



APPLICATION INFORMATION

Openair-Plasma® for painting of plastics

Without the use of any adhesion promotor or heat treatment

The strong adhesion of paints, lacquers and varnishes is especially important in industries like aerospace, automotive, appliances and electronics. In order to achieve the desired adhesion performance many polymers, especially those with low inherent surface free energy have to be pretreated. Traditionally, methods like flame treatment, mechanical abrasion or adhesion promoting chemicals are used to improve the bonding properties of the substrates. The Openair-Plasma® technology offers an innovative and easy solution by generating a highly energetic discharge, simply using compressed dry air as the process gas. Once applied onto the surface, Openair-Plasma® increases the surface free energy of the substrate by removing electrostatic charges and surface contaminants as well as by activating (forming highly reactive polar groups) the treatment area of the polymer. This pretreatment process generates the perfect surface

conditions for a strong and reliable bond – especially when using water-based adhesives. In case of polymer substrates, the activation effect of the Openair-Plasma® technology greatly improves the surface wettability which is especially important for paint systems that require such a high surface energy. The benefits are:

- Reduced use of solvents
- Promote film formation, especially at lower layer thicknesses, prevention of orange peel and picture framing effects
- Increased versatility of paint systems e.g. improve adhesion on silicone or polypropylene
- Even after prolonged storage a flawless paint finish is possible



Openair-Plasma® provides optimal wettability results indicated by a surface free energy of > 72 mN/m

Reduce pretreatment cost through the use of Openair-Plasma®

- Process can be automated by robot handling
- Environmentally friendly and energy-saving, no ozone, low-energy consumption (operational cost savings!)
- Non-hazardous – since it is operated without additional gases, explosive mixtures cannot occur
- Highly reproducible treatment results through integrated process monitoring

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The effect of the Openair-Plasma® treatment:

- Removal of organic residues & dust particles (fine cleaning)
- Physio-chemical modification of the surface
- Electrostatic neutralization of the component surface



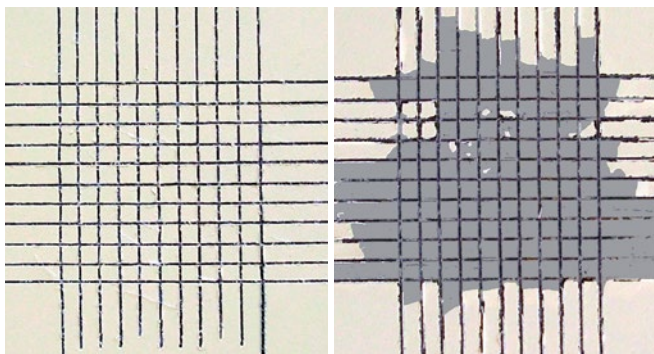
Pristine surfaces with Openair-Plasma®



Openair-Plasma® treatment before antistatic coating

Process engineering

Plastics vary in the degree to which they can be activated. Non-polar plastics (e.g.: PP, PA etc.) are traditionally difficult to bond, especially when using water-based paint systems, other polymers such as ABS, normally do not require pretreatment. However, for all tested non-polar substrates, Openair-Plasma® treatment significantly improves their surface free energy and thereby their adhesion properties.



Cross-cut test for lacquer adhesion: left after plasma activation, right without treatment

Implementation

In order to achieve a surface activation there has to be a specific relative speed between Openair-Plasma® Jet and treatment area. Either the Openair-Plasma® jet or the substrate material is moved. In extrusion systems, precise Jet positioning systems ensure the optimal treatment distance. When painting large 3D parts such as vehicle bodies, the Openair-Plasma® jet is mounted on a robot which scans the entire surface with a pre-defined speed and distance. Through a wide variety of Openair-Plasma® jet nozzle heads, with plasma outlet angles ranging from 5° to 25° as well as V-shaped designs, the Openair-Plasma® Jet RD1004, is able to effectively treat complex geometries and grooves while maintaining the required cycle time.

Openair-Plasma® - ecological & economical

The use of Openair-Plasma® helps to protect the environment in the long term. A pretreatment that physically modifies surfaces at the nano level eliminates the need for additional processing steps involving costly chemical adhesion promoters like solvents, detergents and phosphate-based degreasing agents. Economic benefits and sustainability:

- Increase in the painting capacity of existing systems by reducing the use of primers
- No VOC emissions
- Reduction of running costs for adhesion promoters and associated equipment
- No costly drying systems required
- Energy saving
- Use of water-based paint systems
- Significant improvement of paint quality: better paint adhesion, improved paint coverage, reduced scrap

Touching up and repainting

Despite every effort, defects can often occur in the paintwork of plastic surfaces. A tiny speck of dust in a clear varnish requires costly rework. Openair-Plasma® treatment offers an elegant alternative: a previously applied varnish can be activated by Openair-Plasma® to increase its surface free energy so it accepts a second varnish touch-up layer to achieve the desired paint quality.

Explore the possibilities of this technology and discover the benefits of working closely with our experts.