



ZINC

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NO 6 NAPHTHA CRACKING PLANT OFF-SHORE INDUSTRIAL ZONES TAIWAN



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300,000 tonnes of galvanized steel has been used in this industry development

Client

Formosa Plastics Group

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- Formosa Plastics Group
- Taiwan Galvanizers Association

Petrochemicals in their various forms are represented in a wide range of industry, domestic and luxury goods such as clothing, containers, decorative products, toys, vehicles, building materials and many other utility items. In addition to traditional plastics and fibre, petrochemicals have become an important component of electronics, aerospace and other high technology industries.

The rationale for this industry development in Taiwan arose from the land scarcity, dense population and the need for an economic vehicle to accommodate these characteristics.

In this respect petrochemicals matched the available resources well as it offered accelerated employment growth and value added product opportunities, while occupying relatively little land.

Initially however an acute shortage of basic petrochemicals in Taiwan had impeded development of this logical downstream activity.

To this end a major petrochemical plant was designed by the Formosa Plastics Group and a search for a suitable site undertaken. After wide community debate the project was located in Yunlin County on a vast land reclamation site on the west coast of Taiwan.

This vast project has had a major impact on Taiwan's development and has been called "the locomotive of national economic growth."

Location – "Head of the windstorm and end of the water flow"

The Mailiao and Haifong zones that hold No 6 Cracking Plant extend from the Chuoshui River estuary, nearly 8km north on the coast and approximately 4km seaward, with large areas of the site below sea level for much of the time.

Design included geological considerations and strengthening for the security and safety of the refinery foundations.



Service Environment

The atmospheric conditions are affected by the north east monsoon winds for six months of the year which made land reclamation engineering a most difficult undertaking.

Taiwan has been the subject of a corrosion survey by the Industrial Technology Research Institute (ITRI) and the national Tsing Hua University, where it was established that the coastal zone referred to rated more severe than the C5 zone within ISO 14713 1999, being influenced by the peculiar topography and resulting climate of the Taiwan Strait.

Wind farm structures on site are further evidence of the magnitude of onshore winds with attendant salinity and hostile corrosive influence.

In this context heavy duty galvanizing was predominantly employed on the project.

Elements of the development

Mailiao Port

This will be Taiwan's deepest port with a median depth of 24 metres taking vessels up to 260,000 tonnes and 60 million tons of cargo per annum.

The port will also better serve the surrounding and developing region.

Independent Power Plant

Five generating units will provide up to 600,000kw of electricity with arrangement to also contribute to Taiwan's national power grid.

Oil Refining

The refinery unit will have a capacity of 21 million tons of crude oil per annum or 450,000 barrels per day and will produce 3,840,000 tons of naphtha exclusively for in-house plants.

Naphtha Cracking Plant

The two naphtha plants will have combined annual output of 1.35 million tons of ethylene rising to 1.7 million tons to meet the demand for petrochemicals to develop new product opportunities.

Co-Generation Plant

This unit provides electricity, steam, hyperpure and industrial water, nitrogen, oxygen and compressed air for use throughout the plants. A further 500 T/H boiler is being installed to guarantee the supply of steam.

Machinery Shop & Boiler Shop

This facility provides for the manufacturing and installation of reactors, towers, pressure vessels and tanks, and the latest 600mw independent power unit construction.

Water Fabrication Plant

This plant is owned jointly by Formosa Plastics, Asia-Pacific Investment and Komatsu Electronics of Japan and produces 8 inch wafers with annual output of 2.4 million pieces. The plant is ISO 14001 approved.

Formosa Asahi Spandex Co Ltd

This company is a joint venture of Formosa Plastics and Asahi Kasei and now produces 10,000mt of polytetramethylene glycol (PTMG).

Naphtha Cracking Project Phase 3

Construction projects to expand No 1 & 2 have continued including a plasma display plant, ethylene glycol plant and styrene monomer plant.

This work is proceeding in tandem with development of 18 phase 1 and phase 2 petrochemical and co-generation plants.





Environment Protection

In this major industrial development environmental protection and pollution control have rated an equal emphasis with economics.

International input by leading academic consultants and engineers will be monitored by the Environmental Protection Authority to ensure compliance with relevant Standards.

Public Responsibility

Plans are underway to contribute to the associated community needs and to raise quality of life in terms of recreation, medical services, transport, culture and welfare in general.

Formosa Plastics aims to contribute to this improvement and to build a model industrial park in Yunlin's offshore zones that embrace these principles.

New Town in Mailiao

Given the progress of the No 6 Cracking Plant, influence on the local community will include an advance in living standards from the building of this township.

Yunlin County Government has put in train a 3000 hectare new town development for the region.

This will provide not only for residential and health amenities but also inter-industry commerce, technology links, improved logistics and balanced regional development.

Summary

Seldom does a project provide so much support for an entire national economy.

Concept, planning and execution have been to world's best standards carried out in the face of enormous difficulties.

Critical match of workforce capabilities with its industrious culture has put in place a strong foundation for future development.

Statistics

- Total reclamation area 2601 hectares
- Piles of 4.5 million metres
- Concrete 6.4 million m³
- Piping 3000km
- Increase from 38% to 92% in Taiwan's self sufficiency in basic petrochemicals
- Total project cost: Stages 1, 2 & 3 NT\$542 billion
- Tonnes of steel galvanized: 300,000

Galvanizing as an Architectural Finish

Procedures for Design Detailers

Scope

Design engineers, architects and end users are increasingly specifying galvanizing, not only for its proven corrosion performance, but also for its natural appearance as an architectural decorative finish.

This specification refers to the procedures required when aesthetic appearance is sought, additional to that referred to in AS/NZS4680:1999. For a self finish or post treatment with a finish such as paint or powder coating the following should apply.

Galvanizing is of course a cast coating with a clean metallic and textured surface which may be enhanced with further dressing as an attractive self finish. It must not however be confused with spray painted finishes over fine metals, planed timbers or plaster.

Consultation with the Galvanizer

To achieve the best possible appearance, steel designers should consult with the galvanizers to ensure the steel detailing will produce the desired result.

Important procedures

- Ensure that the galvanizer receives details of the finish required. A test sample of the steel should be galvanizing as the standard for the job.
- Advise the galvanizer at the time of order that an architectural finish is specified.
- Optimum results in processing steel to produce an architectural galvanizing finish will depend on the steel surface preparation.
- Rough areas surrounding the welding or cutting should be buffed to a uniform appearance.
- Sharp edges will normally be heavily coated with zinc but may sometimes need post galvanizing inspection and dressing.
- At the design stage, ensure that the article to be galvanized will fit inside the galvanizing bath in a single dip and discuss with the galvanizer provisions for adequate filling, venting and draining. Ensure that the design will allow even zinc runoff. This can have a significant effect on the ability to achieve a smooth finish. As a general rule, the drainage should be a minimum of 30% of the cross sectional area of the article.

Specification Details

- Specify steel which when galvanized, will produce a 'normal' coating in appearance. Certain steels containing silicon and / or phosphorous can produce coatings which can be dull or patchy grey in colour, with a rough finish and may be brittle. As a general rule the following criteria should be used

$\% \text{ Si} < 0.04 \%$

$\% \text{ Si} + (2.5 \times \% \text{ P}) < 0.09 \%$

While dull coating denotes thicker and longer lasting protection, appearance is adversely affected.

- In extreme cases shot blasting of deformed surfaces may be necessary depending on the finish required. Examples of a requirement for blasting would be structural CHS (circular hollow sections) particularly lacquer coated in the warehouse where part removal has allowed corrosion and texture to affect the steel surface.
- Specify the steel to be galvanized in accordance with Australian Standard AS/NZS4680:1999 and highlight the need for the coating to be free from runs, dags, spikes, uneven surfaces and roughness or other defects that could affect appearance.
- Welding quality should be free from porosity, all weld slag removed and grinding marks minimized.
- Inspection of the finished galvanized work must take place at the galvanizer's yard prior to dispatch.
- To maintain optimum appearance, it is important that care be taken to ensure the coating is not dirtied or damaged during transportation, site storage and or erection.
- If the galvanized coating is to be subsequently painted (duplex coating) the galvanizer should be advised of the paint system to be used at the time of order, as certain operating procedures may need to be taken to ensure the paint coating can be properly applied.
- Differing time periods will temporarily show brightness variations at the early stages of exposure but are a transitory effect.
- Care is required with site storage to provide open ventilation which prevents moisture entrapment with resulting wet storage stain. This is normally a temporary condition which does not affect the life of the coating.
- As the galvanizing surface texture can vary and is dependent on steel chemical composition, consult with the galvanizer on procurement.

Celebrating our 40th Anniversary

The Galvanizers Association of Australia has now completed 40 years of service to industry.

Over this period members have collaborated with the technically advanced Galvanizing Associations throughout the world and have developed outstanding capability.

Current membership extends throughout Australasia and the Asia Pacific region and is located as far off as China and the Middle East, where Australian knowledge has become valued.

GAA is a member of the International Zinc Association, is a founding member of the Asia Pacific General Galvanizing Conference and is involved in Standards Australia and its correlation with other international galvanizing standards.



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