Electrostatic Systems
Basics and Applications

Masthead

Published by: Eltex-Elektrostatik-GmbH **Concept and design:** qu-int. | marken | medien | kommunikation

What gets us moving ...

Eltex is a leader in the area of applied electrostatics, with a particular emphasis on the printing, packaging, finishing, and plastics industries. In this manual, Eltex gives you an overview of the basics, problems and solutions of static electricity.

THE NAME ELTEX STANDS FOR COMPREHENSIVE EXPERTISE IN DEALING WITH ELECTROSTATIC ENERGY.
WITH IN-DEPTH EXPERIENCE AND FORWARD-LOOKING TECHNOLOGIES FOR OPTIMAL WORKFLOWS.

ALWAYS RELIABLE. ALWAYS BETTER.
SINCE 1953.

Electrostatic energy is everywhere – and so are we

eltex
electrostatic
innovations

ELECTROSTATIC CHARGES IN PRODUCTION PROCESSES ARE UNAVOIDABLE. HOWEVER, THEY CAN BE MANAGED WITH INTELLIGENT CONTROL. FOR CONTROLLED DISCHARGE OR FOR USE AS A HELPFUL AND WELCOME FUNCTION.

WITH INTELLIGENT INNOVATIONS FROM ELTEX.

In many industries, at many locations: one solution

eltex
electrostatic
innovations

Shorter processes – with solutions from ELTEX

ALL ELECTROSTATIC SYSTEMS FROM ELTEX SHARE THE SAME PRINCIPAL FUNCTION: OPTIMIZING PROCESSES. OPTIMALLY SAFE, OPTIMALLY PRODUCTIVE AND COST-EFFECTIVE.

THIS QUICKLY SAVES YOU A GREAT DEAL OF TIME AND MONEY.

eltex
electrostatic
innovations

Industries and applications

Electrostatic energy: once a problem, now a solution.

Charging and discharging bodies with static electricity is a phenomenon based on simple laws of physics. As these laws are universally applicable, static electricity is present in every area of industry. Spontaneous and uncontrolled discharges can cause substantial problems, as they impair production processes and thus incur unnecessary costs. Our systems and concepts help you neutralize electrostatic energy or even use it in a targeted manner, thus turning it from a nuisance to a benefit.

Some of the industries that use such systems successfully are:

- the plastics industry, in which electrostatic energy can help to prevent quality defects
- the printing industry, in order to attain higher quality in ink transfer, targeted introduction of moisture and finishing
- the packaging industry, in which the entire work process is improved
- the chemical industry, which relies on electrostatic systems in manufacturing ink, varnish, explosives and pharmaceutical products
- the IT industry in manufacturing microchips and components that require the smallest tolerances
- the automotive industry, in optimizing vehicle painting Electrical engineering, to counteract unwanted charging of components
- the electronics and film industry, in which microscopically pure products are required
- the ceramic, glass, textile, metal and wood industries, in which work processes are made safer, faster and thus more cost-effective

The range of applications for electrostatic systems is unlimited, and so is our dedication to their continuous further improvement. Improving production processes is our task – optimizing quality, productivity and profitability for our customers is our goal.

Target groups and customers

Charging and discharging systems on extruders (pictured: W&H)

Why do you need Eltex?

Primarily if you are a company whose workflows may experience interference from unidentified electrostatic energy or can be improved by its use. If you want to make your production faster, safer and more cost-effective, we help you do just that with our systems and expert advice.

As a mechanical engineering company, you need Eltex in order to equip your products with factory-installed systems to offer your customers higher safety, reliability and quality.

As a plant designer and consultant, you need Eltex if you would like to use Electrostatic Systems as a beneficial part of the design and construction of production facilities.

As an engineer, technician and developer, you need Eltex in order to develop new process and product ideas using electrostatic energy.

Maybe you need Eltex and don't even know it yet. In this case, we would be glad to meet with you for a consultation to help you analyze your specific situation and problems and make the right decision.

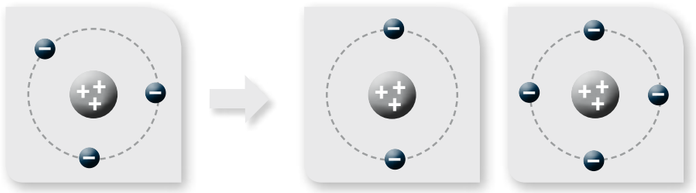
Tiny differences

Electrostatic energy can be traced back to the smallest building blocks of the material world: atoms. These consist of protons in the nucleus and electrons in the cloud. Electrons have a negative charge, protons a positive one. If the number of these two particles is equal, the entire atom is electrically neutral.

If two atoms and their clouds meet each other, make contact briefly (for example) and then are quickly separated, electrons jump from one body to the other. This process, which results in an imbalance in the electrically neutral state, is called charging. The atom has a positive or negative charge depending on whether the electrons or protons predominate. Too few or too many electrons inherently search for a balanced outlet, that is, by discharging.

> Only contact results in a charge

A contact charge always involves two bodies. One of them must form a capacitor, i.e. an insulated body which is capable of charging up electrostatically.



Charging takes place, for example, when two boundary layers are suddenly separated, if electrons jump from one body to the other.

Discharge system on reel cutting machines

A plastic example

A good illustration of charging and discharging in a production process is provided by the plastic film web. If a film web of this type is unwound, the foil surfaces are separated from each other suddenly and at a high speed: the film is charged.

Even if there is only a split-second between contact and separation, discharge may take days. Though the currents developed during this process are relatively weak, the voltages that occur may be several hundred thousand volts high. A discharge will necessarily take place – either uncontrolled or, preferably, controlled.

> Charged up and waiting ...

The electrostatic fields then remain “captive” in the plastic foil until there is a discharge. This can be triggered by an employee – who then receives an electric shock. The discharge can also take place at the production facility or product. These are cases of uncontrolled and unwanted discharges.

Preventing these types of faults of the production process requires sophisticated electrostatic systems. This eliminates the possibility of uncontrolled discharges.

Provoking discharge

Some conditions are highly conducive to uncontrolled discharge. Products with low moisture or rooms with low humidity, materials that can be charged electrostatically (because they have high insulation performance) and a high contact coefficient ensure that frequent and strong charges can take place. Slippage on webs, dielectric fluids at pipe bends or friction at smooth surfaces are additional factors that are conducive to electrostatic energy – and, quite likely, trigger uncontrolled discharges.

Control is better

To prevent problems, a controlled discharge must be induced. For our example of plastic film, this can take on the following form: the film is neutralized in a targeted manner using active discharge electrodes. This discharge cloud, which surrounds the electrodes, neutralizes the charge on the material and thus prevents spontaneous discharges.

Controlled discharges safeguard production processes

To disrupt …

For electrostatic charging, in addition to the material and its insulation value, the critical factor is how quickly the materials are moved. The higher the speed, the stronger the electrostatic charges will be. In most production processes, the objective is to manage the greatest possible quantities of material at the highest possible speed. Electrostatically clinging materials and uncontrolled discharges are thus inevitable. As described above, unless the charge is controlled and eliminated, its spontaneous, uncontrolled discharge can lead to faults, delays and dangers in the production process.

… and serve

However, if we know the laws of electrostatics, we can put this energy to creative and productive use. In the plastics industry, for example, "neck-in" can be eliminated with targeted use of point charging bars. The result: no necking of the film and an increased production volume.

In the printing industry, where long dryers are required to compensate for the moisture loss from the paper web, the web can be charged so that it attracts water aerosols. These then penetrate effectively into the fiber structure of the paper, where they provide moisture efficiently.

Measuring devices provide monitoring and documentation of the efficiency of discharge systems used

Controlled grounding safeguards production facilities from dangerous discharges

Measurement

Reliable results

Before we can eliminate unwanted electrostatic energy, we first have to know how and where it occurs. The basis for eliminating electrostatic energy is measuring the charge and resistance to ground. In all of these measurements, the instability of electrostatic phenomenona must always be taken into account, along with other sources of error.

Precision measurements are used for quality control, quality assurance and compliance with standardized properties of the materials.

Grounding

Down to earth

Precisely when handling highly inflammable materials, uncontrolled discharge is a danger that is not to be underestimated. It can cause explosions, deflagrations, fires and secondary accidents due to the effects of shock. Controlled grounding is a safe and easy measure for protecting people, production facilities and transport machines. Grounding with electrostatic systems is particularly helpful in the following applications:

- Loading and unloading tanker trucks
- For effective explosion protection in production
- For securing big bags when filling or emptying

Discharge

Everything must go!

In many industrial areas, there are charges that cannot be readily discharged using grounding. In this case, systems have to be used that combine active and passive discharge.

Here's how this works: ionized air is used to generate a conductive air cushion made up of particles with positive and negative charges between the bars and the charged surface (such as a fast-running product web). Passive discharging causes high voltage fields to decay, active ion production compensates for residual charges.

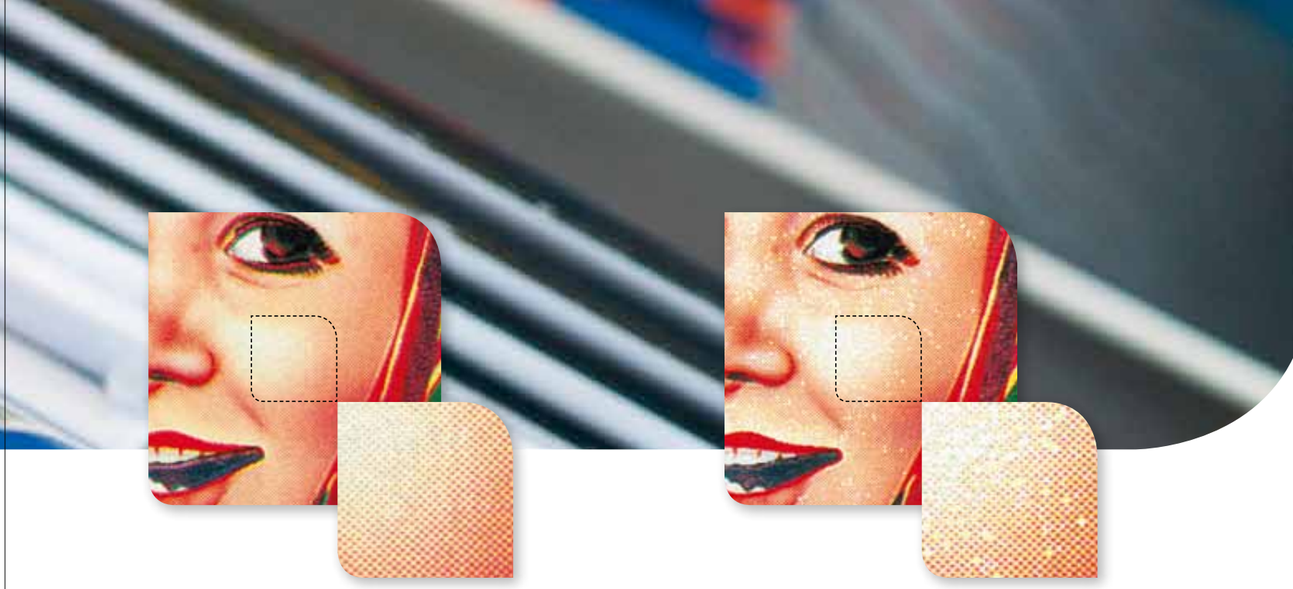
Charging

A welcome force

Distinct advantages exist in the areas in which the phenomenon of electrostatic energy does not have to be neutralized, but can actually be used in a beneficial way – with the correct technology. For example, if we charge paper or plastics unevenly, we can bond them to each other electrostatically. Electrostatic adhesion, blocking/tacking or adhesion has multiple advantages: it leaves no trace whatsoever behind, remains stable during the entire work process and detaches afterwards, either by itself or by targeted discharge.

Intelligent discharging over large distances and high charging in film production

Targeted charging in print finishing



Missing dots are an obvious feature of low printing quality on paper, cardboard and plastic films.
Printing assist systems ensure dot-for-dot perfect results.

Our objective

Experts in electrostatics – working for you

Since 1953, Eltex has been developing and building systems to measure, control, or eliminate these forces or steer them into useful paths. For this purpose, our consistent investment in research is as critical as collaboration with companies, universities and other research teams. Eltex not only implements the results of the latest research, but has, with its practical experience and real-world expertise, made a large contribution to the current understanding and control of the phenomenon of electrostatic energy.

This means that we can either help you with the targeted deployment of our technology or with the development and production of complex systems that are based on your individual situation and tasks – it is definitely worthwhile to talk to us.

After a careful and thorough review of your specific requirements, we recommend the ideal solution for you. The fact that in many cases, one of our already tried-and-tested electrostatic systems will meet the requirements not only demonstrates the comprehensiveness of Eltex' product line – it also saves you time, effort and money.

As a customer, you can expect two things from Eltex:

- First: reliable technology for measurement and control, charging and discharging
- Second: complete, individual concepts for all types of electrostatic problems

At Eltex, experience plus research equals solutions.

Electrostatic Printing Assist for the Print Industry (ESA)

For successful printing

The printing industry is a field in which both the benefits and dangers of electrostatic energy are particularly critical. Consequently, Eltex places a particular focus on special systems that ensure faster, more efficient operation and better results in printing plants.

Viewed superficially, paper is smooth. However, under a microscope, it becomes clear that the paper does not have a self-enclosed surface, but one that is irregular, uneven and usually not compressible. Therefore, complete ink transfer, i.e. without missing (ink) dots, is not possible using mechanical means. High printing speeds pose an additional obstacle and diminish printing quality.

Electrostatic printing assist systems from Eltex solve this problem. A homogenous electrical field is generated between two plates; in this field, a dielectric medium is energized on one side.

The Electrostatic Printing Assist transfers this principle to the printing nip, exactly where the ink is to be transferred to the material surface to be printed on.

This type of electrostatically supported ink transfer works uniformly across the entire web width and is absolutely reliable, from the lowest to the highest production speed.

- Optimum printing results
- Dot-accurate ink transfer
- Higher production speeds
- Longer service life of the impression roller coverings by reducing the impression roller line pressure

Electrostatic remoistening systems

Quenching paper's thirst

In the heatset and digital printing processes, high temperatures are used to dry the inks. Unwanted side effect: This also reduces the water content of the paper, which can cause considerable problems during finishing. The Eltex WEBMOISTER can provide a precisely metered supply of moisture to the paper by field-accelerated microscopic water drops applied directly into the fiber structure of the paper. This attains smooth finishing and higher printing quality.

- No waves formed during perfect binding
- No "growing" or expansion of trimmed product
- No climate waves, fewer tension waves
- Fewer web breaks, higher speeds

The WEBMOISTER is suitable for wide or small machines of all speeds.

Electrostatic ribbon tacking systems

Keeping it together

Ribbon tacking systems come standard in new machines and can be retrofitted everywhere.

If a problem of trim irregularities and dog ears occurs in the printing machine plant, electrostatic systems is the solution. Electrostatic blocking/tacking of the ribbons before crosscutting allows higher speeds and clean blocking in the folder of gravure and heatset weboffset presses.

- Clean blocking/tacking
- Faultless delivery
- Higher speeds
- No dog ears

No more dog ears caused by electrostatic blocking/tacking.

You can find us everywhere

In addition to our headquarters in Weil am Rhein, Germany, there are eight other Eltex locations and agents in Germany. Moreover, because reliable electrostatic systems and intelligent concepts are needed everywhere in the world, Eltex is active internationally.

Around the globe, 45 agents are at the ready to help you improve your productivity, efficiency and profitability.

The first step towards finding the solution for your tasks and problems is always to identify and define them accurately. The best way to do this is in a personal conversation. Get in touch with us by e-mail, postal mail or telephone.

You can find the agent responsible for you online at: **www.eltex.de**

Milestones

Flock finishing systems for textiles **(>1953)**, high-voltage discharge bars and ionizers **(>1963)**, radioactive measuring devices **(>1965)**, high-voltage appliances and generators for the first practical industrial application: sheet adhesion for printing by charging **(>1968)**, electrical fieldmeters, grounding systems **(>1969)**, beginning of development of printing assist **(>1971)**, AC/DC introduction, the first active/passive discharge bars **(>1974)**, development of ribbon tacking for folders **(>1975)**, the electrostatic moisturization takes on initial forms **(>1982)**, the new AC + DC electrode generation R44 **(>1984)**, the first KNH33 powerline high voltage generators **(>1986)**, SG50 Remoistening System, use of the Chill-tack System **(>1989)**, ESA-DIRECT print assist: Eltex GNN70 **(>1990)**, LG50 Remoistening System **(>1994)**, KNH34, R130 Charging Systems **(>1996)**, ES51, R50 Discharging Systems with depth effect **(>1998)**, new ESA generation: GNH61 Top-Loading, GNN71 Side-Loading **(>1999)**, WEBMOISTER 60 Electrostatic Remoistening System **(>2000)**, new GNN75 Core-Charging ESA System **(>2001)**, new WEBMOISTER 70XR extended-range Electrostatic Remoistening System, now also for small water quantities **(>2002)**, new production facility **(>2004)**, the new INNOCURE EFD technology substantially optimizes UV curing with oxygen reduction **(>2004)**, INNOCURE in newspaper offset **(>2009)**, new WEBMOISTER 3000 **(>2009)**, Static Combi Cleaner **(>2009)**, RX3 range-extending discharge **(> 2010)**, Staticjet 24 V discharge **(> 2011)**, 24 V discharge power supply **(> 2012)**

Eltex-Elektrostatik-GmbH
Blauenstraße 67–69
79576 Weil am Rhein
Germany
Phone +49 7621 7905–422
Fax +49 7621 7905–330
info@eltex.com
www.eltex.com