

Static Electricity and Ways to Prevent It

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As users and converters of pressure sensitive tapes and other rolled materials, we need to understand electricity: where it develops, the dangers associated with it, and, of course, ways to control it. Static electricity is much more prevalent in low humidity conditions and the coming months are typically the driest months of the year.

What is static electricity?

Static electricity builds up when one surface is positively charged and the other surface is negatively charged. Nature's desire for balance causes the charges to attract one another, resulting in the discharge that we call static. On a small scale, you see static discharge in the form of a spark when you touch a doorknob after walking across a carpet. On a much larger scale, when the electrical potential occurs between clouds and the Earth, the resulting discharge is in the form of a lightning bolt.

What static has to do with the use of a PSA tape or plastic film?

The act of unwinding and winding a rolled product like a pressure sensitive tape or a plastic film creates a build up of positive and negative charges which, eventually, may lead to a static electricity discharge. This discharge can be small and simply go unnoticed or it may be very large and potentially dangerous. If you have ever felt the hair on your arms stand up when near an unwinding roll of tape, you have felt static electricity. Films are particularly prone to creating a static build up.

Why is static a problem to me?

- The discharge of static electricity may be only a small shock or build to the point that a lightning bolt-like spark will reach out and strike the operator, delivering life threatening voltage.
- Static discharge is a spark. Areas with flammable liquids or gases must remain spark-free at all times. A static build up in such areas can be potentially life threatening.
- The accumulation of electrostatic charges can cause problems, even if ESD events do not occur. If static charges are not neutralized, sheets of materials will stick together, creating jams in downstream processes.
- Electrostatic fields also attract dust particles, fibers, bugs and hair, which result in surface contamination. This causes obvious quality problems in printing, coating and laminating, as well as cleanliness problems with medical PSA applications. Moreover, static charges can cause uneven coatings and "wicking" of inks, and pressure sensitive tape carrying a static charge can damage sensitive electronic components.
- The release of energy seen and felt in a static discharge can damage the release liner of the product being unwound. When the silicone is disrupted by static, it will no longer function as a release system in the area affected by the discharge.
- For example, if you are rewinding large rolls of tape to smaller rolls, your customer may have defective material because it will no longer unwind properly at that spot.

How do I deal with static?

The first step is to identify the 'hot' areas, those that seem to be generating the highest static charge. This can be accomplished with a small, inexpensive handheld electrostatic field meter. You will reach your

own comfort level but in general, action should be taken when the charge approaches 10 (either +10 or -10). There are numerous ways to control static in your facility.

Humidity

Keeping the relative humidity above 50% will lessen the likelihood of static. This can be accomplished with a humidification system such as a simple series of water misters.

Static Control Devices

Three types of static control devices are commonly used in production facilities where tapes and other rolled goods are used and converted: grounded pads, passive ionizers and active ionizers.

Grounded pads, also called antistatic protected floor mats, provide operators with limited protection from ESDs due to induction charging of the human body. If the operator is standing on a properly grounded pad (connected to ground with a proper current-limiting resistor) and with conductive footwear (not rubber soles), the pad can reduce operator shocks. But grounded pads do not eliminate the other problems caused by static electricity and do not protect the operator from direct discharge from a highly charged unwind or rewind roll for example.

Ionizers offer a more effective approach. Ionizers produce large quantities of both positive and negative air ions. These ions are directed to areas where electrostatically charged surfaces require neutralization. The ions of opposite polarity are attracted to the charged surface until electrical equilibrium is achieved.

There are two general types of ionizers and active ionizers. Passive ionizers, also called induction ionizers, include static tinsel and static string, which are simply grounded emitters placed parallel with and close to the charged material. The electrical energy of the charged material will excite the passive ionizer, causing it to generate air ions of the opposite polarity. If properly positioned, a passive ionizer can successfully reduce bulk electrostatic charges. Typically, an active ionizer may follow the induction ionizer to “clean up” residual charges, especially in critical applications.

Passive ionizers have the advantage of low purchase costs. However, a passive ionizer is highly operator-dependent. It must be positioned at the correct distance from the web, and not come in contact with it. If it comes in contact with the charged material, it may become ineffective and the filaments will wear off and contaminate the web and the machinery. If positioned too close, it can overcompensate and result in a charge of the opposite polarity. It must be replaced whenever it becomes dirty or damaged. Active ionizers have a higher purchase cost, but are much more reliable and require minimal maintenance. Unlike the passive ionizers, they are electrically operated or use radioactive materials for the ion source, and are not dependent on local conditions or the electrostatic charge on the web.

The most common type of ionizer for PSA and film applications is the high output static neutralizer bars. They are highly efficient, electrically powered bars which are permanently mounted across the web. Another type of active ionizer is a static blower, which uses fans to blow positively and negatively ionized air at the moving web, thus neutralizing the charged surfaces.

Consult a trained static control engineer to evaluate your facility and determine the best option for controlling static on your equipment. For the safety and well being of your employees, your products and your customers, maintaining a static free environment is critical.