indicator panel which will indicate which channel needs to be checked. Once the connection is re-established, the controller will provide a permissive condition for the process to start again.

Systems such as these are a flexible solution designed for powder processing industries. The monitoring unit, which consists of eight green and eight red panel mounted LEDs, fitted inside a stainless steel enclosure, can be positioned in a location where it is most visible, allowing technicians and operators to observe if the LEDs linked to their corresponding monitoring points are green or red. Should any of the red LEDs be indicating a break in continuity with plant equipment, the technician can check the corresponding location to investigate the ground condition of that specific channel, taking corrective action if necessary.

Figure 1. The Earth-Rite MULTIPOINT II's monitoring unit can be mounted in all ATEX/IECEx zones and all Class and Division hazardous locations

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