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Is Static Control An Issue In Your Manufacturing Processes?

Static Neutralization

Several outside influences can affect the degree of static charges in industrial processes. Influences include humidity, surface contact area, temperature, material type, speed of interaction and surface conductivity.

The higher the relative humidity (dependant upon the atmospheric pressure and temperature), the less static charges typically cause a production related problem. In essence, the humidity deposits a very thin layer of water on the surface of the insulator (i.e. Teflon, PVC, glass) and creates a conductive coating, providing a pathway for charge carriers to bleed off. Increasing the relative ambient humidity in the can alter the surface conductivity of the web so that static charges are easily dissipated. This is most effective for materials that readily absorb moisture, like paper. Increasing humidity on polymers does not work as well, as they do not readily absorb water.

Reducing the surface contact area between materials can also control the degree of charging, as can a reduction in surface roughness.

Temperature also plays a role. At elevated surface temperatures, surfaces become more conductive, reducing static problems. Thus, you will experience less static related problems during a hot, humid summer, than during a cold, dry winter.

In some cases it is necessary to actively neutralize the static present on the surface of a product because the above are insufficient or not feasible solutions. There are naturally a wide variety of static control solutions available on the market today. For the purposes of these notes, ionization techniques for non-conductive surfaces are those under discussion.

Each of the different techniques has inherent advantages and disadvantages. The first thing is to determine is whether the surface with the static charge to be neutralized is a slow moving, three dimensional object, a stationary material such as that in a molding process, or a faster moving web as typically found in the converting, packaging or printing industries.

The ionization forms available for the above applications include passive, active and nuclear.

Nuclear ionizers, while very useful in hazardous locations where sparking must not occur, are not as efficient as some of the other available methods and become less efficient over time. The required Nuclear Regulatory Commission compliance also results in a fairly high operating cost. Operators are often reluctant to work with a radio active product, which creates another set of problems.

Passive ionizers are the lowest cost commercial static neutralizer and function by means of a field created between the static charges on the material to be neutralized and the passive ionizer, which establishes ions which effect the neutralization. This means an air gap of ¼” to ½” must exist between the grounded points (the passive static eliminator) and the material to be neutralized. This gap must be consistent across it’s full length, or some areas will be better neutralized than others. The closer the passive eliminator is to the surface to be neutralized, the higher the strength of the field between the two and the more ions will be created, increasing static neutralization success.

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A good connection between the passive eliminator and the machine frame (unpainted) is critical to insure that the eliminator is properly grounded. Diligent maintenance procedures – frequent cleaning of the passive electrodes – will keep the eliminator efficient and consistent.

Passive ionizers are best used on highly charged, flat surfaces, but are not effective below a specific onset voltage created by the field between the eliminator and the insulated surface.

Active ionizers are available in both AC and DC technology formats.

AC high voltage static eliminators are the mostly widely accepted form of active static neutralization. They are simple to install and use, are rugged, efficient and reliable. Ions produced near the static eliminator are pulled towards the charged material.

Resistively coupled electrodes are characteristic of shockless bars and form an ion cloud of both positive and negative ions. As a charged object or surface comes into close proximity of this cloud, opposite charges pull the ions towards themselves, neutralizing the surface. If there is no oppositely charged surface, the ions simply recombine, are neutralized or migrate to ground.

DC static eliminators offer the advantage of low ozone and EMI radiation emissions, and the ability to neutralize at a greater distance from the charged object. In DC technology, the ions are pushed from the electrodes to where they can come in contact with the surface to be neutralized.

Bipolar (resistively coupled) technology is preferable as it is non arcing, while Directly Coupled technology requires any exposed metal within range be physically shielded to prevent arcing.