ZINC THERMAL SPRAY

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Your city's infrastructure: overworked, under-protected.

From passenger ferries and bridges, to underground trains, strong infrastructure is undeniably necessary for the intricacies of day-to-day human life. Whether the task is as small as getting to work for a meeting or as large as traversing an entire continent for a vacation, modern civilisation relies on certain basic frameworks within their respective dwellings to be safe, effective and dependable.

When left unprotected, the steel materials that comprise these fundamental structures will inevitably corrode and rust. A harsh environment, such as that of a coastal town, will hasten this deterioration process even more, compromising both the structure's appearance and integrity.

Initially, to bring these large designs to life is costly in terms of both time and money, and the expenses do not end there. Globally, infrastructure-related corrosion costs US$2.2 trillion, which translates to more than three per cent of the world's annual gross domestic product. This number does not include the environmental damage, wasted resources, production losses, or personal injuries caused by corrosion.

The World Corrosion Organization estimates that a net amount of 20–25 per cent of this enormous cost burden can be saved by protecting these steel surfaces properly.

ENTER ZINC: THE GREAT PROTECTOR

Zinc is the ideal choice for coating steel because it protects galvanically and is cathodic in nature, meaning that it sacrifices itself in preference to the underlying material. Damaged areas are contained, and there is no corrosion of adjacent exposed steel until all of the sacrificial coating is consumed. There are hundreds of case studies relating to the longevity of zinc coatings on steel, many of them demonstrating no need for corrosion-related maintenance or services for more than 30 years – and even longer if the steel is embedded in concrete.

Galvanising makes up the majority of today's zinc coatings market, but there are some applications where galvanising is not a practical option: namely, in structures or items that are too large to fit in a galvanising bath or that are already in service and in need of further corrosion protection.

Zinc thermal spraying, the process in which zinc or zinc alloys are melted and then sprayed onto a steel surface, is an ideal choice in these applications. The International Zinc Association (IZA) sees strong potential in zinc thermal spray, particularly in the marine shipping, offshore wind tower and railway industries, and has launched a campaign to bring it into the global spotlight.

THE ZINC THERMAL SPRAYING PROCESS

After the surface is prepared through grit blasting and cleaning, zinc or zinc alloy is thermal sprayed using either an electric arc or a combustion flame process at a thickness of 100 microns or more. This number, along with the system of application used, is ultimately determined by the environmental factors surrounding the structure. In the majority of cases, zinc alone is a sufficient coating to prolong the life of a structure; however, in ultra-harsh

conditions, such as a marine environment, it is common to apply a paint topcoat, known as a duplex system, which provides even greater protection.

CURRENT FOCUSES: THE MARITIME, RAILWAY AND WIND TOWER INDUSTRIES

Whether it is a small fishing boat or a gargantuan cruise ship, the common thread of corrosion costs the maritime industry an estimated $50–80 billion annually. This cost burden is typically one that is accepted by vessel owners as commonplace and a necessary evil that comes with being a part of the industry; however, with zinc thermal spray, it doesn't have to be.

Ships are an instance in which a topcoat, typically paint, would be used. This duplex system provides protection for up to 25 years without interim coating maintenance, thus significantly reducing upkeep costs and ultimately keeping vessels in circulation for longer. IZA is currently working with several publications and major stakeholders in the maritime industry to educate and promote the use of zinc thermal spraying.

Like ships, offshore wind towers are an ideal target market for zinc thermal spraying, not only because of their size, but also because of the harsh aquatic environments in which they operate. Wind towers would also typically include a paint topcoat.

The world's first offshore windfarm, Denmark's Vindeby, has recently been decommissioned after 25 years. Each of the wind towers was sprayed with a zinc thermal spray duplex coating upon construction, and they were still essentially corrosion-free at the time of removal. Because of the zinc thermal spray coating, the towers' components will now be recycled and used as spare parts for future wind farms.

IZA is also currently working with the railway industry, which faces similar corrosion issues and costs. A successful zinc thermal spray trial within India's railway systems resulted in India's Ministry of Railways specifying zinc thermal spray for all future protection endeavours. In July 2018, they placed their first order of 2000 tonnes of zinc to kick off the project.

Bridges are another prime candidate for zinc thermal spraying, as the parts that comprise them are especially large and must remain structurally dependable. A prime example can be found in Norway, where the Norwegian Public Roads Administration has seen such favourable outcomes from zinc thermal spray that they have specified it to protect major steel bridges since the 1960s. The have found that the first maintenance operations need not occur until at least 30, sometimes 40, years after the initial installation of the bridge.

Aside from being an excellent option for a structure's long-term protection, zinc thermal spraying comes with the added benefit of significantly reduced maintenance costs. Additionally, zinc thermal spray coatings contribute to a sustainable society, and the ultimate goal of keeping essential structures strong, safe and dependable for essential daily human activity. AR&I

For more information on zinc thermal spraying, and to read specific case studies, visit www.thermalsprayzinc.zinc.org.