Case History
No. 11/2006

PGM Concentrator

The application

Although the hot dip galvanized steelwork at this 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 in that 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 (some 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.

Photo 1: Comparison between hot dip galvanizing and paint in the reagent area.

Overall coating performance

In general terms, the performance of the coating in all the areas of the plant including the Milling, Flotation, Crushing Plant Conveyor Steelwork, Screening and Reagent Areas has been significant. Apart from complete protection of the steel, the rate of deterioration of the zinc coating thickness has been extremely low. By taking coating thickness measurements we have been unable to detect any significant removal of the coating and the steel in most instances is in the same condition as when it was installed. While the design life of the hot dip galvanized steel was set at 25 years, it is apparent that apart from any unforeseen circumstance arising in the future, the future life of the steel will be well in excess of the design life.

Damaged coating in reagent loading area.

Coating thickness at damaged area in reagent loading area *(#1)*.

Environmental conditions

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 Sa2½ abrasive blasted surface was preferred.

Hot dip galvanized water pipe in the reagent area.

Coating thickness of a hot dip galvanized water pipe in the reagent area.

Coating damage and inadequate repair in the reagent loading area.

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Photo 1 shows that in comparison to the coating on the hot dip galvanized bolt (128µm), the performance of the paint system has been marginal. Although the use of hot dip galvanizing in this area was excluded, some installed components and structures were hot dip galvanized and have performed extremely well. The performance of the coating in this area suggests that hot dip galvanized steel would have been the better option than the paint system originally selected.

Due to the fact that reagents may be altered over the life of the plant and that other concentrators may use a different suite of reagents, it may be more prudent in other cases to consider a duplex coating system.

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 painted steel.

Coating thickness on structural steel adjacent to the reagent area.

Underground steelwork

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

Our 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 requires that for structural steel the local coating thickness should be 70µm and the mean 85µm.

 # – Hot dip galvanizing of plain ended tube is done in accordance with SANS 32 (EN 10240) which requires a minimum coating thickness of 55µm for A1 & A2 coating qualities for the conveyance of gas and water.

Hot dip galvanized structural steel adjacent to the reagent area.

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.

#1: In most instances where hot dip galvanizing gets damaged at edges due to excessive coating thickness, a residual iron/zinc alloy layer remains which generally measures between 25 and 60µm.

#2: The Association wishes to thank Mr Jurie van Brakel and Mr Ralph Mophuting of Amplats for their assistance in recording this case study.

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