Dirt Control in Statically Charged Environments

Dirt buildup is a problem in many types of production applications, especially where plastic, fiberglass or other materials that have a propensity to develop a static charge are used.

Examples we will address are as follows:

1. Plastic molded parts need to be packaged or painted and need to be dirt free.

2. Plastic blow-molded parts with holes cut need to have particulate removed from the inside as well as plastic and glass bottles which require dirt removal from the inside prior to filling.

4. Plastic bottles that require printing with a dirty surface, produces poor printing quality.

5. Plastic film or paper that needs to be printed requires a dirt free surface.

Plastic Molded Parts

In addressing dirt, there are various levels of dirt to consider. Fiberglass parts may be sanded prior to other operations. But such sanding creates extremely fine dust such that the dirt may need to be wiped, vacuumed or even washed off. Simply blowing will not suffice. However, for surface dust settling from the atmosphere and surface dust “attracted” to the part due to static charge can be easily removed with a small amount of compressed air “force” used with an ionizing (anti-static) bar or other static removal device.

While dirt “settling” can only be controlled in a production line by keeping the area extremely clean, it is not always possible. Clean suits are not always worn properly (or at all) and doors may not be kept closed, or filters not maintained adequately letting dirt into an area that should other wise be kept clean. That is why some “ionized” blow-off is necessary prior to painting or clean packaging. However, dirt “attraction” to a part can be controlled by placing ionizing “blowers” after molding to reduce or eliminate the static charge, thereby reducing dramatically any attraction of dust to the surface. The less dust attracted, the less dust there is to remove later and a cleaner part results.

Haug Ionizing Blowers are ideal to remove static charge after molding to minimize dirt attraction to a part prior to painting or packaging.

Depending on the nature of the part - size, shape or cost - the part may be blown clean by either a hand-held “ionizing gun” or some in-place unit consisting of either “ionizing nozzles”, or an “air gate” or an “air knife” type system. Obviously a hand-held unit requires additional labor but for complex parts with holes, crevices, and difficult to reach areas, or where the parts keep changing shape, this may be the only alternative. The best choice would be a repairable, ergonometric ionized hand-gun since typically these units get some rough handling when used. Poorly designed ionizing guns that are not repairable can add up to a heavy cost over time in replacement If parts are consistent, then a combination of fixed items from nozzles to air knife systems will work well. Simple, smooth shapes would require only an air gate or air knife system.

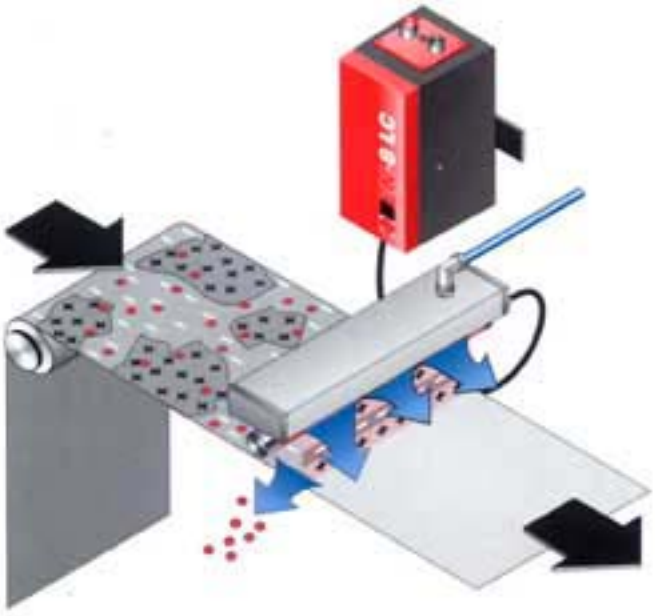
Haug Ionizing Hand Gun is light-weight, ergonometric and repairable which is ideal in rough handling environments.

An air gate system uses flat nozzles offset from each other that provide good blow-off coverage and use less air than an air knife type system. The air knife system however offers continuous blow-off coverage and may be more appropriate for critical surfaces.

Various alternative ionized systems are illustrated below.

The Haug Ionizing nozzles can address small areas for dirt blow-off.

The Haug Wing Jet Ionizer can also address small areas for blow-off that lends itself to a fan type of blow-off and with minimal space



The Haug Air Gate nozzle system with ionizing bar

The Nex Flow Air Blade Ionizer – air knife style system with an ionizing bar

For surface dust that is sticky, extra fine and will not be blown off even after static is removed, the options are vacuum, wiping and washing. Washing is the most costly both in its application and in the slowing of production output. Wiping is labor intensive with continual material costs but is the next best option. Wiping can also be wet or dry. Wet wiping reduces the need for static control because the damp cloth will eliminate the static when wiped. Dry wiping requires static control because the dry wiping itself will build up static charge. Usually an ionized blower will suffice. Some fine dirt may be removed by using vacuum systems.

Plastic Containers or Hollow Parts and Bottle Cleaning

Plastic containers or hollow plastic parts that are either blow molded or injection molded, with holes cut out for mounting or filling, become a huge problem for small particulate removal. The best way to minimize material getting into the hollow part is to keep the cutting tool sharp, minimizing the formation of small pieces that fall into the container. Static charge will make it difficult to remove strings and small pieces from inside the plastic. The only way to remove these materials is to have a vacuum at one end, blow inside the opposite end via an “ionizing” nozzle to eliminate the static inside and from the waste material, and to blow the waste toward the vacuum and then vacuuming out from the opposite end. If the holes are too small, the only other alternative may be washing.

A self-contained system with an “ionizing blow-off and vacuum” can address some parts as above. Such a system exists for bottles to basically blow ionized air into a bottle or other simple container, neutralizing the static on the particulate and bottle interior and blowing them upwards toward the vacuum at the top, drawing out the waste. Special versions are manufactured depending on the shape and size of the containers.

Haug nozzles blowing into one end of a container neutralize the static on the inside and on the waste material, and blows the waste toward the vacuum end while a vacuum opposite draws out the material.

The Haug Bottle Cleaning system combines both a blow-off into the bottle and a vacuum at the top.

Outside Surfaces of Plastic Bottles

Here the same logic for plastic bottles would apply to other cylindrical objects like pails that are printed or where thin or clear labels are applied requiring a very clean surface. The best way to clean such surfaces is to mount the product and "spin it" while it is blown with strong ionizing air from either a "wing jet style" ionizer (especially if a fairly strong force is required to remove sticky particulate) or an Air Blade Ionizer. A blow-off with ionized air should be continuous in such applications due to the high spinning speeds that have to be addressed.

Printing on plastic bottles requires a very clean surface to maximize quality in printing. The smaller the bottle, the more critical the cleanliness because the smaller the print. If the bottle is being corona treated (to improve the bonding of ink or sticking of labels) the surface must be very clean otherwise the corona treatment may not take, as you would be treating the dirt, not the surface.

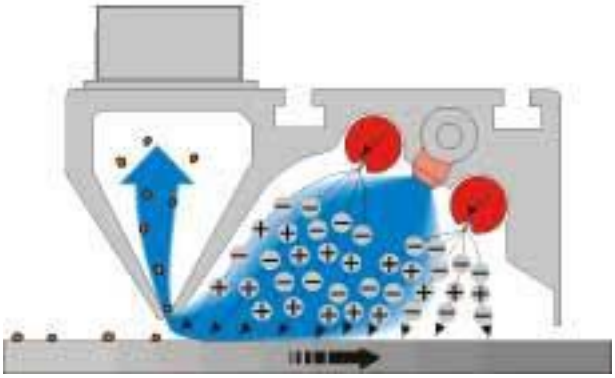
Plastic Film and Paper

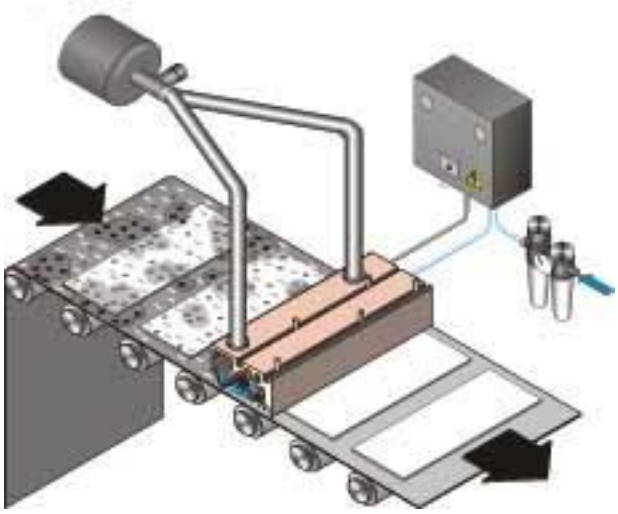
Plastic film and paper have long used ionizing bars in their production to not only prevent dirt attraction, but to prevent film and paper from curling due to static charge, especially at high speeds, with thin material.

But as the demand for productivity and quality increases, so do the speed of production, the tendency of dirt to collect, and the greater the need to clean. To this extend, complex "web cleaning systems" have been developed especially in high-

speed print applications. In these applications, minimizing dirt build up with web cleaning systems can minimize downtime, as well as improve production speed and increase quality. In a web cleaning system, along with an ionizing bar, you have some method of removing the particulate. It is either blow off with nozzles, an air knife style system, or perhaps pulsating blow-off nozzles, and even using ultrasonic sound to remove the dirt. These are non-contact methods. There are also "contact" methods such as using brushes to remove the dirt. Even with brushes, an ionizing bar is required to remove the static charge from the brush, in order to remove the dirt. In all web-cleaning systems, after the dirt is removed from the film, a vacuum system takes the dust away. It is particularly tricky to remove dirt accumulated on brushes. Typically non-contact cleaning systems are most desired especially on fast moving, thin film or thin paper webs.

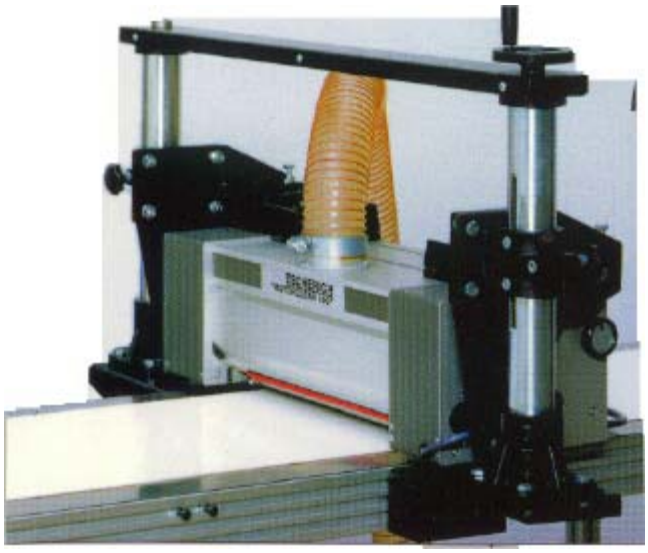
Not all films or paper require sophisticated systems. Depending on cleanliness requirements, a simple Air Gate system or Air Blade Ionizer will be adequate. For example, a very slow moving film on a packaging machine packing a food product may be subject to dirt attraction and collection from settlement. An Air Blade Ionizer will be adequate to clean off the dust and prevent the dirt from getting inside the package. Even large slow moving webs will find this solution more than adequate. Again, a competent static control company can advise on your particular requirements.





The Haug Model Stato 9 web cleaning system is a non-contact web cleaning system with blow-of nozzles, ionizing bars and vacuum collection

The WSI Inc. Ultrasonic web cleaning system can address fine cleaning requirements in high speed print applications.



The Haug Rotoclean is a brush – contact web and part cleaning system.

Important Points to Remember

In any environment where dirt is a problem, and therefore needs to be removed, it implies that the surrounding environment would be subject to dirt and the equipment should be of adequate quality to hold up for a long duration. One of the most critical pieces of any cleaning system is the static bar or nozzle and the power supply which operates it. The static control portion should have the following requirements:

1. The cable should be totally shielded – anything less affects the life span of the equipment and possibly its performance. Unshielded, or partially shielded cable will lead to pre-mature failure of the equipment, and unnecessary downtime and lost production if the cable is not offset and the power supply properly insulated. One way to test if the static cable and power supply are shielded, is to use an AC tester. An AC tester is a small pen-like device that can be obtained from many electrical outlets, that lights up when AC power is indicated. It is often "incorrectly used" to diagnose static bar operation since it only indicates power to the static bar – NOT whether it is adequate power. (More in point 2). If the AC tester lights up when you run it along the cable to the ionizing bar, or around the power supply to the bar, then the cable (and power supply) are definitely NOT shielded. Since the ionizing bar and power supply are such critical pieces to the operation of dirt removal on the materials discussed, it would make sense to purchase units that will actually last.

2. The power supply for the ionizing equipment should be at least 7 kv and the power supply should be repairable. Ionization for static removal occurs at 3600 volts. This is the voltage you need at the points on the ionizing bar or point. In addition, losses can occur in the cable. Over time, the transformer will weaken with age. It would only make sense that a higher kv unit would be better. Some manufacturers cannot, or will not repair their power supplies. They are usually riveted together and repairing them is difficult or impossible. Power supplies are costly.

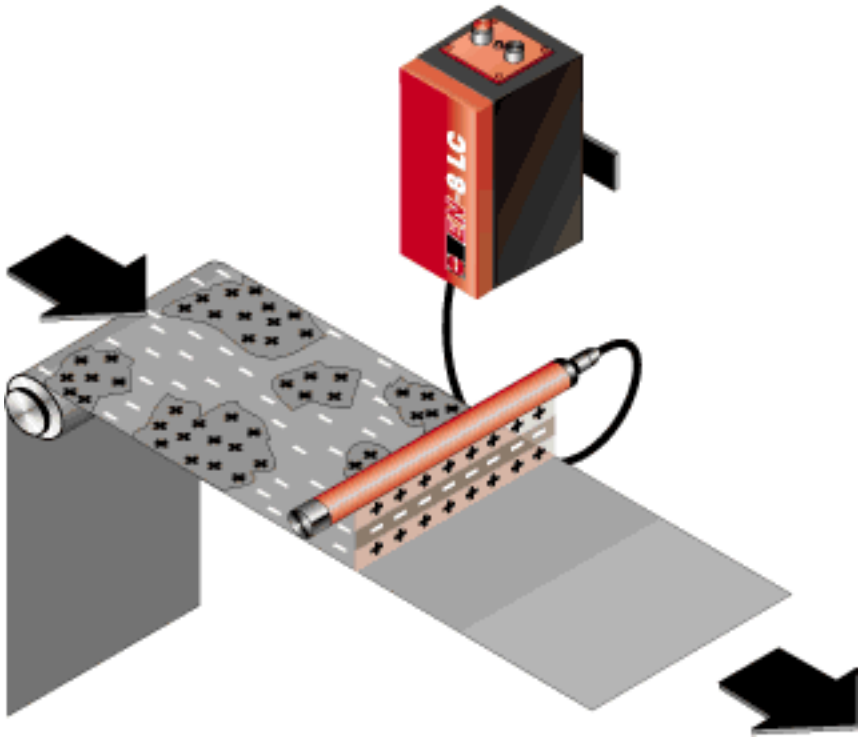
3. The ionizing bars or points should be properly designed. They should be easy to clean with a brush. They should be made such that the encapsulation between the pins does not allow for chemical cleaning to leak into the unit. With any compressed air supply to the ionizing point or bar, the air should not go directly onto the pins to prevent buildup of oil or dirt from the compressed air supply. This will only create the need for excessive cleaning (which is normally not possible and will result in premature failure).

4. The connection from the power supply to the ionization device should be safe. Some static elimination systems utilize cheap clear plastic plugs and connectors with separate ground connections that are all too easily broken and may cause shocks and malfunction of the devices. Much like shielded cable, a proper connection to the power supply should be safe and if possible, any ground should be intrinsic to the connection.

The Haug power Supply is easily repairable.

The Haug patented connection allows for optimum safety in connecting ionizing bars to power supplies.

5. The specifics of the particular application will determine the type of ionizing bar that may be required. In many cleaning applications, in particular when fixed units (where you cannot get close to the part) or when the product is moving at high speed (such as in moving webs, or even spinning bottles) extra powerful static bars may be required to address the distances, speeds and even particular materials involved. This is especially true when utilizing materials such as mylar or rubber where static charges generated may be unusually high – so high where you can literally "feel" the charge at some distance. In such cases, a standard ionizing bar may simply be inadequate to eliminate the charge. Some manufacturers provide special units at a high price and require special power supplies to operate them, while others have extra powerful units that operate from less costly power supplies and allows for greater standardization in a manufacturing facility in those applications where the extra strength is required.



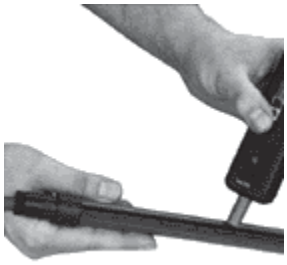
Haug standard Model RN Ionizing Bar

Haug extra powerful Model VS Ionizing Bar provides three times the output than a standard ionizing bar.

Test Equipment

There are two simple devices to ensure the static control portion is working adequately.

1. Bar and power supply testing unit: This device is like an AC tester but has a built in unit to indicate adequate voltage (minimum of 3600 volts) at the bar and power supply to indicate the product is working. The Haug Multicheck for example, lights up red when there is power but following this, the light turns green when close to the ionizing pins on the ionizing bar, or when put into the inlet of the power supply, indicating that there is adequate voltage.



Haug Multicheck indicates whether or not the power supply and ionizer is working

2. Static Meter: This device will indicate whether or not static is actually being removed from the part after leaving the neutralizing/cleaning system. Simply measure the static on the part before it enters the cleaning unit, and also after it leaves. This device is essential because the entire idea of removing dirt from parts that develop static is to eliminate the static in order to remove the dirt. If static charge has not been removed, the likelihood is the product still has dirt. Haug Static meter is used to confirm the removal of static fromproduct after cleaning.

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Cleaning of products with a static charge is partly science and partly art. Special cleaning systems that are similar to web cleaning have been developed for such items as cellular telephones, computer screens and other products to increase production output and improve quality. With the ever increasing use of plastics, dirt control utilizing static control technology, and various cleaning methods, will become more necessary.