NO BARRIER TO PROGRESS

The system was selected for the coating repair of a bridge deck due to its flexible application parameters and drying speed. Inset shows the climatic conditions as the paint was being applied

A project in Belgium has highlighted how proposals to tighten labelling and handling regulations for some coatings can drive innovation, writes **Perry Poppelaars**

Bridges are often taken for granted until they are out of operation, the impact of which can be a timely reminder of the full economic benefits they bring to businesses as well as the general public. Keeping them in service for as long as possible, and minimising any downtime due to maintenance work, is therefore a key goal for those who own and operate them.

To meet this criteria for steel structures, bridge coating systems which offer long-term corrosion protection and at the same time are easy and fast to apply with flexible application parameters are vital.

From this perspective, the coatings that tick the boxes are those based on single-pack moisture-cure polyurethanes. These systems are claimed to provide more than 25 years' corrosion protection in any environment and can be applied during adverse weather conditions. The technology was invented several decades ago by Bayer Material Science and its most striking difference, compared to epoxy coatings, is that the curing process is initiated by the reaction of the polyurethane binder system with atmospheric moisture, measured as percentage relative humidity, rather than by adding two components together.

One positive consequence is that moisture-cured urethanes can be applied up to 98% relative humidity; surface moisture actually completes the chemical reaction, and as a result these coatings show excellent adhesion to visibly damp - not wet - surfaces. In the pores and capillaries of the steel, where moisture is usually present, the coating penetrates deeply into the substrate to form strong chemical bonds. The surface moisture is consumed in the curing process which reduces the risk of blisters or poor adhesion caused by entrapped water underneath the paint film.

Apart from its tolerance to ambient and surface moisture there are a few other important technical advantages which make this technology most suitable for bridge coating maintenance.

These coatings will cure at temperatures down to -5°C without any additives, so heating and dehumidification are not required during application, presenting a significant reduction on energy costs.

They provide longer corrosion protection at a lower film thickness. A typical total film thickness of a coating system for a bridge in a C5-M environment would be only 240 micron. This results in a considerable weight reduction and longer maintenance cycle.

The polyurethane binder ensures permanent flexibility of the entire coating system, resisting cracking of the coating on areas of stress.

MCPU coatings are surface tolerant, which means that they can be applied over a surface prepared to a lower standard. For example, over steel prepared by a power tool (St3), a minimum life expectancy of 15 years can be obtained. In combination with alternative surface preparation methods that do not produce spent abrasives, for example CO_2 blasting or RPR heat induction, it is possible to achieve significant savings on project costs. The absence of tonnes of spent grit allows lighter scaffolding and reduces waste removal costs. Only the removed corrosion product and paint waste need to be collected and disposed of.

When overcoating aged coating systems it is usually not necessary to abrade the existing system. Additionally, MCPU coatings are single-pack products so once they are opened, tubs can be used for another three days if properly closed between uses, reducing the risk of mixing errors and wastage.

While these products are more expensive than regular epoxy coatings, it is worth noting that in general the paint cost only represents 5-7% of the total cost of a project. Because the programme time can be reduced, and they can be applied under climatic conditions where it is impossible to apply standard products, it makes sense to save money on the other 93-95% of the total project cost rather than the paint. The longer life product – and hence longer intervals between maintenance – also reduce the overall lifecycle costs.

Steelpaint has always focused solely on the production and development of MCPU coatings as its particular niche, hence it is logical that the company is now developing the next generation of these products.

For the coatings industry two of the most important items of environmental concern are the presence of volatile organic compounds in coatings, and the use of raw materials causing an environmental threat or a health hazard to the user.

Traditional MCPU coatings are currently still well within legislative guidelines and most probably will remain so for the next decade or more. But without any doubt there will come a time where this will change.

For most coating technologies the reduction of volatile organic compounds is an ongoing effort. The curing mechanism for all polyurethane-based coatings is isocyanate. The isocyanates used in Steelpaint products present, in observance of current industrial safety measures and parameters, no health hazard. But isocyanates in general, also

within European regulation of hazardous substances alongside many other raw materials, are under scrutiny.

Regulations for the labelling of isocyanate-containing products have been tightened, even if there is no change in the hazard potential of these materials; understandably this has raised concerns with applicators. The EU is also planning the introduction of a proof of qualification for companies working with products which contain isocyanates of any kind – whether coatings, sealants, installation foams and so on.

Steelpaint has developed a new generation of single-pack moisture cure coatings based on polyurethane, which do not contain any isocyanates and which in addition have very low VOC-levels.

The Stelcatec line of products represents a major innovation in corrosion protection coatings. Apart from the fact that there are no isocyanates and the VOC levels are very low, all the advantages of the existing technology remain unchanged.

As an extra bonus the total Stelcatec system of primer, intermediate and topcoat can be spray-applied wet-in-wet within 45 minutes, even under adverse weather conditions.

Belgian Rail infrastructure manager Infrabel carried out the first demonstration project using Steelpaint's new product last month *(October)* during a weekend closure to install a prefabricated tunnel underneath a railway track. Planning for this major procedure started two years ago.

The track was closed around midnight on the Friday night, and to make maximum use of the rail closure, maintenance work on two rail bridges in the vicinity was also planned during the shutdown. The available time to carry out all works was from midnight Friday night until the first passenger train on Monday morning, scheduled for 4.30am.

Steelpaint's Stelcatec system was selected for the coating repair of a bridge deck due to its flexible application parameters and drying speed. The work included removal of track and sleepers; installation of a tented enclosure around the bridge; surface preparation using high-pressure fresh water; St3 power tool cleaning; light sand sweep; application of Stelcatec primer on bare metal, and application of full coat Stelcatec High Build. Sufficient time to reinstall sleepers and track had to be included in the programme.

Surface preparation for the coating work started after removal of track and sleepers at 6am on Saturday morning. Coating application had originally been scheduled for 1pm the same day, but the percentage of corrosion was found to be much higher than anticipated, which only became apparent once the sleepers had been removed. As a result, surface preparation took much longer and actual application of the primer only started at 10pm on Saturday night. At 1am Sunday morning the primer was hard enough to walk on and application of the final coat started. Application was finished at 2.15am the same morning – at 8am the sleepers had to be put back in place.

Climatic conditions during the application included a relative humidity of 93%, steel temperature of 6.5°C, ambient temperature of 7°C and dew point of 6°C; the difference between the dew point and the steel temperature was just 0.6°C. Under these conditions it is not possible to even apply epoxy coatings, much less have the coating hard enough to walk on in less than six hours.

The Stelcatec system allowed dry film thickness readings at 7.30am; at 8am the sleepers were reinstalled without any deviation from the original time schedule

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