

# KORROSIONSSCHUTZ

**JOT**special  
JOURNAL FÜR OBERFLÄCHENTECHNIK

[www.jot-oberflaeche.de](http://www.jot-oberflaeche.de)



**Korrosionsschutz – eine diffizile Maßarbeit**

**2008**

Applikationstechnik \_ Schwere Materialien leicht aufgebracht

Beschichtungsmaterialien \_ Korrosionsschutz mit Pulverlack

Strahlen \_ Neue Anlagenkonzepte für Schiffe und Windkraftanlagen

## pretreatment

### Nanopretreatment for pressure diecast housings

# Plasma coating integrated into the process

A subcontractor to the automotive industry was faced with the challenge of retrofitting an anticorrosive treatment for an aluminium part into an existing process chain. Coating with atmospheric-pressure plasma for this purpose fulfils all requirements with regard to quality, feasibility of integration and costs.

In collaboration with Plasmatreat and the Fraunhofer IFAM Institute the automotive industry subcontractor TRW developed a concept for effectively protecting the pressure diecast aluminium housings of the pumps of servo-steering systems against corrosion. A special feature here is the retrofitting of plasma coating into an existing process chain.

By means of plasma from a jet system corrosion protection is applied without contact with the surface of the aluminium. The plasma process operates at atmospheric pressure and does not require a vacuum to deposit a layer. Even in the case of sensitive light metals no structural change occurs in the material. The dry chemical deposition process makes use of what are known as film-forming monomers to produce a highly cross-linked thin nanocoating which exhibits extremely high chemical resistance.



Photo Plasmatreat  
Coating by means of atmospheric-pressure plasma can be integrated in ideal fashion into existing production systems for aluminium parts

The operating gases and monomers are non-toxic and the nanocoating is completely free of chromium, chromates and heavy metals. The film thickness is less than 1  $\mu\text{m}$  and is so low that the dimensional stability of the coated parts is not altered. The entire process includes fine cleaning of the surface which promotes excellent adhesion of the coating. As a result of this the coated surface is resistant to penetration of the film by any corrosive contaminants.

A special advantage of the process is its great flexibility. In particular the film thickness and the speed of the process can be matched in line with requirements to the anticorrosive effect needed. Typical processing speeds vary from 5 m/min to 30 m/min. Directly after application of the coating the part can be processed further. The coating affords not only high resistance to corrosion but also a stable, peel-resistant substrate for adhesives and sealants.

## pretreatment

The process is very environmentally friendly and there is no need for disposal or treatment of chemicals.

### Little need for space and low maintenance costs

In new developments when all quality requirements are known implementation with the aid of appropriate influencing factors, such as design, process chain planning or anticorrosion measures, is achievable using commonly available technical solutions.

Incomparably more difficult are subsequently arising customer demands in projects already under way with existing global process chains. In such cases commonly available technical solutions are frequently no longer capable of integration or this can only be done by making enormous changes in association with high investment costs. Moreover, changes in production processes including reconstruction measures give rise to downtimes in production. Nevertheless, due to new demands from a customer the supplier to the automotive industry decided in 2006 to retrofit a corrosion protection process into the existing production line.

The possibilities for protecting a current pump unit having an aluminium pressure diecast housing against environmental effects were limited to four options: improvement of the material, anodisation, passivation or plasma coating under partial vacuum or at atmospheric pressure.

Interfering with the quality of the aluminium material is a dramatic change since this is also typically accompanied by other effects, such as a decrease in tensile strength.

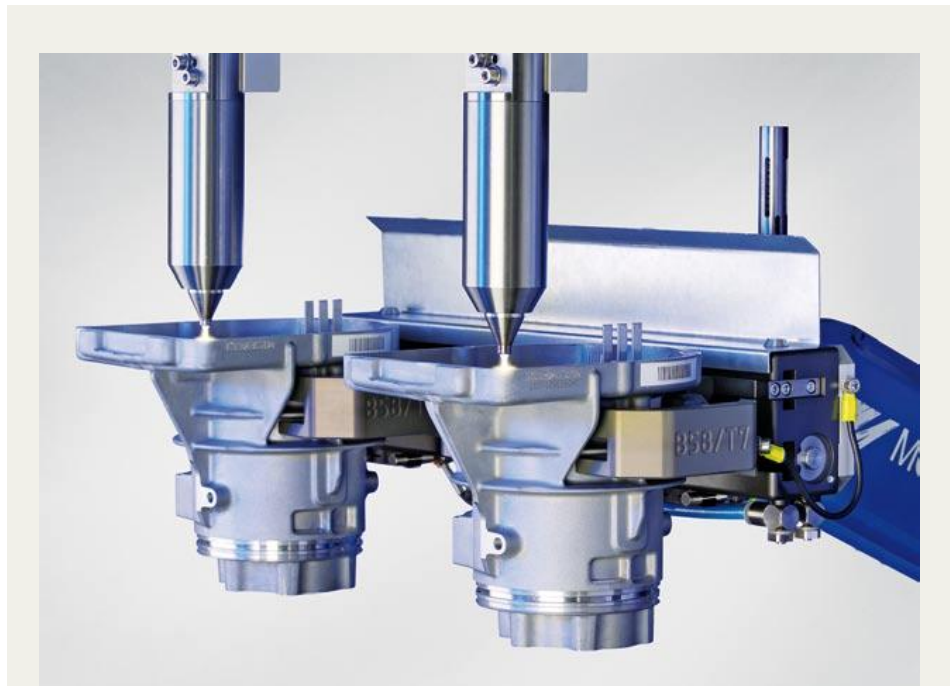


Photo: Plasmatreat  
Prior to plasma coating microfine precleaning of the parts is carried out with atmospheric-pressure plasma

This would have entailed completely new product validation involving great effort and costs.

Much the same applies to anodisation. The formation of the coating on the surface on which the principle of this method is based results in significant changes in dimensions and hence in an impact on the fitting system. The lamellar structure also carries risks with regard to contamination of the hydraulic steering system and critical changes in friction at highly stressed screw joints. Anodisation, therefore, would also make extensive product validation necessary.

Passivation affords good protection against corrosion and has the advantage that no layer of appreciable thickness is formed. However, its heat resistance is not sufficient for the applications and internal production processes at TRW.

Furthermore, both applications, i.e. anodisation and passivation, are expensive methods for corrosion protection.

The possibility of low-pressure plasma coating presumes some readiness to invest in corresponding plant technology. When there is a requirement for high capacity and/or complicated part geometries high investment costs may be necessary.

All three variants considered have one thing in common: the processes would have to be capable of integration into the process chain in such a way that direct quality control would be possible. Subsequent quality control on finished components ready for delivery is very costly and considerably reduces the reliability of the process.

Atmospheric-pressure plasma coating, on the other hand, offers decisive advantages. Integration into finally assembly at the automotive industry supplier could be implemented with little expense and without disturbances in production. At the same time the process could be ideally incorporated into the quality assurance processes.

Due to the possibility of applying plasma coatings selectively, critical areas remain unaffected. New validations are not necessary. Investment and maintenance costs are low. The low requirement for space and maintenance effort together with short cycle times were further criteria for the integration of atmospheric-pressure plasma at TRW.

Until just recently plasma coating was only possible in vacuum. The new technology from Plasmatreat described here allows for the first time the implementation of plasma polymerisation under normal atmospheric pressure in an industrial application. [□](#)

---

Contact:  
Plasmatreat GmbH, Steinhagen  
Tel. 05204 9960-0  
[mail@plasmatreat.de](mailto:mail@plasmatreat.de)  
[www.plasmatreat.de](http://www.plasmatreat.de)