

# A coat of paint or a coat of zinc?

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Lightning might never strike the same place twice, but corrosion does. That is why corrosion engineering is a planned and systematic science. And when one considers the huge savings that are possible by resisting corrosion, it becomes a pet area of the management too. Galvanising has been one of the few methods by which corrosion has been guarded against. And this use of zinc on iron and steel as a protective coating, is more than 250 years old.

**M**oving away from the industry to civil constructions, just to cite an example, the Thane Creek bridge, readers may recall, called for five long years of repair work, as a result of corrosive wear and tear. And five years of work also meant a lot of extra expenditure. On afterthought, one felt that if adequate precautions had been taken at the time of construction, it would have saved a lot of labour and money. One of the extenuating factors of course, is the fact that India being surrounded on three sides by water with high temperature differential, has one of the highest corrosion rates in the world. But, it is exactly due to this reason that corrosion warrants a more careful study.

Constructions now employ Ni-Cr-Mo alloys which have the built-in ability to resist corrosion. Galvanising happens to be another method by which corrosion in iron and steel structures can be delayed (if not totally averted).

## Think zinc

A reference to the table which charts the progress of galvanising from its inception in the mid-18th century, will attest the role being played by zinc in the area of protection from



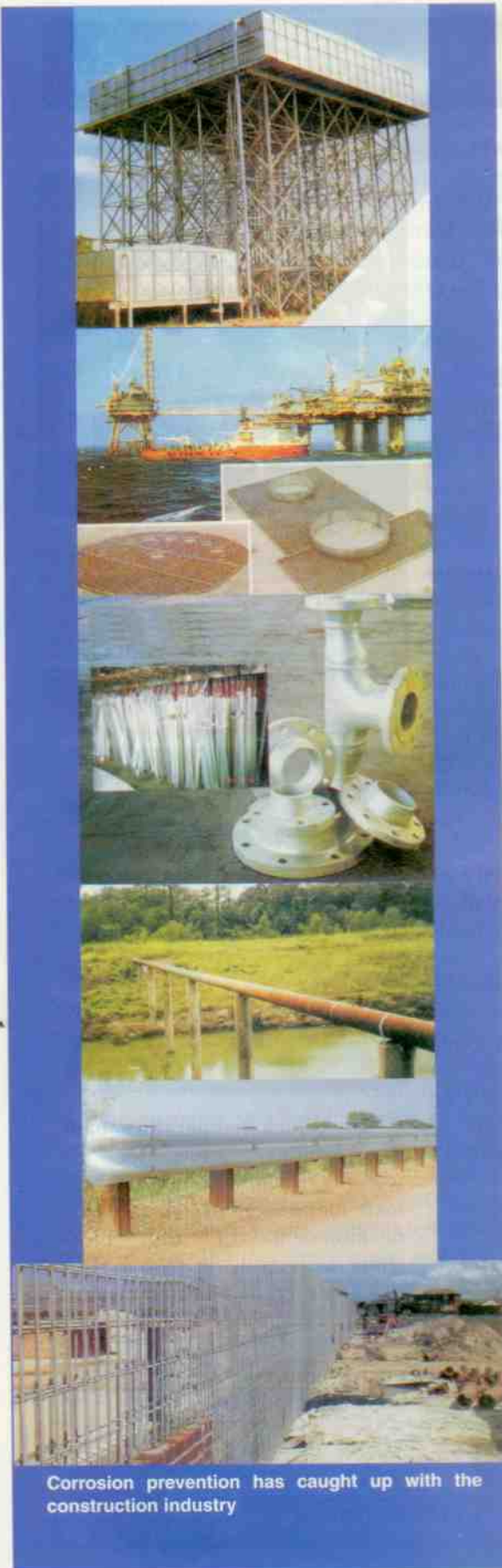
corrosion. Hot dip galvanising - the practice of immersing clean, oxide-free iron and steel into molten zinc to develop a coating that is metallurgically bonded to the surface - provides ideal corrosion protection for steel. This protects steel from corrosion by providing a thick metallic envelope, which completely covers the steel surface and seals it from the corrosive action of its environment. The galvanised coating provides outstanding abrasion resistance. Where there is damage or a minor discontinuity in the sealing coat of zinc, protection of the steel is maintained by the cathodic action of the surrounding galvanised coating, which no other substitute can perform. Most organic paint coatings used on steel need frequent renewal and when the coatings are breached, corrosion begins at the exposed area of steel, spreading rapidly beneath the

coating film. The zinc coating is subject to corrosion\* at predictably slow rates, between one seventieth and one eightieth that of steel, depending on the environment it is exposed to. Besides, depending on the application, galvanising is further classified into general, tube, sheet and wire galvanising.

General galvanising is used in the processing of a wide variety of steel articles like mild steel angles, channels, rods, twisted bars, joints, fabricated structures, pipes, pipe structures, cold and hot rolled sections; and small components. These galvanised items find applications in power transmission,

## History of galvanising

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| <b>1742</b> | French chemist Melouin describes in a presentation to the French Royal Academy, a method of coating iron with molten zinc  |
| <b>1836</b> | French scientist Sorel obtains a patent for a means of coating iron with zinc after first cleaning it with 9% sulphuric acid and fluxing it with ammonium chloride |
| <b>1850</b> | British galvanising industry starts using about 10,000 tons of zinc a year for protection of steel   |



Corrosion prevention has caught up with the construction industry

railway electrification, telecom towers and industrial projects.

**Galvanising in reinforced concrete**

Constructions (both industrial and civil) include reinforced cement concrete (RCC) and reinforcement steel. The steel bar used for reinforcement has not been considered for galvanising in India. The high tensile and flexural strength requirement make reinforced concrete an important structural material for modern building and engineering projects. RCC is a composite material that combines the high compressive strength of concrete with the high tensile strength of steel. However, these strength advantages can be availed of, only if the material properties of the individual constituents are not impaired with the passage of time.

The corrosion protection of galvanised steel ensures that design strength of concrete is maintained and the possibility of surface rust staining and eventual corrosion of reinforcement and spalling of concrete is removed. In aggressive exposure conditions, a coat of zinc often ensures freedom from rust, longer life and lower maintenance costs.

**Corrosion control in our country**

Unlike the international trends, at home here, most steel structures are uncoated or at the most, painted. Even if the structures are

painted, often within 18 months, there are vestiges of rust that appear around the edges. Only about 3.4 percent of the entire steel is galvanised in India, compared to an average of 30 percent in developed countries like the USA, UK, Australia, France, Japan and China. This is partly attributable to the cash crunch as well as lack of awareness on the economic and technical advantages of the galvanising process.

In India, there is a great potential for galvanising to be employed in the automobile and the agricultural sectors. In the latter, the hoppers in seed drills, fertiliser equipment, fittings, irrigation pumps, silos for grain storage, farm fencing, roofing of farm structures and irrigation tanks are potential items which could be galvanised for protection from corrosion.

**Don't take it for granted**

As someone said at the Corcon 2000 exhibition held in Mumbai recently, even after having ensured that structures will be able to withstand corrosion, the engineers cannot tend to relax. Nature poses varying challenges to mankind; as with everything else, so also with the menace of corrosion.

Every year, more steel is lost to corrosion than what is produced. For the sake of economic and environmental utilisation of steel, galvanisation happens to be one of the remedies. ■



The author, the CEO of Pentax Ferro, has 8 years of active experience in corrosion control industry. An affiliate

member of Galvanising Association of Australia, he is currently working back to back with the Indian Lead and Zinc Association, New Delhi, for spreading awareness on corrosion control in India.