Moma Sands Project, Mozambique

One of three such structures, where refined products will be stored prior to conveyance, via an overland conveyor, to a specially constructed loading pier, for loading onto sea-barges for transhipment to ships anchored offshore

The Application

The extensive use of hot dip galvanizing for structural steel components on an extremely remote site where logistics, materials handling, transport and co-ordinated planning had a profound influence on the project timing and completion date.

Environmental Conditions

The corrosive conditions encountered at this remote location can be classified as a C4 or a C5 environment in terms of ISO 9223. In terms of this classification and considering the hot humid environment, in a marine location, a C4 or "Exterior industrial inland or urban coastal" conditions are considered applicable. Zinc corrosion rates for this environmental classification is estimated in the range of 2 to 4 micron (µm) per year. Considering the actual site conditions, the expected corrosion rate of zinc would be approximately 2 to 3µm per year. Assuming these environmental conditions the estimated "Service life" of the hot dip galvanized structural steel would be in excess of 30 years before 1st maintenance.

The Site

The site is located on the Mozambique coast approximately 30 minutes flying time north of Beira. The project involved the design, off site fabrication of steel and hot dip galvanizing, followed by the logistics of loading, ocean transportation of the entire project facilities, trans-shipping, via a sea barge to the beach, haulage inland over a distance of 3 to 4 kms to the various sites comprising the project. The project required integrated logistics planning and co-ordination of all supply arrangements. No infrastructure or formal facilities existed prior to the commencement of the project.

Our Findings

The use of hot dip galvanized steel, in the given corrosive environment, will provide an expected maintenance free service life in excess of 30 years. This estimate is conservatively based on the mean zinc coating thickness of 85µm and a corrosion rate of between 2 and 3 µm per year. The actual coating thickness measured during our site visit was generally found to be well in excess of 100µm and more often than not in excess of 120µm. Alternative corrosion control coatings can not match the

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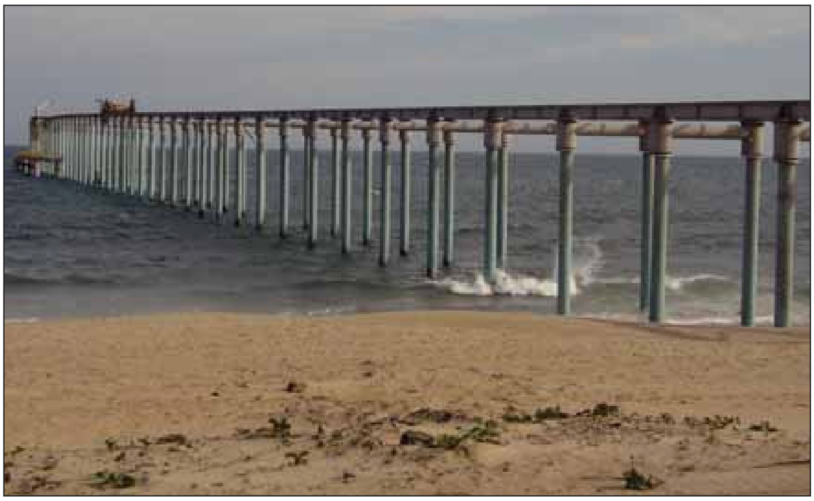
performance of hot dip galvanizing when one considers the rough handling involved in loading, transportation and offloading at such an isolated site. Design requirements of durability and longevity were achieved by way of the metallurgically bonded hot dip galvanized zinc coating, both from the standpoint of a "barrier protection" as well as "cathodic protection". Handling damage, repair of which was achieved by the application of a suitable zinc rich epoxy, does not compromise corrosion control, due to cathodic protection characteristic of galvanized steel. The same repair procedure was applied to the isolated occasions where site modifications were found to be necessary.

Conclusion

The primary features and benefits achieved on this project were:

1. Cost and economic effectiveness of hot dip galvanizing, given the site location and availability of local materials and equipment.
2. The effective use of hot dip galvanizing in a C4 environment, i.e. marine conditions and designing the corrosion control system to suit the given environment and service life requirements.
3. Versatility of steel and the proven and effective methods used to combat corrosive elements within the given environment.

The benefits and economics of hot dip galvanizing on large projects, situated in remote locations that involve special logistical arrangements, extreme and changeable weather conditions are again reaffirmed by this case study.



The sea pier and conveyor termination from where refined product will load onto sea-barges for trans-shipment to ships anchored off shore.

General view of part of the "dry plant" under construction, which will ultimately be used in the refining of titanium products.

The starting point of the 4km overland hot dip galvanized conveyor that ends at the sea pier from where refined products will be loaded onto sea-barges.