

Surface treatments

There are several alternatives **to solve adhesion issues.**

You may be looking for ways to improve the adhesion of varnishes, glue, paint or ink to plastic, metal, composite, glass, leather and perhaps wooden materials.

This presentation of the range of most popular methods currently on the market should help you to understand the alternatives available to you. There is in fact not one technique to address a specific problem, rather a range of **possibilities for each individual surface adhesion problem.**

Although a variety of both technical and economic factors need to be taken into account, it is generally the **application itself that determines the most appropriate technical solution.**



Role of surface treatments

Surface treatments are generally used to improve the external appearance of a material (rough or shiny appearance, colour, etc.), to determine a part's performance (corrosion resistance), to change mechanical and physical properties (electrical conductivity, wear, friction, etc.) or to increase the service life and reliability of a product.

But surface treatment also covers **all the processes used to prepare surfaces prior to bonding.** These phases, considered as **preliminary steps, increase substrate adhesion capacities.**

They thus guarantee **effective permanent bonding** of the products to be applied.

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MECHANICAL TREATMENTS

Compressed air scrubbing, deburring, burnishing, roller burnishing, shot blasting, microbead blasting, polishing, scraping or sand blasting - these **abrasive processes** are recommended to **improve surface roughness through degreasing** (removal of oil and grease) or **stripping** (removal of all traces of rust and oxide deposits). They are generally used in the nautical, automotive or hydraulic industries.

Applications: activation of composite parts, cleaning of damaged mechanical parts

DRAWBACKS

- › Impair surface appearance (particularly a problem with fragile or translucent substrates)
- › Produce dust or surface pollutants implying additional and excessive costs for cleaning, etc.

CHEMICAL SOLVENT-BASED PREPARATIONS

These treatments are used for cleaning and degreasing and are based on **the application of chemicals or surface-active solvents**. The process can be manual through an operator, via the use of wipes, or be via a spray, diffused in specific chambers.

Applications: cosmetic parts treated in-line or technical parts cleaned by an operator

DRAWBACKS

- › Operating cost (labour, investment in PPE or spray booths)
- › Non-reproducible process (e.g. on a treated surface some sections may be omitted)
- › Hazards and toxicology: processes are not environmentally friendly and some chemicals do not comply with REACH European Directives
- › Restrictive regulations and high cost due to residual waste treatment processes for chemicals used
- › Constant consumable costs to be reflected in the unit price of the part throughout its life cycle

BOND-PROMOTING PRIMERS

These are polymer or resin solutions combined with a hardener and various additives that are generally used for gluing plastics and composites. On application, they take the form of a thin film covering the surface.

Applications: pore filling (concrete, stone, wood), filling surface irregularities, wettability improvement, corrosion reduction, water adsorption prevention, etc.

DRAWBACKS

- › Hazards and toxicology: treatments are not environmentally friendly and some chemicals do not comply with REACH European Directives
- › Constant consumable costs to be reflected in the unit price of the part throughout its life cycle

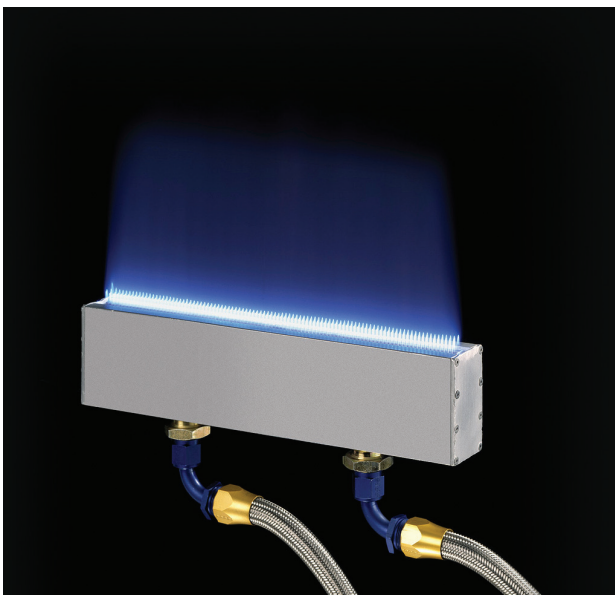
FLAME TREATMENT

The surface of a material - generally a polymer - is exposed to a flame. Simple to perform and cost-effective, this is the main traditional process used to **increase wettability and burn off stubborn grease and grime** while limiting the use of chemicals.

Applications: degreasing and activation of metal parts before label gluing or painting (automotive parts, construction, technical parts), etc.

DRAWBACKS

- › Major setting requirements
- › Dangerous (e.g. unguarded flame that can destroy the part)
- › Varying results (e.g. one part can be treated properly but this might not be the case for the next one or the same part can be treated differently in various places)
- › Impairs surface appearance (e.g. deformed surface due to overheating)
- › Risk of 'overtreatment' (e.g. surface delamination and in some cases adhesion failure of the treated section)
- › Need to use safe systems (insurance costs, safe gas supply required, etc.)



VACUUM PLASMA (low pressure)

The materials to be treated are placed inside a **vacuum chamber** at a very low pressure (approx. 0.1 mbar) which guarantees the vacuum needed for effective treatment. An ionising gas injected and applied in plasma form enables discharges to activate and treat all exposed surfaces.

Applications: surface activation of plastic parts, printing or gluing of batches of small high-added-value parts, silicone etching, ultra-fine cleaning of contaminated parts, deposit of thin layers, coating of plastic parts by PTFE-like films, sealing, etc.

DRAWBACKS

- › Cost of investing in vacuum chamber
- › Treatment of products in batches only, making in-line treatment impossible
- › Relatively long treatment cycle (chamber vacuum, gas injection, surface treatment, gas discharge, pressure rise)
- › Operation with very high energy requirements to produce a total vacuum
- › Varying results: some unexposed sections may not be treated



Innovative electrical

CORONA DISCHARGES

A low or high voltage electric field is produced through an air space. In this environment, electrons accelerate and ionise oxygen and nitrogen gas particles which adhere to the surface of materials, thus creating polar sites. These sites form an artificial bond - which does not exist naturally - with the products to be applied.

DIRECT CORONA SYSTEM

This system operates at a voltage of 10 to 25 kV and a high frequency (50 kHz). It is particularly used for surface treatment of **film sheets up to 6 mm thickness** and **mandrel parts or metal mask parts**. The material is fed between a metal electrode bar and a mass cylinder.

The treatment is also a particularly effective preliminary step for gluing or printing (e.g. pad printing) in all industry sectors.

Applications: printing on advertising bags, food wrapping and packaging, labels, electric wires, cups, syringes, lids, tubes or sleeves, lamination of single- or double-sided adhesive foam, solid or honeycomb sheets, etc.

DRAWBACKS

- › Difficult to implement in application on insulating materials, made of simple shapes, with counter-electrodes
- › Need to be very near the surface to be treated (less than 4 mm away)

CERAMIC CORONA SYSTEM

Substrates made of carbon, metal or any other wholly or partially conductive material are treated by a ceramic electrode.

This process guarantees stable, uniform and lasting quality and is suitable for **standard industrial production**.

Applications: carbon profiles for the automotive industry, epoxy coated metallic panels, thin polymer parts on metal lines, metallised films for decorative purposes, etc.

DRAWBACKS

- › Treatment of relatively flat shapes
- › Need to be very near the surface to be treated (less than 4 mm away)

BLOWN ARC CORONA SYSTEM

This **low-frequency** system (approx. 50 Hz) uses a voltage of 10 to 15 kV applied to two electrodes. **The arc produced is moved by blowing air or a gas mixture**. The "blown" arc then comes into contact with the material to be treated. With this **reproducible, industrialisable and cost-effective** system, it is possible to maintain a marked distance from the surface to be treated compared with a standard corona treatment. It is very efficient for bonding pad printing inks, inkjet marking or the application of adhesives to **profiles and flat or hollow, simple or complex parts with raised features**.

Applications: pre-treatment of PP parts (automotive accessories, eyewear or home appliances, cosmetic bottles, pharmaceutical containers) prior to screen printing, pad printing, inkjet and hot-transfer printing, seal gluing, adhesive profile sealing, etc.

DRAWBACKS

- › Less efficient on "difficult" materials such as complex polymers
- › Risk of impairing surface appearance: possibility of micro scratches on certain sensitive surfaces

This process is both **reproducible and cost-effective** and is perfectly suited to **industrial applications**. And energy consumption remains **stable and under control regardless of whether the process is integrated into production line operations or installed on independent mobile units**. There are several methods available depending on your applications and the specifications of your process.

Innovation

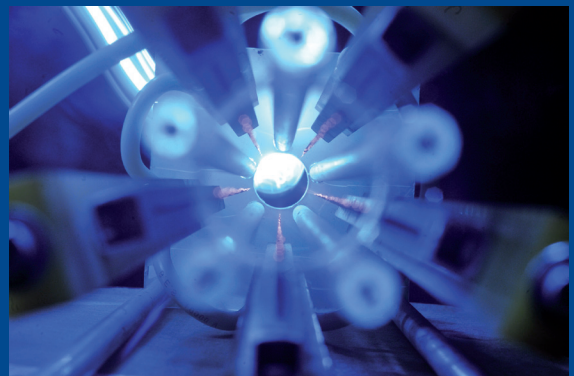
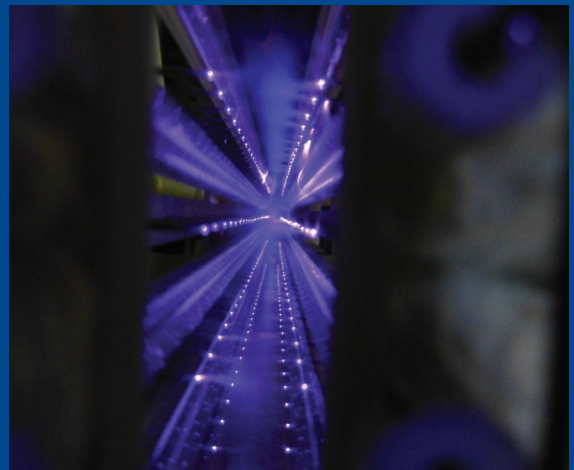
EFFLUVAGE INDIRECT® (INDIRECT DISCHARGE) CORONA SYSTEM

This system is identical to the Direct Corona system as regards its electrical source and its efficiency, but its innovation lies in **the absence of a counter-electrode**, which is usually necessary at the rear of the surface to be treated. This new method applies to treatment of **large areas and formed, thick, flat or slightly raised parts of any thickness or width**. The system is **reproducible, reliable and cost-effective** and can be easily integrated **into production lines or installed on independent mobile units**.

Applications: profiles and automotive and aeronautical connectors, home appliances (washing machine parts, telephone front panels), medical, cosmetic and pharmaceutical parts and products (PP panels for cleanrooms, special PVC floors, door panels, perfume caps), shoe soles, thick PE PP foam, honeycomb sheets or polycarbonate sheets for translucent sandwich panels, furniture manufacture, etc.

DRAWBACKS

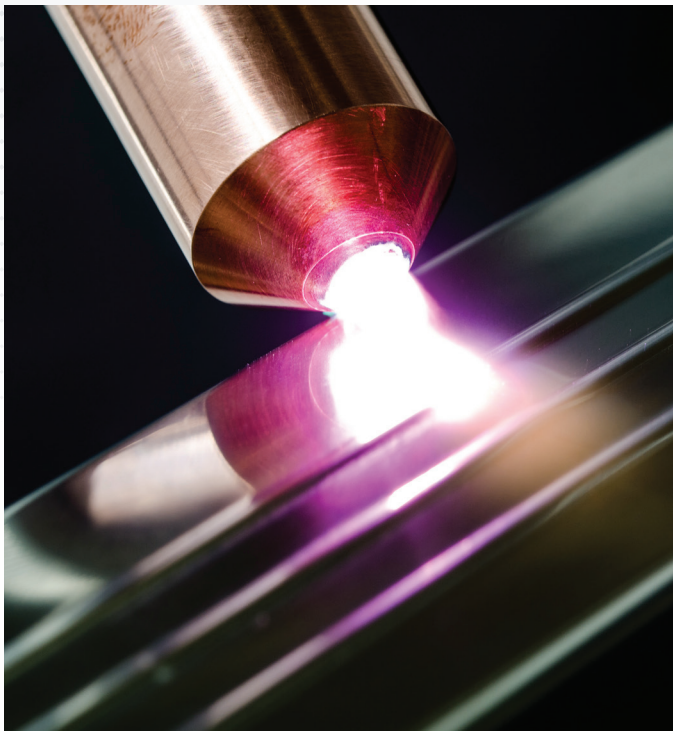
- › Application on relatively flat shapes and non-conductive materials



Innovative electrical

ATMOSPHERIC PLASMA

This technique uses a **high-voltage electric arc inside a torch** to create a plasma environment. Air (or another gas such as nitrogen or argon) is released and crosses the plasma with a chimney effect.



ATMOSPHERIC-PRESSURE PLASMA TORCH

An electric arc is created in a **metal nozzle through which an air flow is conveyed**. This produces a reaction whereby **the plasmagenic elements** inside the nozzle are separated. As the plasma is no longer a conductor but hot, this technology offers the capability of **cleaning surfaces, if necessary, during high-speed localised treatment operations**.

The technique is industrialisable and can be **used as standard on profiled substrates of any material, whether simple or complex, conductive or non-conductive**.

One of its major benefits lies in its easy in-line integration.

Applications: cleaning of plastic and metal surfaces prior to gluing, printing, painting, varnishing, activation of PCBs prior to over-moulding, spraying of LDPE powder for adhesion of polymers and metal, grooves for gluing insulating seals, etc.

DRAWBACKS

- › Relatively small treatment width: 5 to 25 mm maximum, which can be an obstacle to production requirements
- › System costs if installed on a robot or several systems are needed for a greater width of treatment

Innovation

MANUAL TREATMENT PEN MTP2

This new **manual, portable, extremely compact** system does not require compressed air to activate and disinfect parts. It produces **high-density plasma with a low heating effect**, enabling it to activate surfaces such as low-melting point polymers. The pen is easy to use and **highly efficient for sensitive materials and cold treatment** in medical, life sciences and electronics applications.

Its highly precise plasma activation and handiness are ideal for treatment in laboratories, R&D centres or workshops for manual operations by operators or semi-automatic operations.

Applications

- › improvement of adhesion of anisotropic conductive film (ACF) used in the manufacture of flat screens, ultra-fine treatment of sensitive products (contact lenses, high-quality camera micro-lenses, catheters, stents, cannulas, syringes), improvement of wettability for varnishing, gluing, printing, disinfecting, sterilising and odour removal, etc.
- › gluing of polymers, inks, dyes and paints, potting, moulding, under-filling of biomaterial compounds, cleaning of wires, optical fibre cables, packaging, stoppers, optical connectors, etc.

These solutions involve producing a concentrated and controlled plasma jet via the torch nozzle, thus creating surface polar sites.



FILM ACTIVATION AND FUNCTIONALISATION

Innovation

CALVASOL® FUNCTIONALISATION

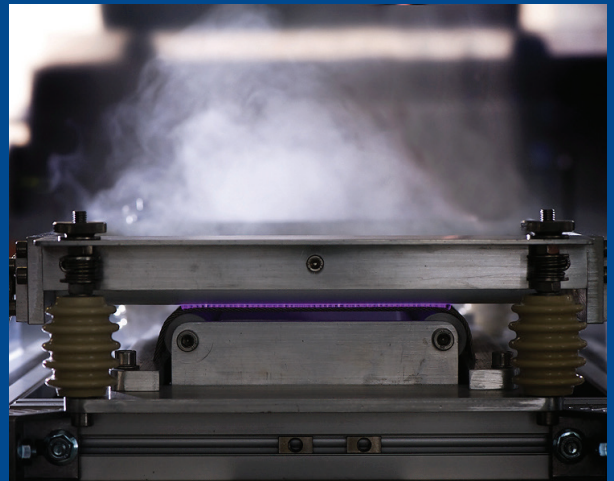
In one operation, this new generation coating technology combines **both a corona effect surface treatment and substrate functionalisation** by solutions diffused in an aerosol. Treated films are given **anti-misting, anti-static, hydrophylic, hydrophobic or anti-adherent properties with one-passage coverage**.

This patented technology is particularly suited to the food industry (anti-misting treatment on wrapping films) and applications combining extrusion production and surface treatment, such as cosmetics, paint or medical products.

Applications: manufacturing of food-grade films, anti-static or anti-block functional films, etc.

DRAWBACKS

- › High investment costs but recouped due to the gain in terms of chemicals, labour and machine use



DRAWBACKS

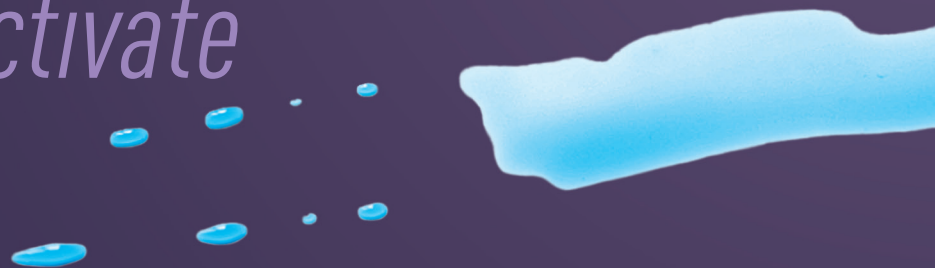
- › Manual system
- › Treatment of small surfaces only



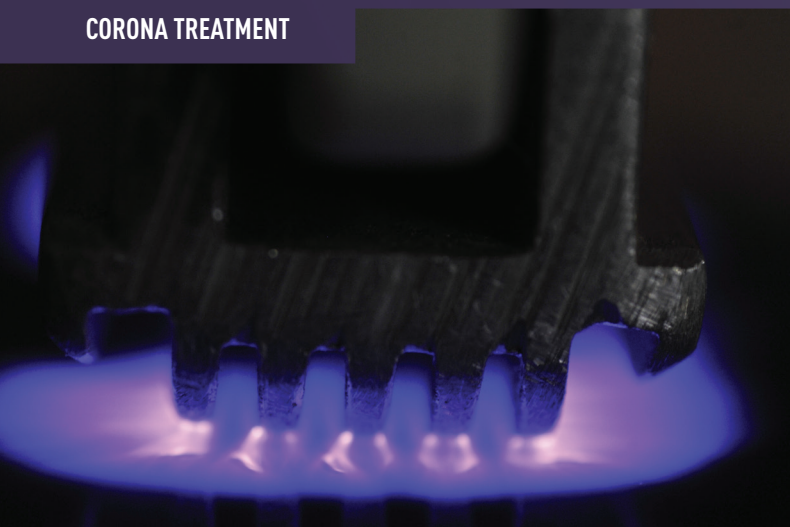
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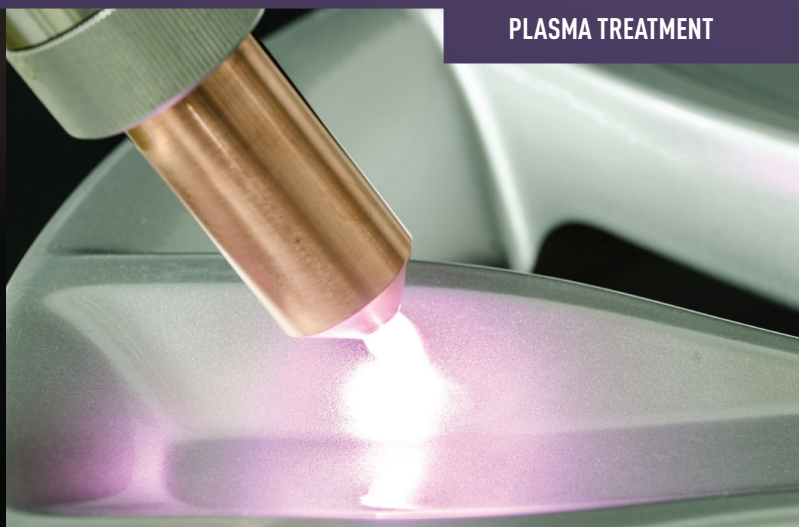
innover
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CORONA TREATMENT



PLASMA TREATMENT



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