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Opening picture: Coating metal surfaces protects them from corrosion and improves their aesthetic properties.



FOCUS ON TECHNOLOGY

Metallveredelungswerk Sulz: the New Frontiers of Bulk Cathaphoresis With the DELTA-eLACK® Process

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Corrosion is a widespread and burdensome problem that affects the steel components used in several industrial sectors such as automotive, construction and aerospace, which coat their metal surfaces precisely to protect them from corrosion as well as to improve their aesthetic properties (ref. Opening photo). In industrialised countries, the estimated annual expenditure to counter corrosion accounts for around 4%

of the GDP. The costs for replacing damaged components and machine downtimes are other issues that are very difficult to solve. However, significant savings can be achieved by applying corrosion-resistant coatings on components. By applying suitable coatings on metal surfaces, it is possible to significantly improve the service life of components and thus reduce downtimes and repair or replacement costs. One of the most common corrosion prevention

technologies is cathodic immersion coating, i.e. cathaphoresis. For many years, this has been one of the most commonly used methods in several industries, especially the car one, to protect metal parts against corrosion. This technology is typically used to coat large-sized workpieces such as car bodies, truck cabins, and agricultural machinery, but also smaller components such as finned batteries, pulleys, industrial fans, industrial furniture, and many more.

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Figure 1: Dörken MKS-Systeme developed a bulk cataphoresis process called DELTA-eLACK® with a drum system.

Due to the characteristics of the cataphoresis process itself, requiring the workpieces to be hung onto frames, bars or skids, until some time ago it was unthinkable – or at least too burdensome in terms of labour and process times – to use cataphoresis to coat very small parts such as fasteners, screws, bolts, pins and washers. On the German market, the cost per cataphoresis-coated component is 3 to 10 cents (calculation based on the dimensions and size of parts). That is why, despite its exceptional strength and aesthetic properties, cataphoresis was never used as an anti-corrosion treatment for bulk small components. Dörken MKS-Systeme, a company based in Herdecke (Germany) and a leading manufacturer of zinc-lamellar anti-corrosion coatings, developed a bulk cataphoresis process a few years ago. It is called DELTA-eLACK® and it enables to coat small-sized components with a drum system (Fig. 1). Metallveredelungswerk Sulz GmbH (Sulz am Neckar, Germany), specialising in galvanic, zinc-lamellar and anti-corrosion coatings, was one of the first companies to implement the new DELTA-eLACK® process offered by Dörken by developing an eco-friendly treatment cycle. This ensures high anti-corrosion protection performance and the application of a black layer of uniform thickness on fastening parts intended for the car industry.



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Figure 2: A part of the coating process.

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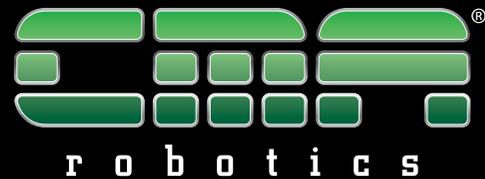
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The company

Metallveredelungswerk Sulz (Sulz am Neckar) was established in January 1997 by Bodo Langendörfer and Hans-Jörg Haible. It started with only 4 employees, but it shortly managed to hire other 100 people thanks to the high quality of its galvanic and chemical coatings and to the numerous innovations introduced. Sulz installed two fully automatic galvanising systems in 2003 and the next year it expanded its galvanic coating range to include the copper plating, nickel plating and chrome plating of high quality car parts. Metallveredelungswerk Sulz developed further innovative coating processes in the following years, thus becoming one of the most successful companies in southern Germany (Fig. 2).

The firm currently produces galvanic coatings, combined with zinc and zinc-nickel substrates, zinc-lamellar coatings, phosphate coatings with zinc and manganese salts, cathoretic coatings, and powder coatings. One of the strengths of MV Sulz is its high degree of innovation, as demonstrated by the implementation of Dörken's DELTA-eLACK® process. This also enabled the company to enhance its other strength: the ability to process batches of small components in a short time.

The solution to bulk cathaphoresis problems: the DELTA-eLACK® system

Cathaphoresis is an electrophoretic coating process developed specifically for parts with complex shapes. The component to be painted is immersed in a water-based coating and direct current is applied to enable the coating particles to deposit on the conductive metal substrate. Cathaphoresis has become a standard procedure in the automotive industry because it allows to apply a protective basecoat that is also aesthetically perfect: black, shiny and uniform (Fig. 3).

DELTA-eLACK® is a black organic topcoat that can be applied on a zinc-lamellar basecoat or on a galvanised surface with



Figure 3: Cathaphoresis has become a standard procedure in the automotive industry because it allows to apply a protective basecoat that is also aesthetically perfect.

a completely new system technology called by Dörken KTL 2.0. The workpieces – small or medium-sized, flat with bends or three-dimensional – are transferred from the conveyor belt to a drum that is rotated and immersed in the tank containing the cathaphoresis product (Fig. 4). This technology allows for the first time and in a very reliable way to subject bulk components to a cathaphoresis process, obtaining excellent results in terms of aesthetic and protection performance and high economic efficiency. The cost of labour for the treatment of components and, therefore, the cost per part are in fact dramatically reduced.



Figure 4: The workpieces are transferred from the conveyor belt to a drum that is rotated and immersed in the tank containing the cathaphoresis product.

With other coating processes, small and very small workpieces are treated with difficulty and unevenly, whereas this new bulk cathaphoresis technology ensures perfect corrosion protection, thin and uniform thicknesses, and a high quality look free of any defects or partial accumulations on surfaces. In combination with a zinc-lamellar coating, e.g. from the DELTA MKS series, DELTA-eLACK® offers the best of two worlds: high corrosion protection performance and a very nice black-coloured surface that is particularly requested by the automotive industry.

Moreover, should the DELTA-eLACK® topcoat be damaged, the cathodic protection of the zinc-lamellar basecoat would remain active.

Aware of the potential of the new KTL 2.0 system, MV Sulz immediately decided to implement it, thus becoming an applicator certified by Dörken and entering into a distribution partnership. Thanks to this innovation, Metallveredelungswerk Sulz GmbH won the "Dr. Rudolf Eberle" prize for the exemplary results achieved in the framework of the Innovation Award 2017 of the state of Baden-Württemberg.

The main features of DELTA-eLACK®

- High cathodic corrosion protection thanks to the combination of a zinc-lamellar basecoat and a cathoretic topcoat;
- High resistance to white rust;
- Bulk coating in a drum system;
- Application of thin and uniform layers;
- Possibility to set and adjust the thickness of the coating layers based on customer specifications;
- Possibility to set friction coefficients based on specifications;
- Aesthetically pleasing black appearance;
- High chemical resistance;
- Sustainable and ecological process;
- Threaded parts do not need further processing or finishing;
- Good wettability behaviour. ○