

D 53477

www.BranchenIndex.de

Branchen Index

GALVANOTECHNIK | DÜNNE SCHICHTEN 2010

JOT

PRODUCTS

Galvan Technique | Thin Layers 2010

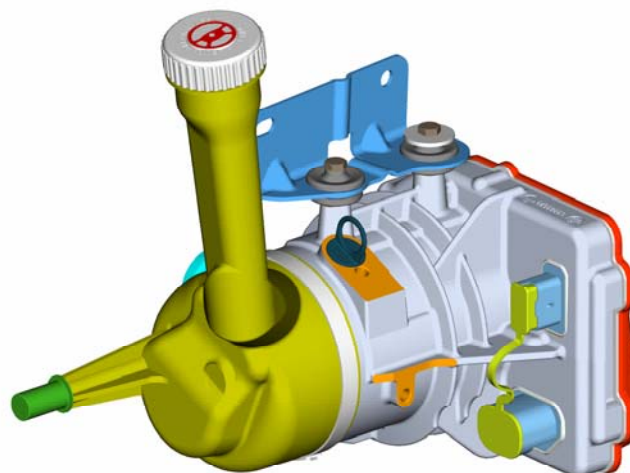
Corrosion protection for pressure diecast housings

Integration of plasma coating made easy

An automotive industry subcontractor could save costs and improve the quality of its products through subsequent integration of an atmospheric pressure plasma coating system for the corrosion protection of aluminium components.

Until just a few years ago, subsequent integration of plasma coating into an existing production line was all but conceivable. The automotive industry subcontractor TRW Automotive nevertheless satisfied the high requirements of a customer and converted the coating of its aluminium components to atmospheric pressure plasma in 2006. In

collaboration with the Fraunhofer IFAM Institute and Plasmatrete, TRW developed a concept for coating the aluminium components of servo-steering systems. 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



The motor pump units of the automotive industry subcontractor TRW Automotive are equipped with aluminium pressure diecast housings. The manufacturer retrofitted plasma coating treatment into an existing production process upon a customer's request.



How is atmospheric pressure plasma coating performing in practical use? Branchen Index interviewed Bertram Schwanitz, development engineer and technical project manager of the automotive industry subcontractor TRW.

What experience have you made with the use of plasma coating for the pump units? TRW has operated this system since early 2007, which makes more than three years, and it has given completely trouble-free performance ever since. Plasma coating saves us a great deal of investment and operating cost compared to other processes. Processes such as passivation and anodisation would have cost us several euros per component. In the case of plasma coating, we are talking about costs per component in the cent range.

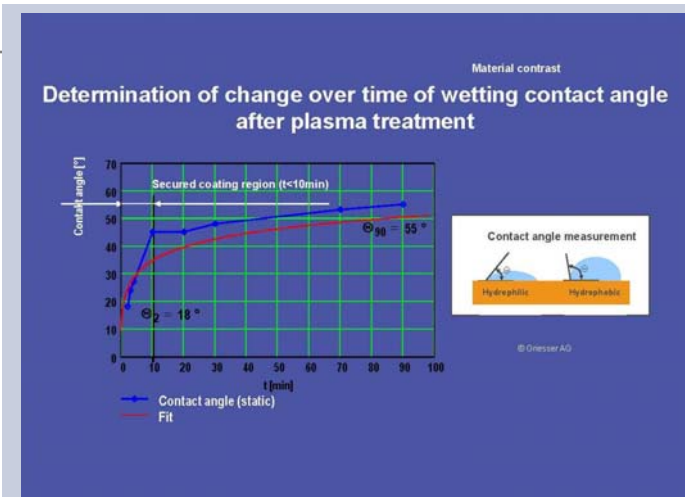
What has plasma coating concretely changed in the production process?

On the one hand TRW could achieve local passivation protection so that the need for coating complete components is omitted. This method is much more cost-effective and protects the interfaces relevant to us. On the other hand it is more convenient to the company to integrate this process into its factory than having to install processes with global subcontractors. And exactly that would be the case when looking at the other corrosion protection methods whether it is passivation, anodisation or even low pressure plasma. In addition, large system equipment as, for example, is the case with low pressure plasma, is not required. Interventions into the production chain, especially into those of our subcontractors, were not necessary. And we have subsequently integrated this very small system with no need for building another hall extension. With the new method we are only left with some operating costs, namely for a few technical gases and for energy in the form of electric current.

We have also improved the process reliability in production: Given that the plasma process becomes active on liquid joints immediately before bonding, we also create an ideally clean surface for this liquid joint application. If this operation was outsourced there would be, after all, always a risk of contamination with the result that we could perhaps not achieve the required adhesion on a fingerprint mark or an oily spot.

Will the coating also be used by TRW for components in other fields of application in the future?

That's generally transferable. The existing lines afford the required flexibility to also permit treatment of other components in a relatively short period of time.



The water contact angle is considerably reduced during the intensive plasma cleaning process of an aluminium surface. The surface energy increases and there-by makes the material well coatable or bondable.

During the intensive plasma cleaning process of an aluminium surface, the natural oxide layer thickness is increased by 1-2 nm and thereby virtually doubled. Moreover, the water contact angle is considerably reduced and the surface energy increased by the plasma process.

In the case of application at TRW Automotive, the microfine cleaning and activation processes provide the basis for optimal adhesion of the subsequent plasma coating. Here, the organo-silicon coating following the cleaning process contributes the majority to corrosion resistance.

Surface energy

The surface energy is the most important measure for evaluating the probable adhesive strength of an adhesive coating. Whether a material is well coatable or bondable mainly depends on its water wettability. The surface energy, however, is often too low for good wettability so that selective pretreatment becomes mandatory.

The "Openair" type plasma process makes surface energies of over 72 mJ/m² possible for most materials and therefore creates optimal conditions for reliable bondings or coatings of a wide variety of aluminium alloys. To this end the surface is cleaned to a microfine level by the jet system and activated at the same time which means that a modification of the oxide structure takes place here.

a layer. The dry chemical deposition process makes use of what are known as monomers to produce a highly cross-linked thin nanocoating which exhibits extremely high chemical resistance.

This system has been operating successfully since 2007 (see the interview box), and TRW could integrate it without significant investments or additional conversions. By doing so, the company reacted to a customer's request for better corrosion protection of the aluminium components and integrated the system subsequently. The low requirement for space and maintenance effort together with short cycle times were further criteria for the integration of the atmospheric pressure plasma.

The atmospheric plasma-coating can be integrated into the existing production line of aluminium parts

Matching the film thickness according to the requirements

The new application comes up with great flexibility. In particular the film thickness and the speed of the process can be matched in line with the requirements to the anticorrosive effect needed. Typical processing speeds vary from 5 to 30 m/min. A further advantage of this method is the peel-resistant, stable substrate which optimally lends itself to adhesives and sealants.

The entire process includes fine cleaning of the surface which promotes excellent adhesion of the film. As a result of this the coated surface is resistant to penetration of the coating by corrosive contaminants.



Another advantage of the plasma process is its environmental friendliness given that the operating gases and monomers are non-toxic and the nanocoating is completely free of chromium, chromates and heavy metals. There is no need for disposal or treatment of chemicals. The system exhibited high process reliability in practical use and could be integrated with little

PRODUCTS

Galvan Technique | Thin Layers 2010

effort and without disturbances in production. At the same time TRW could incorporate the process optimally into the existing quality assurance processes.

The company additionally retrofitted plasma cleaning as a standard process (see the box) into the existing production also for other products. Thanks to the new coating process, the company was able to reduce the costs per component of several euros to a cost level in the cent range. The principle of this process is also quickly and flexibly transferable to the production of other components in the line.

Contact:
Plasmatreat GmbH, Steinhagen
Tel. 05204 9960-0
mail@plasmatreat.de,
☐ www.plasmatreat.de