

Surface Treatment

Lasting Transparency

Brilliant, scratch-resistant surfaces on high-grade plastic display windows can only be produced by costly coating processes after injection moulding.

A South German manufacturer efficiently pretreats components with atmospheric plasma, which strongly improves adhesion properties and brings the coating's appearance to perfection.

One of the leading experts in the area of refinement for plastics surfaces, GfO Gesellschaft für Oberflächentechnik mbH in Schwäbisch-Gmünd, planned three years ago to introduce a new inkjet technique named Selectacoat. For this process a new unit to varnish plastics display fascias was to be constructed. The plan was that the

entire painting process taking place in a cleanroom should proceed at higher speed and under fully automated and environmentally friendly conditions. One of the main aspects was the question of which pretreatment method to use, because unless the manufacturer thoroughly cleans and activates the plastics parts before coating can he be sure of the paint to adhere and the surface to remain flawless at long term. The manual pretreatment carried out up to that point manually by means of alcohol and soft cloths, was to be replaced by a reproducible, high-quality and fully automated pretreatment technique suitable for in-line processes. GfO found the solution at Plasmatreat GmbH,

Steinhagen, Germany, the developer of the Openair atmospheric-pressure plasma technology.

Inline Plasma

This plasma process patented as early as 1995 is applied worldwide to pretreat material surfaces in almost every industrial sector today. The non contacting system has been developed notably for automatic and continuous production. It stands out due to a high process safety and reproducibility while operating gently on the surface. A particular characteristic is that the emerging plasma is electrically neutral which greatly extends and simplifies its application. Its intensity is so high that treatment speeds of several 100 m/min are achievable. The typical rise in temperature of a plastic surface during treatment amounts to $\Delta T < 30 \text{ }^\circ\text{C}$.

The Openair system is characterized by a threefold action: It brings about microfine cleaning of the surfaces of metals, plastics, ceramics and glass on one side. On the other it highly activates the surface by selective oxidation processes. As a result, surface energies over 72 mJ/m^2 become possible with many plastics materials. At the same time the surface is discharged which results in a great extension of the system's application possibilities. The nozzles are designed for the most diverse geometries. They are robot compatible without restriction and can be integrated into an



The data behind the display fascia must be clearly visible. Before its costly coating process it is pre-treated with plasma.

Foto: GfO Gesellschaft für Oberflächentechnik AG

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Colored and scratch-proof coated display fascia for air conditioning systems. Treating the panes with plasma at atmospheric pressure leads to impeccable optics and long term stable adhesion of the coating.
Foto: GfO Gesellschaft für Oberflächentechnik AG

existing production line at any time.

Display Fascias

Whether transparent clear or colored the small flat plastic pane from polycarbonate (PC) or polymethylmethacrylat (PMMA) hides highly complex information centers, displays to visualize information, dozens of control lights, navigation and communication systems. The inserted front display fascia is fixed permanently to the casing by adhesion bonding. On the one hand, the display fascia protects the delicate technology from manual damage and the infiltration of dirt, humidity and dust. On the other hand, it allows the troublefree withdrawal of the actual display unit from the rear of the housing in case of repair. Display windows made of i.g. polycarbonate are easily scratched and unwanted reflections may occur making it difficult to read the data. To counteract such effects, GfO applies a scratch-proof coating that, moreover, does not only resist chemical impact from detergents, but gives intense deep gloss to colored parts. The experts plastics refinement decided to base the new serial installation from the

outset on the technology supplied by Plasmatrete.

At GfO, solely for the automotive industry, hundreds of thousands of plastic plates a year are pretreated with plasma and coated with scratch-proof varnishing. To these are added large quantities of display fascias for other sectors such as medical devices, white goods, aviation and the electronics industry. The level of cleanness of the injection molded components arriving at the coating works is required to be very high. Nevertheless, by being exposed to the ambient air, it often cannot be avoided that dust particles deposit on the surface. It is therefore indispensable for the components to undergo a pre-treatment.

Initial precleaning to remove relatively coarse soiling is followed by atmospheric-pressure plasma pretreatment. A rotary jet specially designed for gentle all-over treatment conveys the plasma at onto the surface. Immediately afterwards the finely cleaned and highly activated plastic parts are given their scratch-resistant coating in the painting station. Due to the high surface tension achieved by the

plasma treatment the paint forms a homogeneous film.

Simple integration into the process

The fact that rejects have been reduced considerably, the speed of the process has been increased and overall far greater economic efficiency has been achieved is apart from the new inkjet process the merit of the pretreatment with atmospheric-pressure plasma.


When asked, if the Openair-technique had caused any severe difficulties to the coating expert or his staff, Norbert Weiss, GfO's Sales Manager denied: "Neither did we have any problems with the integration of the system, nor with the training of the staff. Every automotive manufacturer has his own products, and each of the components has its own parameters (distance, performance, speed). This means that the plasma jet is merely set to the optimum working point to make sure the customer's quality requirements are adhered to." Concerning intervals of the pretreatment system's maintenance, Weiss is very satisfied, adding: "The plasma system has been in use at our

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plant in continuous operation since 2007 and until today only one maintenance was needed. The plasma system just keeps on working and working.”

Among the major benefits of the described plasma process are its reliability and quality in the production process as well as the easy integration into an automatic and continuous production flow. The high activation of the plastics surfaces allows inter alia long term stable and impeccable coatings. Furthermore the wish for higher economical efficiency can be achieved just as well as requirements for perfect environmental friendliness.

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