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Eliminating the Static

Six months ago, printing-equipment manufacturer Mark Andy hosted an educational technical program for new and prospective RFID label converters. At one of the presentations, Bill Arnold of RFID inlay maker Omron Electronics told the attentive group, "Congratulations! You are now in the electronics component manufacturing business."

After that short and simple exclamation, we all took a moment to think about what it meant and how it would affect us. RFID is truly a new world, not only for end users of RFID labels, but also for the people who produce them. Label converters must now work with RFID inlays costing 20 to 40 times the price of the label materials. Despite their high cost—and quite unlike the high quality of label materials used by converters—some reels of RFID inlays have failure rates (nonfunctioning RFID chips) of 25 percent. And with new inlays rapidly coming onto the market, converters run a risk of getting stuck with expensive, obsolete inventory. Even more important, being involved in RFID labeling requires converters to adopt new ways of controlling and monitoring product quality.

Prior to the arrival of RFID, label converters had learned to understand some esoteric concepts: web guiding, tension and registration control, release characteristics, peel tests, anilox cell characteristics and UV photo initiation, to name a few. These concepts all apply to production and performance results we can ultimately evaluate with our physical senses. With RFID, however, label converters now have far greater responsibilities for things they cannot so easily detect. They need to rely on RFID interrogators (readers) with near- and far-field antennas to detect RFID label functions. Converters further need to determine reader parameter settings that allow correlation between what the RFID label converter says are ‘good’ and ‘bad’ labels and what the inlay manufacturer says are ‘good’ and ‘bad’ inlays. In addition, label converters need to detect and identify bad product accurately at press speeds.

Static electricity, always present in press operations, can destroy RFID tags, either outright, or with latent damage that kills the microchip at some unpredictable point in the future. Surprisingly, inlay providers do not have clear specifications for limiting static buildup, or for prevention of static discharge. Even the packaging in which inlays are shipped often has no printed warning about electrostatic discharge (ESD) risks. As such, it’s largely down to the converter to learn enough about static electricity and ESD, and to implement the necessary procedures and countermeasures.

Label converters have probably seen instances where unwinding and rewinding operations produce enough static electricity to throw a strong spark several inches through the air. In such cases, tens of thousands of volts are discharged. That kind of static charge can be dissipated by dragging conductive strands of foil, known as ‘tinsel,’ over the web of label stock—a crude, but known practice within the industry. Many converters may not realize passing a web over an idler roller can generate 1,000 or more volts, or that a gripper and pacing roller nip used to drive the web can generate well over 5,000 volts. In contrast, some inlay suppliers advise keeping static levels below about 500 volts. Tinsel is effective at dissipating static electricity down to about 5,000 volts, but it is simply not effective in controlling static to the relatively low levels required by inlays.

Fortunately, help is close at hand. Static neutralization equipment has improved substantially over recent years. Modern static neutralization systems include antistatic bars that emit electric charges to air molecules. Positively and negatively charged air molecules, known as ions, surround an antistatic bar. These ions are attracted by opposite charges carried on webs of inlays and label stock, neutralizing the static charge. Modern antistatic bar designs allow emitted ions to travel substantially farther from the bar, so antistatic bars no longer need to be mounted as close to a web. Even better, a single antistatic bar provides static neutralization for a much larger area.

Modern bars now neutralize both positive and negative charges approximately equally, without the need for bulky air blowers used in earlier designs to propel ions out to increase neutralizing range. Antistatic bars typically attract dust and debris around the ion-emitting electrodes. This dust allows some electrical energy to short to ground, diminishing the number and range of the neutralizing ions. This dust needs to be cleaned off the bars periodically to maintain neutralizing performance. Some power supplies now include monitoring circuitry that indicates system performance and notifies the converter when the bars need to be cleaned. Advanced static control systems may also include a PC interface allowing RFID label converters to monitor system performance over time as part of a wider process control and quality initiative.

The white paper, “Mastering RFID Label Converting,” by Mark Blitshteyn of electrostatics management products and services provider Ion Industrial, can give you further understanding of the issues involved in manufacturing RFID labels and controlling potentially harmful static electricity.

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