

SURFACE TECHNOLOGY: PLASMATREAT CEO CHRISTIAN BUSKE ON THE POSSIBILITIES OF PLASMA TREATMENT

INTERVIEW

“Plasma technology often already amortizes within one year.”

The surface treatment with plasma can do far more than increase the durability of tools. Christian Buske, executive of Plasmatreat GmbH, Steinhagen, explains how aluminum is protected against corrosion by it.



“By plasma activation composites obtain completely new structural compositions.”

> For a long time surface treatment with plasma was said to be relatively expensive. Has this changed in the meantime?

This depends upon the technology that is replaced by plasma technology. I suppose that the atmospheric plasma technology amortizes itself within one year in one third of the applications. One has to look at the whole process. Let me give you an example: with two-component injection moulding cheaper raw materials can be used and activated with plasma to the same high level as was possible with the original, more expensive material.

> Metalworkers mainly know surface treatment with plasma from coating tools to increase durability. It is also used for cleaning processes. Now you have developed procedures for the treatment of aluminum. With these the corrosion protection can be realized. How does it work?

Generally the energy of a plasma beam is high enough to break the bonds of the molecules, so they can create new assemblies with the gases in the surroundings. For aluminum corrosion protection we add a silicium-organic precursor material to the plasma beam. This precursor is dissipated by the plasma energy and deposits a glassy coating on the surface from 20 to 500 nm thick depending on the application. It builds a barrier against humidity, oxygen and corrosion on the surface. These layers can provide a finish, yet can also be adhered to with PU or silicone glues. The layer

makes sure that the adhesion in the glue joint is not undercut so easily by corrosion creep.

> Which applications does your method lend itself to?

As our process takes place under atmospheric pressure, no vacuum chamber is needed. So it lends itself to automated in-line processes. The jet of the plasma beam is driven past the part to achieve the corrosion protection. In this respect it is suitable for selective corrosion protection on parts.

> What applications does this lend itself to?

Our customer TRW treats aluminium die-cast housings, in which electronics are waterproof sealed. There is a cap - in which the electronic is already built in - that must be secured to the housing with a gasket between the two. To accomplish this, the housing is first pre-cleaned micro-finely with plasma. It is then coated by plasma polymerization and subsequently the cap is pressed on. The corrosion creep of the sealing is avoided in this case by our partial corrosion protection. Especially with cars there are a variety of peripherally located electronic parts that have to be protected from humidity.

> Which corrosion protection do you displace?

Up to now this was mainly done by means of passivation and pickling, yet these additional procedures easily cost a few Euros with a housing part. Plasmapolymerization brings

about only one tenth of these costs.

> Of what size may the parts be?

Size does not matter as the tool can even be operated manually as well.

> Are there any other restrictions?

The components should be absolutely clean and free of greases or oils. This can be accomplished by another plasma process which takes place just beforehand. In this case the same plasma tools can be used, all that has to be done is to switch from the plasma cleaning to the plasma coating mode.

> What progress is there with cleaning of aluminium?

We have recently installed equipment to clean 300mm wide bands in throughflow. These bands are later coated in the coil-coating-process. In the past, phosphoric acid and other wet chemical procedures were used to accomplish the same result. For example with Griesser, a Swiss manufacturer of aluminum external blinds, we have connected 48 plasmajets in series for the cleaning of the aluminum. The customer saves approximately 800t per month of sewage as well as an enormous amount of chemicals. The production speed is quadrupled.

> What other applications does the process lend itself to?

Plasma can clean oil from flutes very well and cleans fins as well. Also, aluminum can be prepared for welding by plasma treatment. The weld is then much more even and contains minimal oxide.

> The plasma surface technology is also interesting for plastic fabricators. Which trends do you notice there?

The development shows that layer structures of composites as they are used in the construction of vehicles, wind power, and aircrafts no longer have to be mechanically cleaned to bond or

be coated to a high degree. Painting processes are improved drastically simply by the cleaning and activation of a surface with plasma. This is also valid for flat-lamination processes as well as for the lamination of sandwiches. Here the plasma-activation of the inner sandwich cores often creates new structural composites. This allows for the use of easily recycled materials such as polypropylene (PP) and PP-composites for these inner cores. 3D-geometries are also possible.

> And what does it look like with injection-moulding?

We have been working on increasing the compatibility of different hard-soft-materials in the sector of injection-moulding together with the chair of plastics engineering of the University of Erlangen-Nürnberg, Neue Materialien Fürth and KraussMaffei. It was observed that economic PP and thermo plastic polyurethane-elastomers (TPU) no longer separate during injection moulding if the PP-surface is treated with plasma. This can potentially replace PC-ABS in many applications and saves up to one third of the cost for materials. Again in this way several manufacturing steps are handled in one injection-moulding machine. The plasma technology is integrated in-line in the KraussMaffei machines. Still, we are also open for other cooperations.

> Can this process not improve the feel of surfaces at the same time?

Yes, inside vehicles problematic soft touch paints can be replaced by it. The thin TPU-layer on PP creates an agreeable feel of the dashboard.

> Doesn't that mean designers and draftsmen have to integrate this technology into their ideas and work?

In the automotive or the plastics engineering industry it has to go via these two groups, as they choose the materials. They have

> CHANCES IN THE MARKET

The industrial plasma surface technique is a key technology for a better protection against wear and corrosion or reduction of friction on critical machine components. In the composite industry these possibilities are used successfully for high-performance products. There are many fields however where the potentials of this technology for product innovation are by far not exploited.

to know the possibilities of the technology and know about its economical potential. The fact that together with a machine manufacturer and a raw material manufacturer we are able to offer the customer a complete system makes things easier. In certain branches it is difficult to familiarize the designers with this technology.

> Where can these specialists get informed on this technology?

Besides personal talks with our experts, mainly during conferences – for instance on plastics engineering in the automotive industry. Furthermore we do cooperate with the Fraunhofer IFAM in Bremen.

Sabine Koll
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