

Sigma Technologies Atmospheric Plasma Treaters

For High-Speed Web Applications

Increase surface energy for improved adhesion

Functionalize surfaces with active chemical groups

Ablation of organic contaminants and low molecular weight material

For films, non-wovens, metals and more



Sigma's patented water-cooled electrodes treat material uniformly over a wide surface area.

Treatment Station Specifications (for treating roll goods)

All Sigma treaters manufactured in accordance with CE.

Operating Modes	Plasma, chemical corona, conventional corona
Gas Chemistry Control	Independent computer controlled gas flow meters
Max. Web Width	Unlimited
Max. Line Speed	Unlimited
Frame Construction	Epoxy coated stainless steel
Process Drum Surface	Silicone rubber, insulating ceramic, or conductive ceramic
Electrodes	Water cooled, level or corrugated Manual plasma "gap" adjustment
Optional Features	Single and double-side treatment Bar-code reader for closed-loop configuration of treatment parameters Remote mounted touch-screen control station

Power Supply and Control Features and Specifications

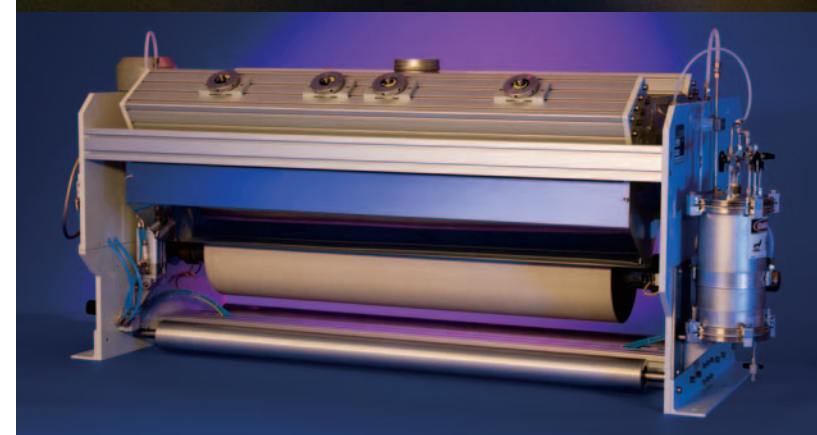
Frequency	40 kHz
Line Voltage	480V 3ph 50-60Hz
Controls	Integrated touch-screen controls
Other Features	Automatic variable power control (in relation to web speed)
Facility Requirements	Electrical Plant water Exhaust 30 Amps, 380-400 VAC, 3-phase (50-60 Hz) 20 gpm @ 60 psi (<30°C) Standard plant exhaust

Specifications subject to change without notice.
Sigma Treatment Systems can be retrofitted to replace corona treaters on existing lines.



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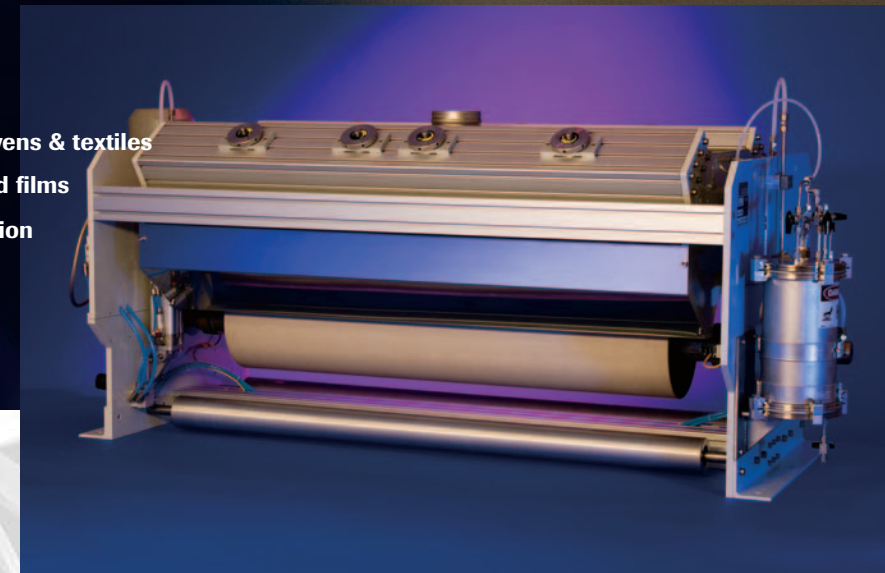


Sigma Technologies



Plasma Applications

- Improved printability of water & solvent-based inks
- Better dye-ability & color-fastness on non-wovens & textiles
- Stronger adhesion of polymer & metallized films
- Enhanced liquid absorption or repulsion
- Improved wetting



Sigma's Atmospheric Plasma Treaters enhance material surface properties with a safe, homogenous, low-temperature flame.

Sigma has long been recognized as a leader in developing innovative surface solutions, adding value to materials by modifying, or functionalizing, surfaces without affecting the bulk properties of a substrate. Sigma has provided cutting-edge solutions for various industries and applications, including textiles and non-wovens, computer electronics, storage media, packaging films, nanopowders, pigments, automotive, and many others.

Sigma's Atmospheric Plasma Treaters (APT) are designed to prepare material surfaces for various downstream processes, including lamination, coating, printing, and many others; specifically, atmospheric plasma treatment systems allow manufacturers to modify the molecular composition of a given surface, allowing for custom engineered material surfaces for enhanced chemical bonding. Furthermore, APT works to remove, or ablate, low molecular weight material (LMWM) and organic contaminants – revealing the true micro-roughness of the material surface for better physical bonding.

What Is Plasma Treatment?

Plasma is a partially ionized gas comprised of ions, radicals, metastables, and neutral molecules. Sigma's Atmospheric Plasma Treaters work by accelerating these species toward a substrate, where they react with the surface, modifying its chemical and physical properties. The substrate's bulk properties, however, remain unchanged. Requiring neither chemical baths, nor excessively high voltages, plasma treatment offers a low-temperature, low-cost, highly reliable method for improving surface properties.

Beyond Conventional Surface Treatment

Though adequate for some applications, surface treatment technologies such as corona, flame treatment, and wet chemistry are incapable of producing uniformly high treatment levels, and sustaining them over long periods of time. APT is a room temperature, "cold flame," pinhole-free, process capable of achieving and maintaining surface energies of even the most difficult-to-treat materials (such as PE, PP, PTFE, etc.) exceeding 50 dyne on most materials.

Multi-Mode Operation (Plasma, Chemical Corona, & Conventional Corona)

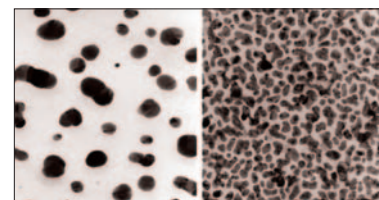
Unlike conventional treatment technologies, Sigma's Atmospheric Plasma Treatment systems are capable of operating in three different modes, which are selected depending on the substrate, desired treatment type/level, and ongoing treatment cost. Operators can easily switch between plasma, conventional corona, and chemical corona modes by modifying the gas chemistry and power levels delivered to the plasma electrodes.

More Flexible Than Corona Treatment

Until recently, corona treatment has been the only dry process available for increasing adhesion and bond-ability of material surfaces. Conventional corona treatment, however, produces non-uniform results that begin to fade almost immediately after treatment. The high energy, high temperature filaments typical of an intense corona discharge commonly result in pinhole damage and backside treatment, both of which lead to poor quality materials not suitable for many downstream processes.

Sigma's Atmospheric Plasma Treaters create a uniform, low-temperature, "glow" discharge capable of achieving high surface energy levels without material damage.

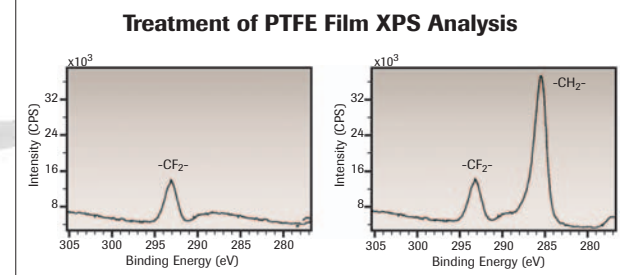
Manufacturers can also customize the gas chemistry to alter the chemical make-up of a material's surface, creating application specific engineered materials—something simply not possible with conventional corona treatment.



Plasma treatment increases nucleation sites (right) for better bonding than untreated material (left).

Customized Surface Chemistry

Sigma's Atmospheric Plasma Treaters include integrated gas flow metering, enabling you to control the atmosphere in the plasma region. By introducing gases to the plasma, functional groups can be added on the surface to bond with subsequent films or to interact with external gases or liquids.



XPS analysis of polymer before and after functionalization with APT.

Remove Contamination for Sensitive Processes

In addition to the modification and activation of material surfaces, plasma treatment is an ideal platform for cleaning and/or sterilizing materials for a variety of applications. Unlike other treatment technologies, plasma ablates the surface, removing low molecular weight material (LMWM), oils, and various contaminants that can impede the process-ability of materials for sensitive applications such as data storage, aseptic packaging and medical devices.

Longer Lasting Surface Treatment

Manufacturers of polymer films and non-wovens often corona treat their materials to provide an additional benefit for their customers. Unfortunately, the effect of corona treatment begins to degrade almost immediately after application, often plummeting to pre-treatment levels by the time the material arrives at the customer's site. As a result, many end users re-treat their film prior to processing as a matter of course, regardless of the initial treatment.

However, materials that have been Plasma, or "Chemical Corona," treated can be activated with appropriate reactive gasses to maintain treatment levels for considerably longer periods of time, providing a true

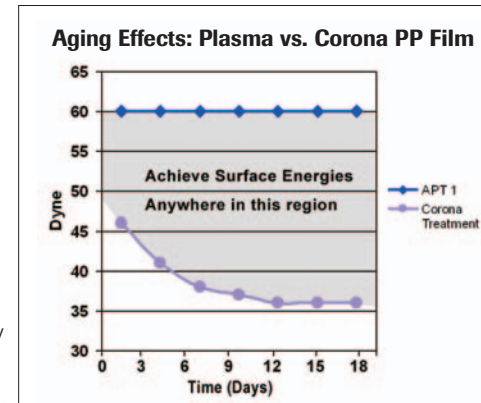
benefit to the customer. Specifically, by customizing the reactive gas mix introduced to the plasma electrodes, functional groups are formed, or grafted, onto the surface of the material, resulting in near-permanent treatment levels.

Ideal for Demanding Production Environments

Sigma's Atmospheric Plasma Treaters are capable of reliably processing materials over unlimited web widths, at any line speed. Rugged construction and easy servicing ensure high uptime, while computer controlled gas flow metering and lower voltages keep operating costs low.

Any Substrate, Any Time

Sigma surface treatment solutions include a range of wide web and flat plate systems designed to add value to various material surfaces ranging from polymer films, non-wovens, textiles, powders, fibers, hollow tubing, electronic components, glass and metal sheets, complex 3-dimensional objects, and many others. Regardless of your material or process, Sigma can engineer a surface treatment solution to meet your requirements.



APT Power Supply

