Present and future

The crucial features of corrosion protection

Thom Hermens from Dow Coating Materials and Dr Andreas Paulsen of Hempel, give us their thoughts on the properties required of DTM coatings, and how the drive for productivity will shape future developments.

1 What is the current situation for direct-to-metal corrosion protection?

Demand for direct-to-metal coating solutions and especially for waterborne direct-to-metal is growing. European Union regulations are a big factor in driving this growth. The EU cap on VOC factory emissions is forcing applicators of industrial factory-applied coatings to look for lower-VOC solutions in order to continue growing their businesses. For many applicators of corrosion-resistant coatings, direct-to-metal is the preferred solution to replace solventborne coating systems. Waterborne direct-to-metal not only provides lower VOCs but also improves productivity by replacing the traditional two-step primer and topcoat system with a single-coat application.

Our latest film build technology offers the possibility of formulating direct-to-metal coatings with good adhesion to various substrates, good corrosion resistance, and fast early hardness development to enable high application line speeds. Where higher film build is possible, for example around 100 μm dry film thickness, formulations without anti-corrosive pigments now also provide good anti-corrosive properties while at the same time simplifying the formulation space and increasing gloss potential. One area for further improvement is chemical resistance. Although self-crosslinking technology has improved the chemical resistance of one-component waterborne direct-to-metal resins, it still requires a boost if it is to match two-component topcoat performance.

2 In your business, what is the most crucial part to be protected?

Increasing productivity has been the metal coating industry’s focus for the past five years. Significant cost savings can be made by applying coatings in the factory instead of on site. As a result, the demand for pre-coated metal parts, whether for new construction projects such as buildings and bridges, earth-moving vehicles or temporary pipe coatings for the oil and gas industry, has been increasing steadily. Paint formulators and raw material suppliers are working together more than ever to develop products for these crucial applications. One particular focus for these coating systems is improving application properties while maintaining corrosion resistance performance. This requires faster curing speeds yet longer pot life. As a result, there is increased interest in alternative two-component technologies that avoid traditional, slower curing technologies such as isocyanate for polyurethane or amine for epoxy and offer improved application properties, enhanced user protection and reduced environmental impact. There are many potential technical solutions, so much more is possible!
Anticorrosive coatings

“A shift to a complete liquid coating solution is envisaged for the near future”

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1 What is the current situation for direct-to-metal corrosion protection?

For a heavy-duty coating supplier, direct-to-metal coatings (DTM) is a term typically used in the industry to describe primer-finish single coat systems that can be used when a combination of moderate corrosion protection and fast throughput in the workshop is required. A good example is the line production of large structures, such as wind turbine tower sections or parts for heavy machinery. If DTM coatings are to perform well, the formulation, production and, particularly, application are highly important. There is only a single layer of coating to protect the substrate, and thus the film thickness needs to be uniform with good edge retention properties and without defects such as pinholes. Careful formulation can ensure that these challenges are met, and this can lead to huge production savings by replacing a multilayer system with a single DTM coat. For example, using ultra-high-solids polyaspartic based coatings, a 3-tonne steel section can be moved from the paint shop barely an hour after painting, whereas a conventional 2-coat epoxy polyurethane system would usually require overnight curing of the topcoat to develop its mechanical properties.

2 In your business, what is the most crucial part to be protected?

Critical parts to be protected are steel structures that will be placed in aggressive, inaccessible environments. This makes repairing and recoating tasks extremely difficult to perform to an adequate standard. With the current state of technology this is not an impossible problem: coating suppliers are faced with these challenges every day. But if the conditions above are combined with demanding application properties, the choice of coatings is not trivial. Wind turbine towers for offshore wind farms are representative examples. Superficially, a tower section seems easy to coat as it is a simple structure with controlled application conditions. However, the need for productivity puts huge constraints on curing speed and rapid hardness development of the complete coating system. Combining fast drying properties with exceptional performance is difficult, as the range of binder systems with rapid curing properties might not always be appropriate for extreme corrosion protection. The current technology combines spray metallisation and coating, but a shift to a complete liquid coating solution is envisaged for the near future. This will put further pressure on the robustness of the coating system chosen.

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