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Diagnosing and solving static problems and surface treatment issues are key to improving the converting process. This eBook provides useful content to help converters overcome safety issues, increase productivity, and achieve superior product appearance while maintaining consistency in quality control.

Contents

Diagnose Static Problems With A Handheld Static Meter

Handheld fieldmeters are our workhorse tools for solving static problems.

By **Kelly Robinson**, PE, PhD, Electrostatic Answers

Handheld static meters are our most important instruments for diagnosing and solving static problems. First, let's take a look at what handheld static meters measure. Then, we'll use our meter to diagnose and solve a static problem.

The handheld static meter in Figure 1 responds to the number of electrical charges on the plastic sheet or web. The meter displays the electric field E_{Sheet} caused by the charges. Most static meters are calibrated at a specific measurement distance D_{Meter} recommended by the vendor. Read the directions to learn the calibration distance. For many meters, the calibration distance is 1 inch.

The display often has units of "KV" or kilovolts. So, you must divide the displayed value by the calibration distance D_{Meter} to get the electric field. This is important when you compare readings taken with different meters.

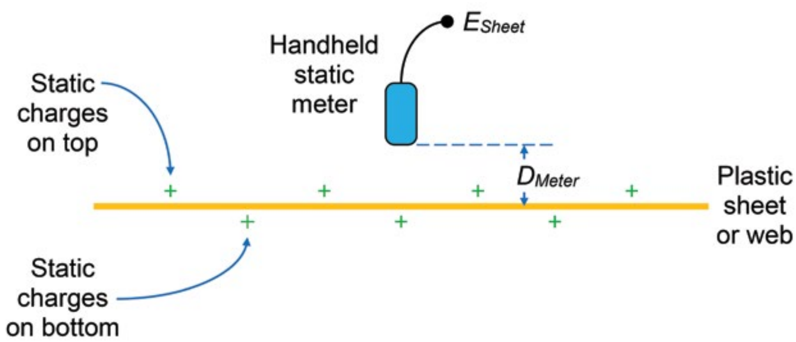

Figure 1: Hold the meter distance D_{Meter} from the charged sheet or web

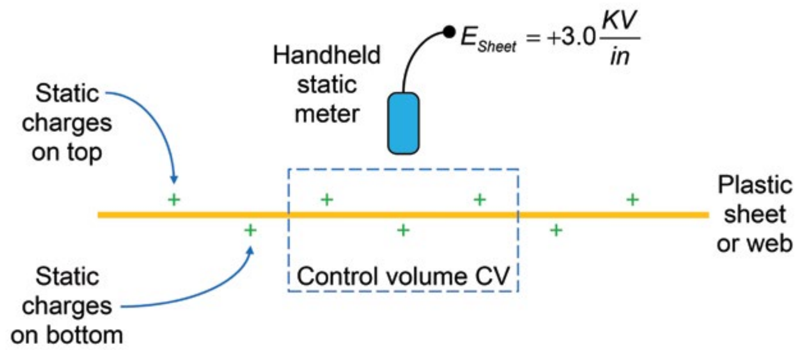

Figure 2: The static meter responds to all of the charges in control volume CV.

For example, if the calibration distance is 1 inch and the meter reads "+5.0 KV," the electric field is found in (1) to be +5.0 KV/in.

$$E_{Sheet} = \frac{V_{Displayed}}{D_{Meter}} = \frac{+5.0\ KV}{1.0\ in} = +5.0\frac{KV}{in}$$

The static meter responds to charges on both the top and on the bottom of the web. To help me take readings, I do this "mental exercise." In my mind's eye, I draw a control volume in front of the static meter in Figure 2 around the plastic sheet or web. The static meter responds to all of the charges inside the control volume. Since there are three positive charges inside the control volume, the meter reads +3.0 KV.

Notice that some of the charges are on the top and some are on the bottom. The meter responds to all of the charges on both sides. So, we can take static reading from either side. We'll get the same reading from either side. This is good because we can pick whichever side is safer and easier to measure. There is no need to measure both sides.

Now, let's solve the static problem. Suppose the process in Figure 3 has high static on finished material that causes a problem. Of course, we should measure the static level E_{Finish} to see how much static is causing the problem.

To solve the problem, write down the static readings along the material flow in Figure 3 beginning with the incoming materials, exiting each process step, and finishing with a reading on the finished material. Look for high static readings. High readings indicate static problems. And, look for big changes from one reading to the next. These changes in readings indicate sources of static in the process. Finding the sources is the key to solving the problem.

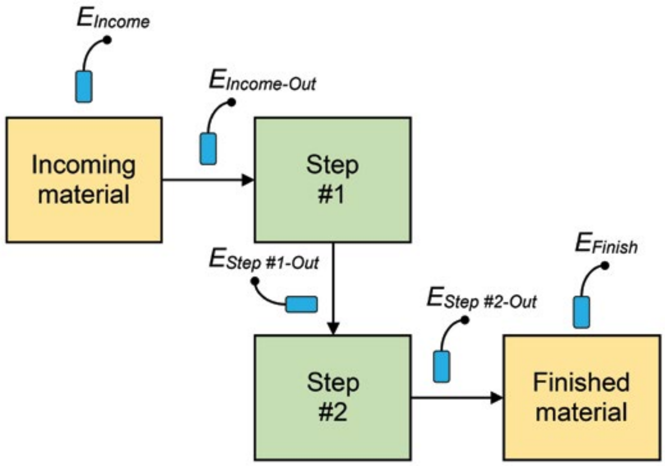

Figure 3: Take static readings along the material flow through the process.

High readings indicate static problems. And, look for big changes from one reading to the next. These changes in readings indicate sources of static in the process.

Suppose that E_{Income} in Figure 3 is too high. The static problem may be caused by high static on incoming materials from your supplier. Solve this problem by working with your supplier.

If E_{Income} looks OK, then look at $E_{Income\text{-}Out}$. If $E_{Income\text{-}out}$ is high, then there is something about how we handle incoming material causing high static. Focus on reducing static in how we handle incoming materials, or dissipate static on the material entering the process. Many good static dissipators are commercially available.

If $E_{Income\text{-}out}$ is low, then look at $E_{Step\ \#1\text{-}out}$. If $E_{Step\ \#1\text{-}out}$ is high, then there is something going on in process Step #1 causing high static. Focus on reducing static in process Step #1, or dissipate static on material exiting Step #1.

If $E_{Step\ \#1\text{-}out}$ is low, then look at $E_{Step\ \#2\text{-}out}$. If $E_{Step\ \#2\text{-}out}$ is high, then there is something going on in process Step #2 causing high static. Focus on reducing static in process Step #2, or dissipate static on material exiting Step #2.

And, of course, dissipate static on the finished material to keep E_{Finish} low.

When static is well controlled, write down the static readings again along the material flow in Figure 3 from the beginning incoming materials, exiting each process step, and finishing with a reading on the finished material. This ensures that all readings are low and that the static problem is solved.

Solve static problems by using your handheld static meter to locate the sources of static charging. Dissipate static at the sources of charging. And, dissipate static at the process location that has the problem. Then, use your static meter to verify that the problem is solved. ■

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The need for quality static control and monitoring the static environment has become more and more critical. As the converting industry continues to require cleaner and higher-quality output, a smarter static neutralization system is key to success. As the worldwide leader in static control, Simco-ion's application experts offer individualized static solutions to meet the needs of todays' converting industry.

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Combating the Invisibles of Static Control

Contributed by Kevin Coldren, Simco-Ion Sales and Business Development Manager

Ions are all around us, and, when trapped on an insulative surface or isolated conductor they create static charges which interfere with value added converting processes like printing, coating, slitting, and laminating. This interference can take many forms: printing/coating defects, process slowdowns/jams, contamination and operator shocks, to name a few. Unless remedied, this interference will continue unabated, as will the losses to the converter.

How does one combat the invisible? Start with introducing smart technologies: monitored static eliminators, supported by static sensors, and closed loop feedback systems. Take a systematic approach that proactively eliminates static and provides communication and then add in connectivity to your PLC, so that data on system performance is available when and where it is needed.

Once the interference posed by static charges is eliminated, converters may still have to deal with residual contamination. Rather than relying on compressed air devices that simply relocate the contaminates, best practice is to employ a means of capturing the contaminate such that it is not only removed from the substrate but eliminated from the converting process. Current generation contact cleaners rely on engineered, traceable elastomers and adhesives, evolved well beyond the "tacky rolls" of old, and remain the best choice for printers, coaters and metallizers who insist on eliminating contaminate from their critical, valued added processes. For faster web speeds, or applications where voluminous contaminate threatens to overwhelm the converting process, there are vacuum systems, some with newer clamshell designs, that will consistently remove particles well below the visible (>50 micron) spectrum. These vacuum systems incorporate monitored static control and monitored vacuum levels for maximum effectiveness.

The IQ Power Static Neutralizing System is an unparalleled lineup engineered with the technology that brings complete monitoring intelligence with a user-friendly interface. The system provides the highest performance available with versatile, innovative configuration and simple installation options.

While ions, static charges, and associated field lines remain largely invisible, their negative impact to converters is not. Higher web speeds increase the charge on a substrate which then traps contaminate and leads to printing and packaging defects. Field lines coming from the charged surface interfere with printheads, nearby electronics and are directly linked to operator shocks and fire risks in hazardous environments. Even after static removal a 10-micron particle held onto the web by gravity will become a clearly visible 100-micron particle after coating or lamination, resulting in an obvious defect. A systemic, ROI driven approach to static and web cleaning, that takes clear advantage of advances in automation (high power, small space ionizers, Industry 4.0 communication) and cleaning technology, is the best way for the converter to improve safety, lower operating costs and improve efficiency. ■

Troubleshooting Defects in Extrusion Coating

By **E. J. (Ted) Lightfoot**, Ph.D. , Contributing Writer

Extrusion coating is typically the most cost effective coating method for long runs of melt processable material and tends to be used for commodity applications. Quality plays a different role for commodity products than specialty products. True commodity markets are hyper-competitive. Where premium pricing of specialty products depends on differentiated features, any differential pricing on commodity products usually reflects quality.

Defects can represent an excursion from normal operation or reflect the limits of your process capability. In the first case, your goal is to get back to normal operation. Troubleshooting needs to be quick, efficient, and easy to implement. Projects to reduce the normal level of defects often take longer and will be discussed separately.

Operators should have a troubleshooting guide that gives a list of concrete actions they can take to resolve the "usual" defects. The guide should give boundaries to ensure safe operation and prevent damage to the equipment. You also want to document their efforts and limit how much they try before seeking help: troubleshooting gets expensive. The most comprehensive guide to stary with is the TAPPI Ultimate Web and Roll Troubleshooting Guide. Not only will this help you deal with the usual defects, it can help with some unusual defects as well.

But there are three issues with published guides. First, they contain only public knowledge: more is known than has been published. Second, these guides are generic: your guide should be specific to your products and your line. Finally, while experienced people are likely to get the right diagnosis when consulting a guide, the greener people are, the less likely that becomes. The cost of pursuing a missed diagnosis can be high.

A more robust approach to dealing with unusual defects, given today's high employee turnover, is a database of quality issues keyed to the attributes of the defect. Table 1 shows a basic defect classification scheme (your markets may require other attributes, categories, and layers). There are three reasons all quality excursions should be

Table 1- Sample top level defect classification scheme

ATTRIBUTE	CATEGORIES					
Geometry	Space filling (pattern)	Linear	Spot / shape			
Manifestation	Thickness variation	Inclusion	Void	Other visual	Property	Nonplanarity
Map location	Regular repeating	Lane	Random			
Depth	Top of coated surface	Coated layer (which?)	Lower interface	Base	Coversheet	
Composition	Same as bulk	Ingredient in the mix	Contaminant			
Directionality	MD	TD (CD)	Oblique	None		
Detection geometry	Transmission (bright field)	Transmission (dark field)	Reflection			
Onset	Gradual	Sudden	Start-up	Sporadic		
First detectable	Mix	Coating	Drying	Laminating	Off-line testing	

characterized and recorded in a database. First, the database provides continuity: an experienced engineer may remember a similar situation from years ago, a new hire cannot. Second, the database aids diagnosis: the questions and characterization you need to put the problem in the database will lead you to root cause and tell you how to resolve the majority of defects. Third, the database helps management track the cost of poor quality (so all incidents should go in the database).

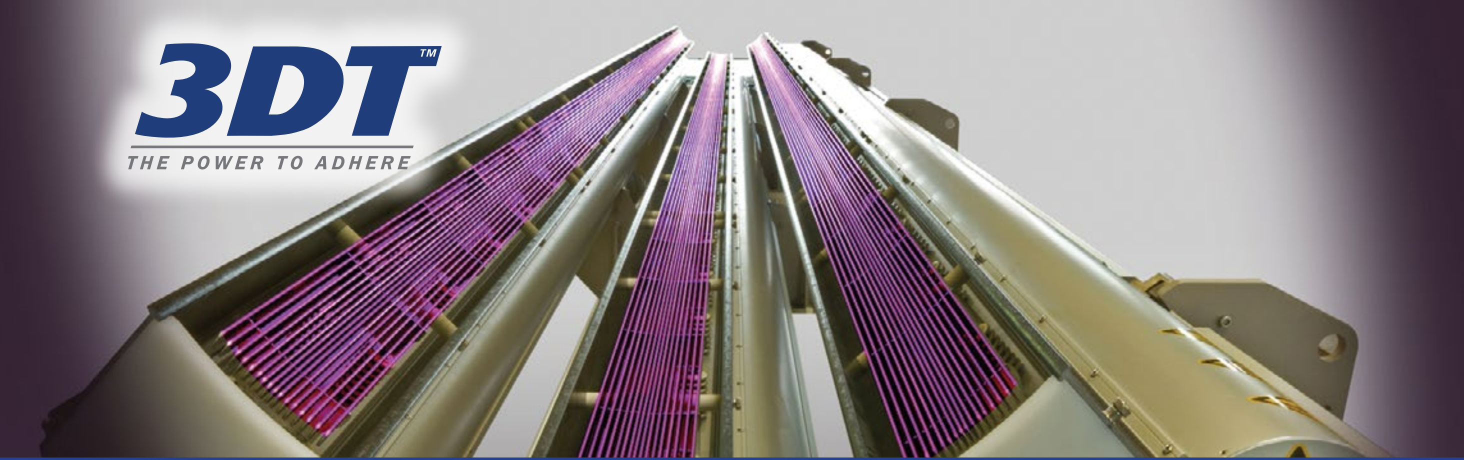
The database can show all similar previous cases, see what was tried before and what worked. For example, a rough pattern on the surface could be melt fracture or sharkskin. An experienced eye might know which; a new engineer may not. Should you add a slip agent or slow the line down? Slowing down will eventually work – but productivity is critical too. You can experiment, or, if you have a database, you may find out that slip additives have been tried before and never worked with this resin, the problem is correlated to polymer lot and speed. That would set you a step ahead on a different path.

The first question to ask when figuring out what happened is "what changed?" That can mean simple detective work (checking lots etc.). But there are other tools that find and alert you to changes before you get into trouble. The sooner you become aware of a shift, the less yield loss you are likely to take.

Statistical process control can be done on paper, but SPC software packages are available to save labor. Techniques like CUSUM (cumulative sum) provide early warning as the process starts to shift.

The remaining options discussed here are sometimes called "advanced process analytics". Process historians monitor process settings and conditions (from the DCS or PLC) allowing you to compare how the product is running today with how it ran in the past. There are also measurement techniques that can alert you to mechanical issues. Vibration analysis is very effective at diagnosing wear in bearings or other rotating equipment. You can relate the frequency of any vibration to specific pieces of equipment (e.g., bearings). Machine direction gauge measurements can also be passed through a Fast Fourier Transform to produce a "spectral signature" for the line running a given product. A change at some frequency offers the same warning as vibration analysis, but is monitored continuously. The normal on-line instruments for product release are also useful. Transverse (cross) direction gauging will often detect specific gauge defects (like "spiking" – something blocking the flow inside the die). Of course, on-line optical inspection can be used to control chart defect levels (although you need to set them up properly to prevent a rash of false alarms), show real time images of the defects and where they occur (e.g., are they in a lane?).

Does this always work? No. Usually you can control the "usual" defects with a troubleshooting guide. Usually, the diagnostic questions and database will connect you to helpful history and give enough understanding to resolve the unusual defects. Usually, the advanced process analytics will pinpoint problems early. But sometime, none of this works. In that case, you need to move on to the techniques for defect reduction projects (which will be discussed in a future article). ■



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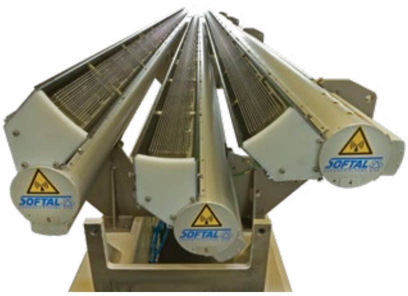

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Static Control for Corona Treaters

Corona treaters can deposit very large amounts of static on web.

By **Kelly Robinson,** Contributing Writer

Figure 1 is a chemical reactor that uses an electrical discharge to modify the chemistry of the treated surface. Treaters are often used before lamination to improve adhesion and before coating to improve wettability and adhesion. Corona treaters incorporate oxygen species into the treated surface. Atmospheric pressure plasma treaters can incorporate nitrogen and other chemical species. These chemical changes improve wettability and increase adhesion.

The corona treater in Figure 1 produces two, unwanted by-products; ozone in the air and static on the web. After we neutralize the static, the treated surface will still have the chemical modifications that provide the improved wettability and higher adhesion.

Table 1 summarizes the functions of the four key components of a corona treater.

1. High Voltage Electrodes

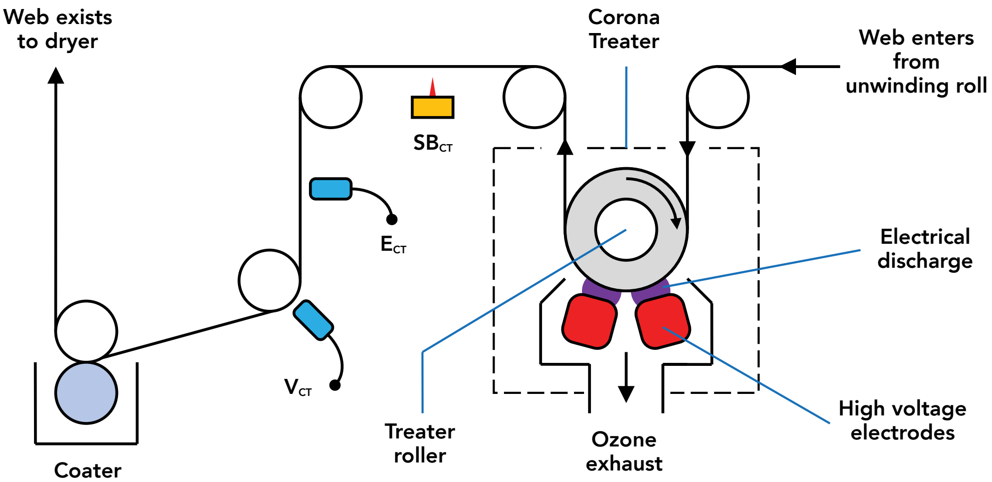

Figure 1: The corona treatment before coating improves wettability and increases adhesion.

#	Component	Function
1	HV Electrodes	Provide high voltage to the electrical power
2	Power Supply	Provides electrical power
3	Treater Roller	Provide ground for the discharge, and conveys wen through treater
4	Sparking damages release liners.	Removes ozone

Table 1: Corona Treater Components

– A corona treater in Figure 1 has two electrodes that provide the high voltage needed to form the electrical discharge. The high voltage (7 – 15 KV) at roughly audio frequency (5 – 30 KHz) forms an electrical discharge between the electrodes and the nearby treater roller. The electrodes surfaces may be bare metal or ceramic.

2. Power Supply – A power supply (not shown in Figure 1) converts 60 Hz electrical power into the high frequency, high voltage power needed by the corona treater. These power supplies are designed to deliver large amounts of power (5 – 25 KW). A typical, industrial scale, corona treater consumes about as much power as a residential house.

3. Treater Roller – The treater roller serves two important functions. It is the ground for the energetic, electrical discharge that drives the valuable chemistry. And, the treater roller conveys the web through the energetic electrical discharge. The surface of the treater roller may be either bare metal or be an insulating material such as rubber or ceramic. Either the electrode surface or the treater roller surface must be insulating so that the energetic, electrical discharge is uniform rather than being an electrical arc.

4. Ozone Exhaust – The electrical discharge in a corona treater is chemically active. This discharge drives the chemical reactions on the web surface that promote wettability and improve adhesion. This chemically active discharge also forms ozone and oxides of nitrogen that must be removed. The ozone exhaust system removes these unwanted by-products.

Another unwanted by-product of corona treatment is static charge on the web. I first thought that static from a corona treater should always be negative because electrons move faster through air than positive ions. However, I have measured both negative static and positive static exiting corona treaters. And, the magnitude can be very low or very high. So, we must be ready to dissipate large amounts of static of either polarity. This is an update of my earlier column.

When the treater is operating properly, the static will be on the treated surface because the charge comes from the electrical discharge. When the web loses contact with the treater roller, backside treatment can deposit static charges on the untreated web surface. Backside treatment occurs when the web is baggy or at high speeds when air gets under the web. When we solve these problems, the static is all on the treated surface.

The best practice is to install powered static bar SB_{CT} in Figure 1 on the web exiting the corona treater facing the treated surface. While a passive static dissipator such as a tinsel strand may be used, I recommend using a powered static bar so that the web entering the coater is as charge-free as possible. Passive static dissipators always leave a low level of static on the web.

Take two static readings to verify that static is well controlled on the web exiting the corona treater before entering the coater. Use an electrostatic fieldmeter to measure E_{CT} in Figure 1 on a web span exiting powered static bar SB_{CT}. Exiting a powered static bar, reading E_{CT} should not exceed ±2 KV/in.

Use an electrostatic voltmeter to measure V_{CT} in Figure 1 when the web exiting the corona treater is wrapped on a grounded, metal idler roller such as a hard-coated aluminum idler roller. While I have shown V_{CT} in Figure 1 being taken on the treated surface, it is OK to take reading V_{CT} on the back, untreated surface, if this is safer or more convenient. Reading V_{CT} should not exceed ±10 V/mil (±0.4 V/mm) of web thickness. For example, for a 2 mil (50 mm) thick web, reading VCT should not exceed ±20 V.

Corona treaters can deposit large amounts of static on treated surfaces. This static is an unwanted by-product of treatment. Dissipate static on the web from corona treaters using a powered static bar installed on a web exiting the corona treater facing the treated surface. ■

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4 Steps to Resolving Coating Defects

By **Mark Miller**, Contributing Writer

Every coating process engineer and equipment operator wants to know where to start when a coating problem surfaces with their product, so let's start with the surface of the problem. The main thing to do is properly identify the coating defect you are seeing. This will allow you to concentrate on the process, equipment, or material issue and not spend time on unnecessary investigation. So, look at the coating defect and identify the issue. No, no… really LOOK at the coating defect. Analyze it. How? Besides looking at the defect off-line after it is produced with the naked eye, or under a microscope, you can look at the defect as it occurs on the web with on-line inspection equipment. Visualization and understanding the defect is an important first step in the troubleshooting process. The remaining four areas are based off of true understanding of what you are seeing.

A good example of this is when a coating streak occurred in a process I was involved with. Initially the thought was that the fluid had gels in it. Without looking at the coating defect under a microscope, the process engineer immediately tore down the pumps, hoses and filters and replaced them. Guess what? The defect remained. Upon closer examination (100X magnification), the streak was a film particle that was trapped between the fluid and the substrate. Once the substrate was properly cleaned, the defect went away. So, again, look at the defect.

The second step is to collect defect samples and non-defect comparative samples, process data from those runs, and product data from the raw materials. Time spent with this information will provide the road map to the defect solution. Make sure the information collected includes discussions with the keeper of the information, so you understand if there are discrepancies in what is provided and what is reality. This is where the defect solving team is formed. The stakeholders in the solution should include the keepers of the information.

The third step is to utilize the collected information to develop a designed experiment that will push the process and materials to define the defect. Work with the defect solving team (engineers, operators, and material control) to identify the top five materials and process conditions that are most likely to contribute to the defect in question. This will be the basis of the experimental design. Utilizing five variables will allow you to statistically analyze all the variables with the fewest number of design points without losing their interactions. In the design of experiment lingo, this means that you should run a 25-1 DOE.

Once the experimental design is established, run the trial test to see what shakes out as important to controlling the defect. The first trial may be one of three, but within three trials you can narrow the focus down to what is really behind the defect. The result can simply be qualified as "yes" or "no" that the defect is present but, having a graduated scale for the defect will help concentrate your efforts.

The last step in the process is to utilize the results so that the defect does not happen again. You may laugh at this, but if you have taken the time to deal with a defect that required as much thought, energy, and time as you have spent on the recent issue then don't stop before the results are communicated. Making sure everyone in the product chain, form raw material supply to converted product delivery, is aware of the defect and the reasons behind the solution is critical. The only thing worse than a coating defect, is a coating defect that comes back after being cured. Happy troubleshooting! ■

STATIC CONTROL:
Crucial to Fluid Converting Processes

By **Matt Fyffe,** Vice President and General Manager at Meech International

The static charge often found on converting lines is an ongoing problem for a variety of industries. Paper, foil, plastic and various other materials can all fall victim to the effects of static charges – the results of which can be detrimental to production and health and safety.

Static is typically the result of an imbalance of electrical charges on a substrate, which is generated through the friction or separation between two objects – a web unwinding from a roll to be formed for labeling or packaging, for example. When not controlled, static can attract dust, dirt and other assorted particles, causing machinery to become blocked or damaged and ultimately compromise the quality of the end product. This includes print being out of register, small holes appearing in extruded film, and the final products appearing distorted.

In industries such as food and drink, where optimum product appearance is paramount, the competition on supermarket shelves is fiercer than ever. Engaging packaging and labels are designed to catch the eye of the consumer – any faded or inferior products are less likely to grab attention, so aesthetics are vital.

For companies in the healthcare and pharmaceutical sectors, the need for quality control is essential, as any products that are found to contain foreign bodies or contaminants within the packaging will be rejected outright.

Regardless of the sector, contaminated packaging and labeling can lead to excessive rework levels, as well as increased wastage, downtime and running costs. As convertors are faced with the pressure to deliver faster against increasingly tight deadlines, in order to remain competitive, the possibility of static charges being generated is further increased – fast running machinery generates static on the web surface and, by generating heat, can also increase static levels in the ambient air.

Static shocks can also lead to injury for workers in the vicinity. Though an initial static shock may subside quickly, the involuntary reaction of a worker may cause them to interact physically and suddenly with equipment or another member of staff.

Fortunately, technology is available that can counter the threat static poses.

Combatting Static

Static control measures should be carefully considered by converters dealing with manufacturing processes to ensure consistent quality. Containing ionization technology, static control solutions work to neutralize charges and, in tandem with a web cleaner, prevent the attraction of dust and dirt onto the web's surface. The technology employs high voltage AC or 'pulsed' DC to produce ionized air which creates a high-energy cloud of positive and negative ions to neutralize static electricity present on production equipment. This ensures that many potentially costly production problems are avoided.

Meech CyClean non-contact web cleaning.

Pulsed DC ionizing bars can provide short, medium and long-distance static elimination on a wide range of materials at each stage of the converting process. This highly regarded technology also benefits from today's industry 4.0 technology – an increasingly common concept that envisions significantly higher productivity and efficiency through people and machinery working together harmoniously.

Monitoring and adjusting the performance of connected static control equipment through a mobile phone, tablet or remote desktop, tracks equipment performance and allows the user to easily assess the ionizing performance. It can achieve this through LAN or WAN networks, which allow access to performance information at any place or time, enabling operating settings to be easily amended to ensure maximum productivity and quality of output.

But static control alone may not be enough to remove all traces of contamination. A web cleaner is a vital partner in ensuring any converted materials are in pristine condition.

Web Cleaners

Though static control provides a highly effective solution, combining it with a web cleaner allows for optimum web and converting performance. Contact and non-contact web cleaning systems are available – deciding on the most practical system depends on the web materials being processed, the application, the flexibility required by the converting line and the speed of the web.

Contact cleaners, as the name suggests, make contact with the web and break the boundary layer. Some such systems incorporate twin elastomer rollers, which are in full contact with the entire width of the web and physically lift debris from the web's surface. They are generally better suited to slower moving webs and more robust materials. Non-contact systems use blow-and-vacuum technology either side of the web, stripping the boundary layer of contaminants which are captured and subsequently removed. The use of air prevents issues surrounding marks or damage to sensitive webs.

Due to its impact on web and converting machinery performance, static's elimination should be a fundamental part of the quality control measures adopted by any converter. Combining automated static control and a web cleaner can allow for the most pristine of webs, guaranteeing consistent end-product quality, reducing the need for maintenance and ensuring high levels of health and safety are observed. ■

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Static Control for Adhesive Lamination

Prevent static from becoming laminated inside a multi-layer web using best-practice static control.

By Kelly Robinson Ph.D., Owner at Electrostatic Answers

The multi-layer web in Figure 1 performs better than a single-layer web. Printing on the "sealed surface" in Figure 1 is durable and scratch resistant. And, a thin barrier film laminated to inexpensive thicker web makes a strong packaging film that extends product shelf-life.

High-performance, multi-layer webs are often produced using adhesive lamination. Preventing static from becoming trapped inside is our main static control goal. To accomplish this goal, first identify each source of static charging. Then, use best-practice static control to neutralize static from each source.

The multi-layer web is formed at the lamination nip in Figure 2. First, let's look at the web exiting the Dryer / Oven. The adhesive surface exiting the Dryer / Oven is normally static-free. Once the adhesive is coated, the surface of the adhesive touches nothing until lamination. So, the adhesive surface is normally not a problem.

However, the back, uncoated surface exiting the Dryer / Oven in Figure 2 likely carries static from touching the hot, idler rollers. The best practice is to dissipate static on the web exiting a dryer or oven (see Static Beat | Control Static on Insulating Webs in Dryers). This uncoated web surface will be exposed after lamination. So, while static control is recommended, we can use an economical passive dissipator.

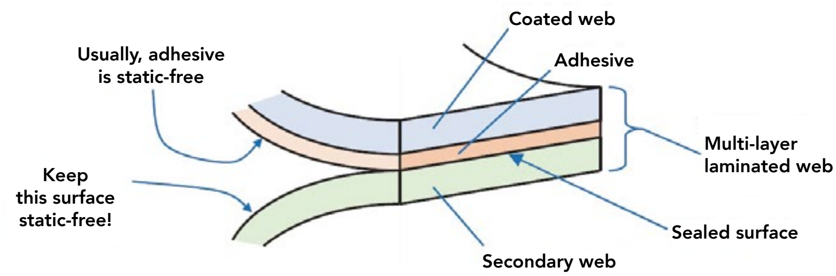


Figure 1

Install passive static dissipator SD_{DRY} in Figure 2 on a web span exiting the Oven / Dryer facing the uncoated web surface that touched the hot idler rollers. This static dissipator may be a passive static dissipator (see Static Beat | How Do Passive Dissipators Neutralize Static?).

Verify that the web exiting the Dryer / Oven carries low static by measuring E_{LAM} IN 1 in Figure 2 using a hand-held electrostatic fieldmeter (see Static Beat | Assess Static Risks Using Electric Fields). The average fieldmeter reading should not exceed ±5 KV/in.

The secondary web in Figure 1 is usually the problem. Any static on the "sealed surface" of the web from the secondary unwind will be trapped inside by lamination. Once static is sealed by lamination, it cannot escape. This static will be present in the web for the life of the product. So, preventing this static from becoming trapped inside the web is our main goal for lamination static control.

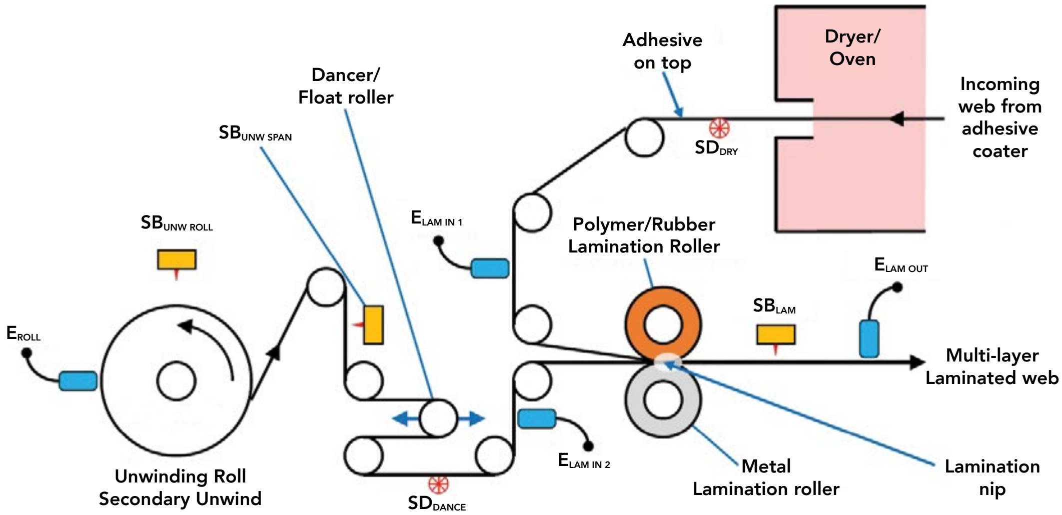


Figure 2

An unwinding roll can store a large amount of static from the process where the roll was wound. The best practice is to use two powered static bars to dissipate static on both sides of the web exiting an unwinding roll (see Static Beat | Unwinding Static).

Install powered static bar $SB_{UNW\ ROLL}$ in Figure 2 to dissipate static on the outside surface of the unwinding roll. This static bar should be a long-range, pulsed DC static bar so that good neutralization efficiency is maintained (see Static Beat | Static Dissipator Neutralization Efficiency) as the roll diameter decreases.

Verify that $SB_{UNW\ ROLL}$ functions properly by measuring E_{ROLL} in Figure 2 using a hand-held electro-static fieldmeter (see Static Beat | Assess Static Risks Using Electric Fields). The reading should not exceed ±15 KV/in.

Install powered static bar $SB_{UNW\ SPAN}$ in Figure 2 to dissipate static on the inside surface of the web exiting the unwinding roll. This static bar should be short-range static bar installed after the first fixed idler roller facing the inside surface of the web roll (see Static Beat | Unwinding Static).

Dancers or Float Rollers can deposit a significant amount of static on the web surface that touches the moving roller. The best practice is to dissipate static on a web exiting a dancer or float roller. The web surface that touches the Dancer or Float roller in Figure 2 is the bottom surface of the web that will be exposed after lamination. So, while static control is recommended, we can use an economical passive dissipator.

Install passive static dissipator SD_{DANCE} in Figure 2 on a web span after exiting the Dancer or Float Roller facing the web surface that touched the moving roller. This static dissipator may be a passive static dissipator (see Static Beat | How Do Passive Dissipators Neutralize Static?).

Verify that the web from the secondary unwind carries low static by measuring $E_{LAM\ IN\ 2}$ in Figure 2 using a hand-held electrostatic fieldmeter (see Static Beat | Assess Static Risks Using Electric Fields). The average fieldmeter reading should not exceed ±5 KV/in.

The Polymer / Rubber Lamination roller in Figure 2 can deposit a large amount of static on the web. The best practice is to dissipate static on a web exiting a lamination nip.

Install powered static bar SB_{LAM} in Figure 2 on the web span exiting the lamination nip facing the web surface that touched the Polymer / Rubber Lamination Roller. This static bar should be short-range static bar installed to maximize its neutralization efficiency (see Static Beat | Static Dissipator Neutralization Efficiency).

Finally, verify that the Multi-layer Laminated web exiting our process carries low static by measuring $E_{LAM\ OUT}$ in Figure 2 using a hand-held electrostatic fieldmeter (see Static Beat | Assess Static Risks Using Electric Fields). Exiting a properly functioning powered static bar, the average fieldmeter reading should not exceed ±2 KV/in.

The over-arching static control goal for lamination is to prevent static charges from becoming sealed inside the web. Practice good static control and follow best practices to achieve this goal. Verify that static is well controlled using a hand-held electrostatic fieldmeter. In general, static readings should not exceed ±5 KV/in. ■

INNOVATING SURFACE ANALYZATION AND CORONA TREATMENT

Contributed by QC Electronics

Forget about dyne testing, QC's surface analyzation lab has all the equipment you need to outsmart your competitors and put your product in first place. This lab service is free of charge to new and existing QC customers. Send your material to QC and become an expert overnight.

QC Electronics has established an elite surface analyzation laboratory for the corona treatment of samples, extensive material analysis and consultation. The laboratory consists of a brand new 48″ QC sheet corona treatment system (converts to bare roll or covered roll depending on application), brand new top-of-the-line material characteristic measurement and surface analyzation devices for pre and post-treatment material analysis, and various dyne testing devices. QC is also in the process of developing a new plasma treater; we are expecting to release this product early 2022.

PROCESS

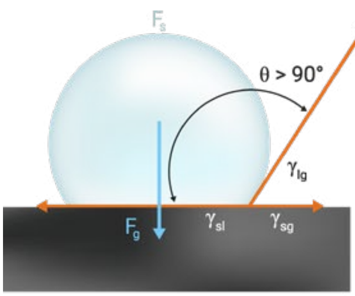
Once QC receives the material, turnaround is just 1-3 days depending on the material. The material will be tested prior to corona treatment to get an understanding of the material's original state. Then, the material will undergo the corona treatment process and tested in our lab immediately after. The equipment tests and analyzes the material, then generates a report on various changes in the properties of the material. Just to list a few - molecular changes, contact angle measurements, wettability diagrams, and more. The image below illustrates the three different types of contact angles: Hydrophobe, Hydrophile, and perfect wetting. QC's lab team will review the report and then present you with a detailed material analysis, treatment report, molecular changes of the material report, consultation for understanding the elements of the reports provided, and advice on how to achieve the best adhesion results based on the customer's material, application, and process. The QC team has undergone vigorous surface analyzation training to guarantee the expertise necessary to understand and produce results for difficult-to-treat and complex materials.

CUSTOMER CARE

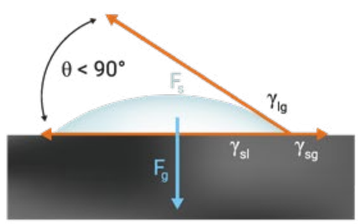
QC's lab equipment analyzes your material in microscopic detail allowing the lab team to instantaneously recognize the process that will exude the best adhesion results. The equipment shows QC customers detailed molecular changes the material experiences pre and post-treatment to fully understand the vital information that determines exactly how your product chemically reacts to corona treatment. This information guides our customers in developing the highest possible quality of product. QC's surface analyzation lab is the only corona treatment lab that produces and provides this level of detail free of charge to its customers. QC is the only corona treatment system manufacturer that can show and provide this level of genuine care for our customers' success.

QC has helped numerous customers better understand their material itself, how its molecular structure changes with corona treatment, and how to apply that information to maximize their product(s) profitability and value. The end goal of our sample process is to provide our customers the necessary information to take their products to the next level.

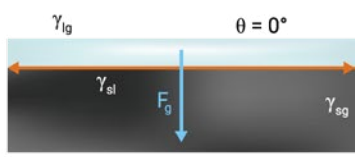
Contact sales@qcelectronics.com for more information on QC's sample services and capabilities. ■



Hydrophobe



Hydrophile



Perfect wetting