F1106 Long Term Corrosion Protection

Thermal Spraying Stands the Test of Time

Thermal or metal spraying steel to protect it from corrosion has always been recognised as a long-term solution for many industries. UK based Metallisation has been providing anti corrosion solutions for over 80 years, to a diverse range of industries all around the world. One of its successes is the anti corrosion protection of bridges, including the Forth Road Bridge.

Most bridges are prone to corrosion from the weather and from salt used to 'grit' roads in winter. Bridges such as the Forth Road Bridge face the additional threat from the harsh sea salt environment in which it is situated. Metal spraying is the best protection from corrosion in this environment.

When the Forth Road Bridge was opened in 1964, by her Majesty the Queen, it was the longest single span bridge outside the United States. The road bridge, not to be confused by its neighbour, the Forth Rail Bridge, is 2.5km in length, including the approach viaducts. Metallisation was chosen to metal spray the steel structure, which makes up the bridge, to protect it from corrosion. The contract to protect the bridge was split between Metallisation and Merseyside Metal Sprayers Ltd. The latter company was commissioned to treat the 1200 balustrades and vehicle grillage panels.

The project took around two years to complete. The process started with the delivery of the prefabricated steel sections to the Metallisation plant in Drem, near Edinburgh.

Each of these giant sections was then treated individually, starting with the cleaning process using grit blasting. Grit blasting is the most effective way to remove scale and rust from steel to provide a clean, prepared surface for the zinc to adhere to. The second stage was to spray the steel surface with zinc

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using the Metallisation Flame spray process, which is still used today, with the Metallisation MK33 system. The zinc was supplied at the time by Charles Clifford, manufacturers of zinc. Charles Clifford subsequently became an integrated part of Metallisation.

In the Metallisation Flame spray process, the raw material in the form of a single wire, cord or powder, is melted in an oxygen-fuel gas flame. This molten material is atomised by a cone of compressed air and propelled towards the work piece.
The molten spray solidifies on the component surface to form a dense, strongly adherent coating suitable for corrosion protection. Major advantages of the Flame spray process are that the coatings are available for almost instant use with no drying or curing times and there is no risk of damaging the component through heat distortion.

The modern day version of the MK33 is the Metallisation Mark 73, which represents a breakthrough in anti-corrosion spraying. With a new choice of continuous or stop/start nozzles, throughputs have been raised by 33%. With its predecessor already one of the fastest guns around, this new development puts the Mark 73 way ahead of the field. The combination of the new head with an improved valve and pilot assembly and a high power air motor drive must make this the fastest and most reliable system in existence.

The metal spraying process, coupled with the equipment used in protecting the Forth Road Bridge, was very innovative for its time. Although, now watching the video of the work being carried out, it all seems incredibly antiquated and labour intensive. When the large prefabricated panels were being sprayed a rather unique process was devised in order to control the pistol heads of the MK33. Using brass plates with holes punched in strategic places, the pistols were controlled and moved by a flow of air being pushed against the plates. Whenever the air hit one of the strategically placed holes it caused the pistol head to change direction. Thankfully, the controlling of the pistol heads is now far simpler.

The third and final phase in the metal spraying process was to apply the etch primer and then the surface was painted. Even this stage in the protection of the steel

structure was researched and evaluated, to ensure the longevity of the life of the bridge. Sample steel panels were taken to a laboratory and exposed to a continuous atmosphere of salt spray, much stronger and harsher than the reality that the bridge would face. The same panels were also exposed to the extreme pressures of an accelerated weathering machine, to see just how strong and protective the Metallised surfaces were. After 18 months of testing both zinc sprayed surfaces and the paint surfaces, the Metallisation process had shown no sign of any breakdown. This included a test area that had been deliberately scratched through to the metal itself.

The Forth Road Bridge is still going strong today. This is just one project of many that is testament to the metal spraying process in protecting steel structures from corrosion. For a copy of the video demonstrating and discussing the Forth Road Bridge project, please call Stuart Milton on +44 (0)1384 252 464. For further information on Metallisation please visit www.metallisation.com

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