Hot Dip Galvanized Case Study No. 18
Cape Town Petro-chemical plant cable ladders

The Application

The original petro-chemical plant in Cape Town was established in 1966. The subject case study cable ladders were installed in about 1984 and therefore have an estimated service life of approximately 25 years.

General view of the petro-chemical plant at Milnerton Cape Town

25 year old duplex coated cable ladders were used as the bases of the case study

At the time when these cable ladders were installed, the plant electrical engineer had specified hot dip galvanizing for corrosion control and long term sustainability and service life performance. In 2009 an evaluation of the cable ladders installed in 1984 was undertaken to establish the corrosion control performance of hot dip galvanized steel, as a stand-alone system, before considering specifying a duplex system for future applications.

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A number of cable ladders were selected for evaluation of the corrosion control performance after 25 year of service.
At the time and as a result of abnormal heights of cable ladder side rails (140mm), top-hat type cross rung configuration were specified for use in most of the petro-chemical plants throughout South Africa.

The cable ladder side rail and top-hat type cross rungs were manufactured from 2.0mm mild steel. The splice plates were made as a flat plate bolted together using M6 fasteners uniquely spaced on either side of the junction. The cable ladders and splices were hot dip galvanized in accordance with the previous national standard, SABS 763, which has been super ceded in 2000 by SANS121 (ISO 1461:2009). All cable ladder fasteners were either mechanically or zinc electro-plated.

Zinc electro-plated fasteners were used for slice plates, with coating thicknesses normally less than 10µm

Many of the fasteners were found to be corroding and in need of maintenance

Environmental Conditions

The location being relatively close to the sea would generally be categorized as marine atmosphere. In reviewing the ISO 9223 – Corrosion of Metals and Alloys – Corrosivity of Atmospheres it is possible to categorise this part of Milnerton as a C3 or worst case scenario C4 environment.

Environmental conditions of the area are influenced by the prevailing winds. The corrosion rate of zinc experienced at the site are reduced by the rain bearing North Westley and Westley winds that wash the corrosive chloride salts from the hot dip galvanized steel improving service life of structures.

For a fully detailed review of the ISO 9223 specification a review of Information sheet No.8 from the Association web site www.hdgasa.org.za is required.

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The Site

The plant is situated in Milnerton area and within approximately three and a half kilometres off the Atlantic Coast line. Note the influence of prevailing winds relating the corrosion rates and the removal of the corrosive chloride salts from structures.

A&S Cable ladder and a more modern edge mounted cable ladder in the background

Close up view of the A&S Cable ladder

Findings

Hot dip galvanized steel is specified primarily for corrosion control of carbon steel structures. For this reason three factors must be considered when galvanizing (zinc) and/or duplex corrosion control systems, i.e. coating thickness, continuity and environmental conditions.

SANS 121 (ISO 1461) specification requires that for steel thicknesses equal or greater than 1.5mm, but less than 3mm, must have a minimum local coating thickness of 45µm and a mean of 55µm. The coating thickness readings taken on both the side rail and cross rung of the cable ladder in question remain well in excess of this specification. Coating thicknesses on all the cable ladders inspected and measured were found to exceed 80µm.

Unfortunately the mechanical and electro-plated fasteners were found to be corroded and require corrective action in order to extend the service life of these items.

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Examples of hot dip galvanized cable ladder being measured at 89µm and 82µm respectively

Conclusion

After 25 years of service life the cable ladders were in excellent conditions. Measurements take from which it can be assumed that the components can be expected to continue in service for a further 25 years

As indicated the fasteners require maintenance and to this end it is recommended that the corroded components be replaced or thoroughly cleaned and generously over coated with an appropriate zinc rich epoxy, such as “Galvpatch” or “Zincfix”.

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