



A sustainable alternative to electroplating

Metallized plastic components have the same high-quality look and feel as chromium-plated metal parts and are less costly to produce. For these reasons, they are used in auto manufacturing for radiator grilles or mirror caps, as well as for electronic appliances and bathroom fittings. Today, Oerlikon Balzers has developed an eco-friendly method for metallizing plastic components. The technology named ePD™ enables parts to be metallized in a process that saves cost and resources, without yielding any harmful substances. In addition, this innovative technology opens up new and exciting designs and functionality possibilities.

With high-quality metallic coating, plastic components take on a luxurious chrome look. Hence, they are popularly used in design elements for cars, electrical appliances, kitchens and bathrooms. In vehicles, radiator grilles, mirror caps, door handles and trim are some items with such a finish. Push buttons and covers for hi-fi equipment, cell phones and coffee machines, as well as showerheads, are further examples of products coated with this method.

Plastic is gradually replacing metal as the basic material for such applications for good reason: Bernd Fischer, Head of Oerlikon Balzers, summarizes the main benefits of metallized plastic compo-

nents: «Plastics are light and corrosion-proof. Apart from that, plastic injection molding is a much cheaper form of manufacturing.»

Eco-friendly production process

Historically, electroplating was the main method used in metallizing components, where metal ions are deposited on plastic parts in an electrolytic bath. However, this wet chemical method requires the use of chromium derivatives and nickel – substances graded as ecologically harmful. Consequently, the European Union intends to limit the use of certain chromium derivatives. And a total ban of such usage in the future cannot be ruled out. In emerging markets like

Brazil or China, there is today a much greater awareness of environmental issues than just a few years ago. As a result, setting-up of new electroplating plants is becoming much more difficult even in these countries.

The automotive, electronics and sanitation industries are therefore seeking sustainable alternatives. Oerlikon Balzers, a Business Unit of the Oerlikon Group's Surface Solutions Segment, has the answer – it has developed an exceptionally innovative method for the metallization of plastic parts. Its proprietary ePD process – embedded PVD for Design Parts – is environmentally friendly and requires no metal derivatives such as chromium or nickel. With ePD coatings, there is zero heavy metal waste and no contaminated wastewater. «We are convinced that this technology can be used anywhere in the world with less costly or complicated restrictions,» says Helmut Rudigier, Chief Technology Officer at Oerlikon Balzers.

Coated layers

only 0.2 micrometers

The new process saves costs and resources

During the ePD process, the metallic coating is applied between two layers of UV lacquer. The first layer evens out the irregularities that occur during injection molding, while the top coat serves as an effective protection against environmental factors. The metal layer between them is coated using the PVD (Physical Vapor Deposition) process, which makes it possible to use substances that are environmentally friendly.

This process also helps to conserve the use of resources. The metallic layer is only about 0.2 micrometers thick as compared to coatings with electroplating which have a thickness of up to 60 micrometers. On top of that, the ePD-coated plastic parts can easily be recycled at the end of their product life-cycle.

Manufacturers benefit not only from a more efficient use of resources but also from cost savings. Components that need to be lacquered and metallized require no separate injection molding tool for the metallization process. If ePD is integrated as part of the in-house production process, there are further cost savings from eliminating the transport of semi-finished parts.

Flexible and corrosion resistant

The significantly thinner metal coating has several essential advantages. It is flexible and can even be made transparent to accommodate light or radar. Due to this flexibility, parts can be bent or stretched to a certain degree, allowing standard components to be easily modified to fit a specific design. When used in components for the exterior of cars, this malleability also increases safety. For example, in the event of an accidental collision between a pedestrian and a metallized radiator grille, there are no splinters or sharp edges, even if the grille is broken.

Moreover, coatings done using the ePD process have proven to enable excellent corrosion resistance despite the thinness of the coating layer. In the so-called "Russian mud test", parts coated with this process were even resistant to highly corrosive salts, which are used to melt ice on roads in Russia and Canada.

The layers facilitate innovative functions

Another major benefit of using the ePD technology is that manufacturers gain the possibility to integrate additional innovative functions, for which electroplating only offers limited scope. Take for example radar-transparent housings - integrating a radar sensor that measures the distance to objects in front is absolutely no problem in the case of an ePD-coated radiator grille. Equally within the realms of possibility are door and trunk handles with built-in sensors to enable doors to open automatically. And because the layers can be applied such that they are transparent, symbols can also be integrated into backlit buttons. Thanks to this new technique, totally new designs



with countless color, nuances and optical effects can be realized. In highly competitive markets such as automobile or consumer electronics, innovative products developed with such additional functions can make the difference for companies to gain a competitive edge.

Use as a service or integrated in industrial production lines

Within the next few years, the ePD process could establish itself as the new industrial standard for metallizing plastic parts. «In every respect, it is a substitutional technology with enormous potential in a rapidly growing market,» explains Rüdiger Schäfer, Head of ePD Technology at Oerlikon Balzers.

The Surface Solutions Segment is offering its customers the new process in two different ways. Firstly, selected coating centers of the Business Unit provide metallization as a service with the same high level of quality and fast throughput times.

Secondly, the fully automated and self-contained coating system can be integrated into current industrial production lines. This is particularly of interest to large automotive suppliers, who today usually have the plastic parts galvanized by an external partner. With ePD, they could offer this coating process as part of their own production, thereby increas-

ing their own value-added services. «Removing the back and forth transportation of parts for coating simplifies production logistics and results in cost savings,» analyzes Schäfer. In addition, suppliers with their own ePD systems could offer their customers a wider range of innovative solutions – not only through better designs but also with new innovative functions. ■

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