RFID RESOURCES

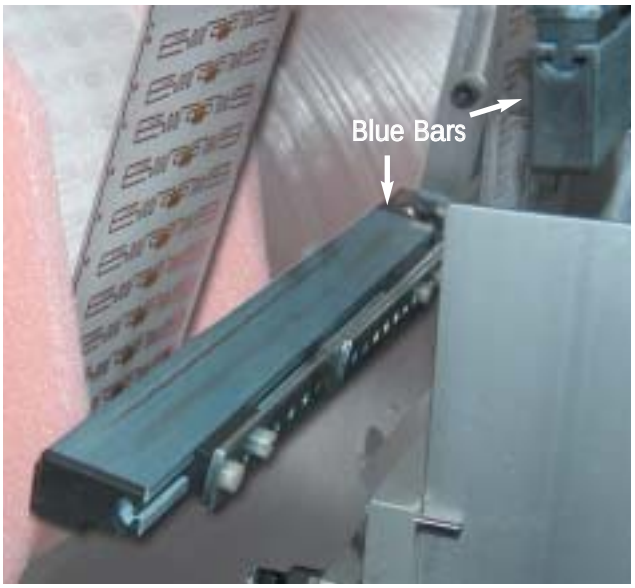
SIMCO highlights

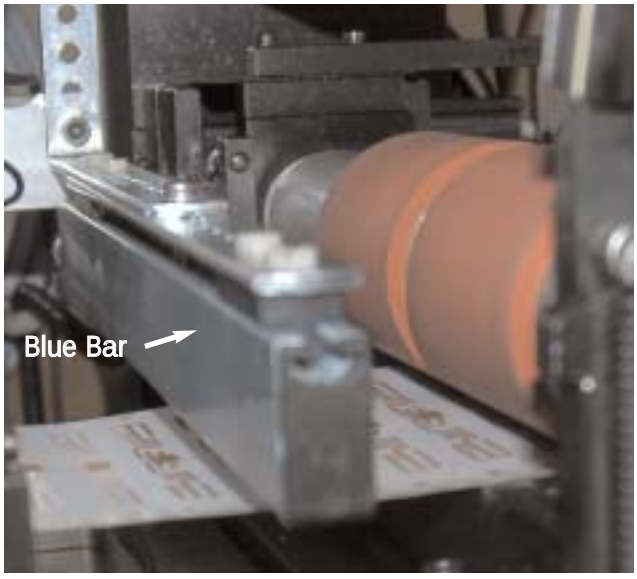
The Shockingly True Story of RFID tags and Static Electricity!

Radio Frequency Identification, "RFID", is changing the world of automated identification. These devices will eventually track everything from airline luggage to the inventory at your local grocery store. The applications are unlimited, however, with all new opportunity comes the challenge of change.

RFID is a method of remotely storing and retrieving data, using devices called RFID tags. RFID devices contain antennae to enable them to receive and respond to radio-frequency queries from an RFID transceiver. There are active tags, which have an internal battery, and passive tags, which do not. The battery units send a stronger signal for a greater distance, but active tags are also larger and more expensive.
(Con't on Page 2)

An electrostatic discharge can damage a RFID tag in an instant, causing you production problems, and worse, unhappy customers when they find out that the tags aren't working.





High static charges are common problems in tag and label manufacturing environments, with surface charges generated anywhere along the path, from the feed-roll to the rewind. The addition of RFID devices creates significant complications because some of these devices are susceptible to charge levels as low as 500 volts.

Depending on your applications requirements, SIMCO offers static neutralizing systems, compact ionizers and ionizing blowers to help you eliminate the static charges that can lead to device failure.

Since 1936 SIMCO has been unsurpassed in knowledge and experience controlling static electricity in electronic and Industrial applications. SIMCO puts you in charge of your own devices! Call 215-822-6401 to schedule a FREE on site analysis or go onto our website for more product and application information.

FOR MORE INFORMATION ON RFID APPLICATIONS GO TO WWW.SIMCO-STATIC.COM

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RFID

Tags and Static Electricity

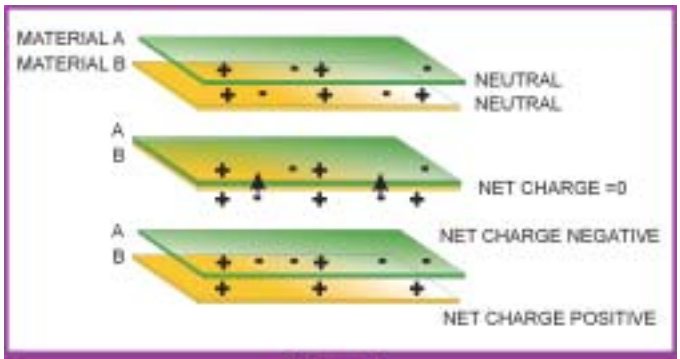

Figure 1
Contact and Separation of Surfaces

All of this sounds like the instruction manual for an electronic product doesn't it? Well, I'm not certain how familiar packaging converters are with electronic components, but I can assure you that converting factory environments are no place for an unprotected chip! Sure, as mentioned above, there are different types of RFID devices, and some are more robust than others; however, there have been many documented instances where RFID devices (tags) have been damaged by static electricity. An electrostatic discharge can damage an electronic circuit in an instant, causing you production problems, and worse, unhappy customers when they find out that the tags aren't working.

Problem

Static charges are commonly found in many packaging/converting operations; like web slitting, printing, coating, etc. and many other operations like individual package wrapping or automated pallet wrapping, to name some examples.

The static charges are generated by the contact and separation of the material as it passes through the various manufacturing and handling processes. Static electricity is an electrical charge on the surface of the material caused by an imbalance of electrons. The charges usually occur on insulative materials, such as films or coated papers, and may be on a conductive surface if it is isolated from ground. This is an important point, because many materials suppliers are claiming that their new "antistatic" materials will protect RFID devices from the effects of static electricity; which unfortunately may not always be correct, because static charges can be inductively transferred to a conductive object that is isolated from ground. The next time the conductive object (like the RFID device) comes into proximity of ground, the transfer of electrons could cause damage.

When two surfaces are in contact an alignment of electrons occurs between the two surfaces (See Figure 1). When the surfaces separate an exchange of electrons takes place. The surface that has gained electrons becomes negatively charged due to the overabundance, while the surface that has given up electrons becomes positively charged due to the electron deficiency.

The materials involved and the pressure and speed of contact and separation affects the magnitude of the charge. The contact and separation, or friction, is known as "triboelectrification," or "tribocharging." It is the same phenomenon as when you walk across a carpet, touch a light switch, and get a shock. To understand the static charge characteristics of materials, their relative position within the Triboelectric Series must be considered.

Figure 2 Triboelectric Series Chart

The relative positioning of the materials governs the magnitude and polarity of the charge that results when the materials contact and separate. The farther apart the materials are in the series, the greater the magnitude of the charge. Also, materials located at the top of the chart acquire a positive charge when they are in contact with materials ranked lower on the chart (See Figure 2).

This is further complicated by the fact that static charges are cumulative; charge potentials can continue to increase each time the material contacts another surface (See Figure 3). This is evident in processes where the material may come in contact with several surfaces, like idler rollers in a web converting application. Does any of this sound familiar? Do you currently experience static control problems when you run different materials, or at different times of the year? What is important to recognize is that the charges do increase with additional friction events, and that you need to keep the charges at safe levels as part of your plan to protect the RFID devices during manufacturing.

RFID Tags and Static Electricity

Typical manufacturing areas that tend to generate significant charges include; web transport systems - unwinds, nip rollers, accumulators, idlers with insulative sleeves, corona treaters, lay-on rolls, rewinds - automated wrapping operations, individual packages or pallet wrappers.

Unfortunately the involvement of RFID devices with packaging materials has changed everything, because these tiny circuits cannot withstand exposure to stray voltages. They can experience damage from different sources, the most damaging of which are:

- Damage from a direct electrostatic discharge (ESD). When a charged object or individual touches a device, some of the stored energy is transferred or discharged either to the device or through the device to ground. The charge is transferred to the device with sufficient energy to cause damage to the circuit.
- Equally as dangerous for potential damage to RFID devices is electro-magnetic interference (EMI). This is also referred to as electrical overstress (EOS) in the electronics industry. It occurs when a device is exposed to a transient energy, or voltage, temporarily overstressing the circuit and causing damage.

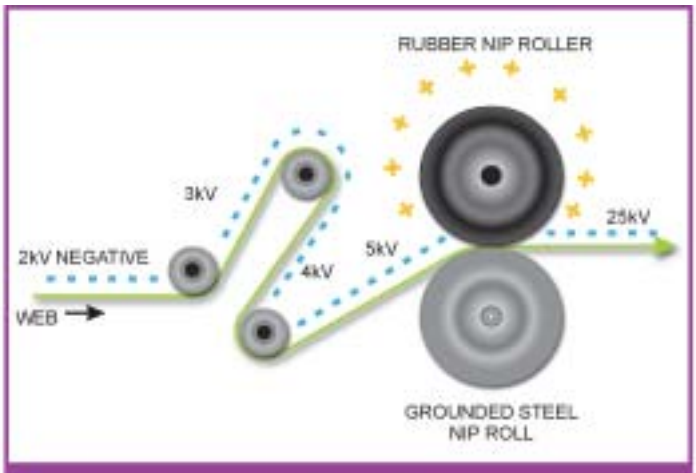

Figure 3
Cumulative Charges on Film Web caused by Contact with Several Surfaces

Interesting data from the electronics industry shows that EOS/ESD events only cause immediate, or catastrophic, failure of a device 10% of the time; while 90% of the time these events cause a latent failure, which will ultimately cause the device to fail. I relate to latent failures as being much like a crack in a pane of glass. As the glass receives continued stress events the crack grows larger until the glass breaks. The problem that this raises is when does the RFID device fail? Do you find the problem, or worse does your customer find it? I hate it when that happens.

Solution

So how do you protect RFID devices from static electricity?

First, you need to use an active (electrical) static eliminator that can provide relatively balanced ionization and is capable of neutralizing your specific application (speed, type of material, etc.). The ionizing balance (equality of positive and negative ions) of an eliminator is important because the offset voltage differential (usually negative) of a unit could damage some RFID devices. Although there is no specific industry standard as yet that identifies at what voltage level an RFID device will sustain damage from static electricity, many device manufactures recommend that charge levels be maintained at around 500 volts when the tags are exposed. As the tags are placed into pressure sensitive label assemblies, as an example, they become more robust, however many tags deposition equipment manufacturers recommend controlling static charges to around 1,500 volts once the tag is incorporated in the label stock. In either event, balanced ionization from a well-designed ionizer will reduce the static charges quickly to levels that are no longer dangerous to the RFID device.

Never use passive static eliminators (tinsel or conductive string) to protect RFID devices. Although passive eliminators do reduce static charges in some industrial applications this type of ionizer can be dangerous for RFID devices, because they will only reduce the static charge to the threshold voltage level where their ionizing capability is initiated. The danger is that the threshold voltage levels of passive eliminators will often exceed the voltage range that most RFID devices should be exposed to.

Second, the use of an extended range active static eliminator will allow you to locate the unit 2”to 6” inches from the target to be neutralized. This will provide a safe distance between the RFID device and the high intensity electric field that is present in close proximity to the ionizer emitter electrodes (pins). Also, the additional distance from the target will provide a better mix of ions and, consequently, a better ion balance, so there are no residual voltages to be concerned with.

Conclusion

Change is a good thing, as long as you are prepared for it. RFID technology offers the packaging world a bright and promising future; all you have to do is make sure that it is protected from static electricity. **Good luck!**

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RFID Product Solutions

Blue Bar and True AC Power Supply

The Blue Bar us a super high-output, shockless static bar that is especially useful for high speed applications and is effective at wen speeds of 2500 feet per minute or more. The static bar can be located up to 6" from the tags and labels.

The TrueAC Power Supply is the only self-monitoring AC power supply available for static control equipment. Features include on and off indicators, clean bar, fault and service remote display capability.

PerforMAX 3 Static Bar with Monitoring System

The PerforMAX 3 is the most advanced static control system available for monitoring static neutralizing performance. PerforMAX3 provides outstanding extended range performance to eliminate static charges even when installed 2" to 10" from tags and labels. The PerforMAX3 system is available in several configurations. The standard system provides remote ionization monitoring and control, clean bar and system fault indicators, and remote on/off control. The computer interface configuration has remote computer monitoring and data acquisition.

fusION Ionizer

The fusION delivers powerful and balanced static control in a compact package that can be installed in places where typical ionizer designs do not fit. Simple to install, operate and maintain. No adjustments or calibration are necessary with Simco's patented auto balancing (DOCC) technology. The biggest benefit for RFID applications is the this unit has a guaranteed ion balance of + or - 50m volts, and is specifically designed for use in electronics applications.

Aerostat® PC Ionizing Blower

Distinguished by its variable speed control, balanced ionization and patented emitter point cleaner, SIMCO's Aerostat PC is an excellent choice for static elimination in RFID application when a static bar can not be used. While helping to protect products and personnel from the effects of static discharge, the Aerostat PC is lightweight, small, and quiet - making it easy for the user to direct the ionization where it is needed. Best of all, this unit has a guaranteed ion balance of + or - 50m volt!

2257 North Penn Road • Hatfield, PA 19440 • Tele:(215) 822-6401 • Fax:(215) 822-3795
www.simco-static.com • e-mail: sales@simco.biz

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