

The Basics of Static Electricity

Electro static discharge can be a large disruptor of processes within manufacturing facilities. It can cause problems with maintaining product quality and keeping process speeds at optimum levels.

What Causes Static Electricity?

Static electricity occurs most often on the surface of nonconductive materials but can also occur on ungrounded conductive surfaces. A static (non-moving) electric charge is created whenever two surfaces come into contact and separate, or when friction occurs between them. When two materials are in contact, electrons may move from one material to the other.

Atoms with weakly bound electrons tend to lose them, while atoms with sparsely filled outer shells tend to gain them. This is known as the triboelectric effect. When the materials come in contact, and then are separated or have friction between them, they retain this charge imbalance.

Number of electrons: M



This charge imbalance is where static electricity comes from. Both positive and negative charges will remain static until contacted by or in close proximity to a conductive or grounded surface. The static electricity sparks that are generated between surfaces or people is an example of such flow.

Number of electrons: N



How to Control Static Charge Buildup

1) Determine the source of static buildup

The first step in static control is to determine where in the process static charges are being generated. Many times a static charge will be located right where contact, detachment or friction are occurring within your process. A simple diagnostic tool to determine if static is present is a static meter. This is a hand held instrument that will provide you the polarity and strength of the static charges present. Knowing these values can help determine how to prioritize your plan or measure the effectiveness of any static control product.

2) Eliminate or minimize the source causing a static charge

Having identified the source of static, consider eliminating, minimizing or treating the source generating the charge.

- Replace non-conductive points of contact with conductive materials connected to earth ground.
- Prevent parts from rubbing against themselves or other non conductive surfaces.



- Increase relative humidity. When relative humidity increases, the surfaces and materials in a given environment can absorb the moisture in the air or they will form a very thin surface layer of moisture which dissipates accumulated static charges.

3) Treating Static Buildup

It is not always possible to eliminate the sources of static buildup. In those cases, ionization treatment is required. Ionization is the process of converting an atom or molecule into an ion by adding or removing electrons.

EXAIR's shockless ionizers use a 5000 VAC transformer to supply power to an emitter point. On the positive phase of the cycle, electrons are stripped from air molecules in the vicinity. On the negative phase, electrons are added to air molecules in the area. The air molecules are then in an unbalanced state of charge and become what is called an ion. When these ions come into contact with an unbalanced molecule on a charged surface, an exchange of electrons takes place. The air molecule is no longer an ion and the surface molecule is now neutralized (balanced).

Products for Removing Static Charge

To improve effectiveness EXAIR marries its engineered blow off products with ion technology. The use of laminar air flow distributes the ions faster, at further distances, and into somewhat inaccessible areas. EXAIR has a broad range of static eliminating products to serve most any application.

When static is a problem on moving webs, sheet stock, three dimensional parts, extrusions or packaging, EXAIR has a solution. Our Gen4 static eliminators have undergone independent laboratory tests to certify it meets the rigorous safety, health and environmental standards of the USA, European Union and Canada that are required to attain the CE and UL marks. They are also RoHS compliant.

EXAIR's Gen4 Static Eliminators include the:

- | | |
|---------------------------|----------------------|
| Gen4 Super Ion Air Knife, | Gen4 Ion Air Cannon, |
| Gen4 Ion Air Gun, | Gen4 Ion Air Jet, |
| Gen4 Super Ion Air Wipe, | Gen4 Ionizing Bar, |
| and Gen4 Ionizing Point | |

EXAIR's **Basics of Static Electricity** white paper will help you learn what causes static electricity and how it develops. Discover what steps can be taken to eliminate static.

Learn more about static and each of our Gen4 Static Eliminator products by visiting our Web Site at www.exair.com. Download the entire white paper at www.exair.com/sebasics05.htm.

Application Spotlight:

Super Ion Air Knife Eliminates Static on a PVC Substrate

Application Goal:

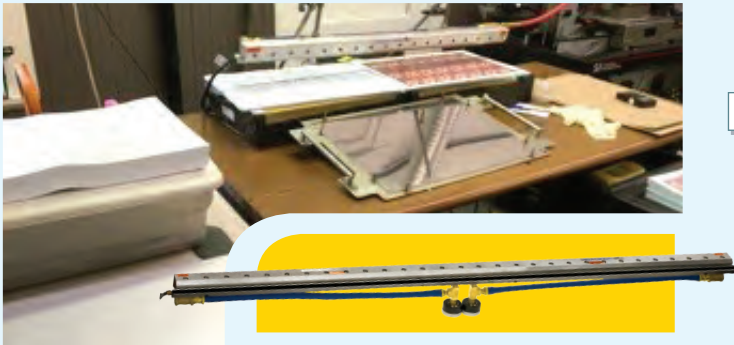
Reduce defects from dust and particulate during a PVC substrate printing and laminating process.

The Problem:

A manufacturer prints custom logos on PVC substrate cards before they are laminated. Between printing and laminating, static electricity causes dust and dirt to adhere to the substrate. The company scrapped an average of 200 cards per 1,000 card lots during the winter months due to blemishes. With EXAIR's **Model 7905 Static Meter**, the substrate's static charge measured 19 kV/inch. Operators tried to wipe the material off with soft fabric, but the wiping only increased the static while moving the dust around, not off, the laminate.



The Solution:



The customer installed a **Model 111236PKI 36" (914mm) Super Ion Air Knife Kit with Plumbing Kit Installed**. Once installed, only 30 cards were lost out of 1,000 cards. This is an 85% reduction in defects from blemishes. Also, operators no longer needed to wipe off the debris, which made their job faster and eased their burden of preventing defects from dust. The Super Ion Air Knife lowered the static charge on the substrate from 19 kV/inch to 1.3 kV/inch in a single pass.

Editor's Comments:

The Super Ion Air Knife eliminated 85% of the card waste, reduced static on the substrate to 1.3 kV/inch, and lowered the time it took to make each product. These improvements allowed the company to increase production and shipments, which has increased the number of customers they are able to satisfy.



EXAIR unconditionally guarantees its cataloged products for 30 days.

If you are not satisfied for any reason within that time, you may return the product for full credit with no restocking charge.



New Application Checklist

EXAIR products solve a variety of problems. Please call our Application Engineers at 1 (800) 903-9247 or e-mail them at techhelp@exair.com for assistance with yours.



A company manufactures sintered metal parts using powdered metal. After the powdered metal is sintered and cooled, the manufacturer performs a reaming application. This produces a small amount of chips and dust which has been a housekeeping issue. They were manually cleaning the mess and needed to eliminate the cleaning process. The customer ordered the **Model 6193-5 five gallon Mini Chip Vac** to pull the small chips and dust into the chip vac which can be emptied easily. This saves time and eliminates housekeeping issues.



A medical hose and tubing coupling manufacturer was having difficulty removing static and particulates from plastic coupling components. Their secondary cleaning process was labor intensive and not 100% effective. They chose to use the **Ion Air Gun** which proved effective at breaking the static charge and removing the particle contamination.



A manufacturing company is using the Ion Point to remove a static charge from a small plastic part. The static charge was interfering with an ink jet printing application and causing splatter on the part. The **Ion Point** eliminated static and improved the printing quality and the product appearance.



A west coast coffee company was looking for an inexpensive way to move their ground coffee from their grinder to a hopper on their fill machine which was 25' away. They ordered (2) **Model 6064 2" (51mm) Stainless Steel Line Vacs** and automated the previously manual transport application.



When the temperature outside drops and humidity plummets, static electricity problems are sure to make bad things happen, leaving you to deal with the associated production headaches. Order any Static Eliminator by March 31, 2019, and we'll include a **FREE Model 7929 AC Sensor**.



To learn more go to:

www.exair.com/05/sepromo.htm