

## Press Facts

### **Custom-made corrosion protection**

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*The legally required elimination of chromium (VI)-containing coatings represents an opportunity to optimise existing surface protection properties and develop new ones.*

The EC directive 2000/53/EG (End Of Life Vehicles) comes into effect in July 2007 and all EU Member States will have to have implemented its provisions by then – although vehicles with a weight in excess of 3.5 tons are exempt from the directive. From this date on, the corrosion protection on important vehicle components, for example, is not permitted to contain any chromium (VI) in excess of 0.1 percent by weight. The above deadline has recently been extended to July 2008 for bolt and nut assemblies for chassis applications only. However, at the time the extension was granted, the automotive industry had already progressed to such an extent with the substitution of chromium (VI)-containing corrosion protection that most companies are presumed to continue to keep to the original deadline. A similar directive affecting the electronics industry (2002/95EG) will come into force earlier, i.e. in July 2006. For both the electronics and the automotive sector, this virtually signifies the end of being able to use two highly effective, but harmful corrosion protection systems that contain chromium (VI):

Chromium (VI)-stabilized zinc lamella coatings and yellow passivation of galvanic zinc coats.

However, all of the corrosion protection requirements that have hitherto been achieved using these conventional methods, can now also be consistently produced using chromium (VI)-free coatings.

In view of this, the conversion to chromium (VI)-free corrosion protection represents an opportunity to optimise existing protection characteristics and to develop new ones. This could, for example, include friction coefficients or coating colours. Modern chromium (VI)-free zinc flake systems are perfect for replacing the old chromium (VI)-containing coatings. Dörken MKS-Systeme GmbH & Co. KG has more than 20 years of experience with these systems and, with its Delta- Protekt® KL 100, is already offering a high-performance solution that has long been approved by leading car manufacturers. Dörken also offers highly advanced sealings for the Galvano range in order to enable achievement of equal or longer life times in conventional corrosion tests for chromium (VI)-free protection system structures.

## **Fundamental questions**

Every design engineer confronted with the conversion to chromium (VI)-free coatings will have two fundamental questions. The first of these is whether or not it is actually necessary to change a particular surface protection system. In view of the long supply chains and the many possibilities involved in coating production, it may be difficult to determine exactly what type of corrosion protection has been used on a component. This is because chromium (III) does not fall under the regulations

of the above EC directives and is permitted to be used in chromium (VI)-free passivations. Obtaining sure proof of any of the differences between the two oxidation stages using X-ray photoelectron spectroscopy (XPS) is a complex and costly business.

The second question is that of additional costs associated with any conversions. In view of the ever-increasing steel and oil prices, lightweight construction is of increasing importance: because the use of light and high-strength materials equals less material and fuel consumption. Which is precisely why high-performance corrosion protection is becoming so important. If surface protection systems are optimally designed to meet the stresses a component is exposed to over its entire service life, then any oversizing aimed at ensuring the functionality of the component can be totally avoided. The cosmetic appearance of corrosion protected wire components – such as springs, screws and chains – do not have to loose out either as a consequence of the conversion. Here, the requirements of most designers can be met by using silver, black and coloured topcoats.

## **A complex matter**

Another complex matter requiring consideration by design engineers is how to proceed in practical terms with the replacement of chromium (VI)-containing surfaces. If the component needing protection is new, this issue is easily dealt with since the automotive industry specifies which coating systems are approved for use as corrosion protection. This means that all that is required to provide surface protection for new components is getting in touch

with the relevant coating company responsible for providing the surface protection for those components - simple. Alternatively, coating manufacturers like Dörken MKS-Systeme offer a service for developing coatings for new components and will see all new coatings through the inspection phase in collaboration with their licensees.

If, however, the component needing protection is part of an ongoing design, there are various aspects that need consideration when selecting the new chromium (VI)-free surface. The latest car manufacturer's specifications are again the first source of reference for suitable coatings. Since these components are, however, to be installed in an otherwise unchanged environment, the characteristics of the old, chromium (VI)-containing coating and the new, chromium (VI)-free corrosion protection must be as similar as possible. This not only refers to cosmetic appearance, but also to friction coefficients, layer thickness and chemical resistance. The achievement of such consistency requires close cooperation between the component manufacturer, manufacturer of the coating media and the licensed coating company.

Dörken generally conducts talks with all parties involved right at the beginning of every proposed coating conversion. These talks involve recording and evaluating all of the boundary conditions associated with the use of the relevant component and are followed by a range of basic coating tests that are initially performed during pilot runs and are later used in the production plants of the coating service provider. The coating samples obtained in this way are then tested using parameters that are agreed beforehand.

The results of these tests are subsequently detailed and discussed by all parties involved and, it is at this point that between one and three of the various samples has to be selected for further testing conducted in close collaboration with - in particular - the component manufacturer, in order to ensure the functionality of the new coating. At the end of this process, the component manufacturer will have gained a new chromium (VI)-free surface for introduction to his customers. Dörken and its licensees across the world are, of course, also happy to take on the presentation of the final product to end customers.

## **Early talks**

Using the above strategy, the surfaces of a range of components, such as fasteners, springs and chains have already been successfully converted to being chromium (VI)-free in the most recent past. The increasing number of enquiries and initial sampling performed by surface finishing and independent coating service providers are speaking for themselves: the deadline for the conversion to chromium (VI)-free surfaces is getting closer and the need to act is becoming more urgent for all those concerned. Unfortunately, there are no ready-made solutions to this problem and every single component must be evaluated individually on the basis of its unique requirements. The development of custom-made corrosion protection is a complex process that requires the collaboration of all parties involved - right from the start. The earlier individual parties enter into talks, the better.

**Literature:**

[1]: G. Jander, W. Blasius, Textbook of analytical and preparative inorganic chemistry, S. Hirzel Verlag Stuttgart 1989, S. 443.

**Box:**

Dörken MKS-Systeme GmbH & Co. KG or one of its licensed coating service providers will be happy to answer any questions regarding definitive coating requirements and specifications. A list of licensed coating service providers and further information on microlayer corrosion protection coatings can be obtained at [www.doerken-mks.de](http://www.doerken-mks.de) or by calling Tel. +49 2330 63- 607