Hot Dip Galvanized Case Study No. 11
Platinum Group Metals Concentrator

The Application

Although the hot dip galvanized steelwork at the PGM Concentrator is not that old (having been built in 1996/1997) in terms of the coating life of some Eskom pylons (60 years), the coating performance is no less significant. There are several relatively corrosive micro environments at the concentrator, which have had a significant effect on painted surfaces whereas hot dip galvanizing in these areas has performed admirably.

The original decision to hot dip galvanize the steelwork at the concentrator (approximately 6 500 tons) was partly based on the coatings performance in many previous underground applications where the environment is considered to be significantly more corrosive.

Several coating evaluations have already taken place at the Concentrator over the last 9 years, proving that the choice of coating in all circumstances was the correct one at the time.

Environmental Conditions at the site

The reagent area

Because of the concerns and possible doubts, as well as lack of data, regarding the long term performance of hot dip galvanized steel in the reagents area on account of the presence of relatively small quantities of alkaline and acidic reagents, the specification for steel in this area excluded the use of hot dip galvanizing. Instead the use of a 3-coat vinyl co-polymer system over a Sa21/2 abrasive blasted surface was preferred.

Hot dip galvanized structural steel adjacent to the reagent area where zinc coating thicknesses were measured in excess of 150µm

The milling area

Hot dip galvanizing has performed extremely well in this area, which is an open building with no roof. In other similar plants where open mill buildings are used, painted steel structures undergo relatively high corrosion and frequent maintenance is required.

The flotation building

Flotation plants are usually considered the most corrosive areas in typical platinum concentrators. Spillage and the generation of corrosive atmospheres often give rise to high rates of corrosion of protective coatings. It is for this reason a duplex system (hot dip galvanizing with 2 or 3 top paint coats) is often specified.

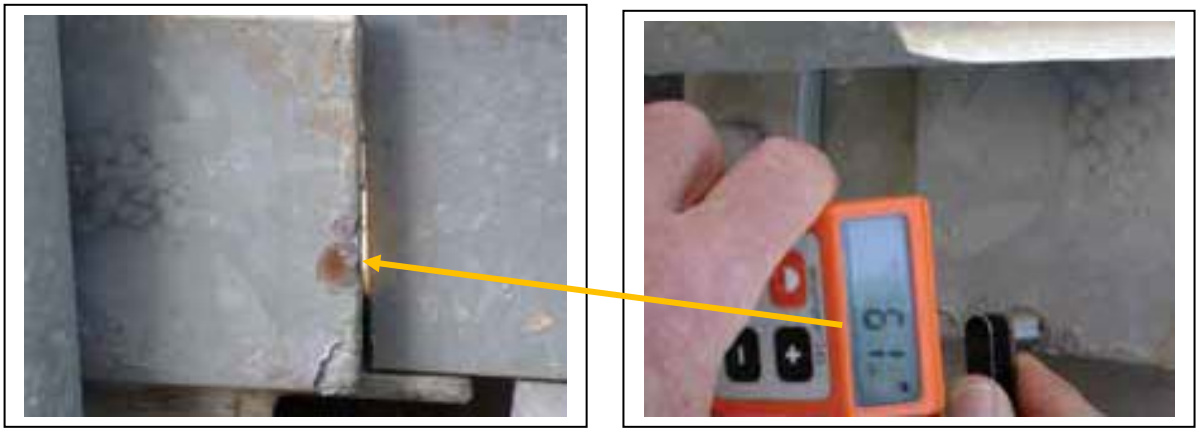
Underground steelwork

The hot dip galvanized steelwork in these areas was, due to time constraints not valuated but in past surveys the performance of the coating in these areas has been equal to that achieved in the plant environment.

Findings

Having walked throughout the plant, apart from a bit of discoloration at a welded and non-repaired area on a bracket and a damaged coating in the Reagent Loading area, both of which should ideally be repaired, the coating in general is performing extremely well.

Coating thickness readings ranged from 59µm on water piping to 267µm on structural steelwork. The specification requirement for structural steel (>6mm) shall have a minimum local coating thickness of 70µm and a mean of 85µm with at least 5 or more readings being recorded.



In areas where hot dip galvanizing is damaged, usually due handling damage and/or excessively thick coatings (>200µm), a residual iron/zinc alloy layer remains that generally measures between 25 and 60µm

In such damaged areas, rust staining can develop indicating that the zinc/iron alloy layer is providing corrosion control. More importantly with a hot dip galvanized system, no under corrosion creep id possible, due to the metallurgical bond as well as zinc being electro-negative to carbon steel.

Conclusion

The hot dip galvanized coating in all the areas of the concentrator has performed exceptionally well and provided the conditions at hand do not change for the worse in the future, the coating should provide a service free life of well in excess of the original design life of 25 years.

HOT DIP GALVANIZERS ASSOCIATION SOUTHERN AFRICA