

Introduction:

Friotherm Engineering (Pty) Ltd was founded in 1973 by a small group of thermal engineers, with a simple philosophy of satisfying the customers' requirements by providing suitable products through expert knowledge and advice. Our core competencies include technical advice, thermal design and calculation.

Over the years we have developed into a well-established national company, having designed approximately 30 heat exchange products. Friotherm manufactures to codes ASME and TEMA and the thermal design is in accordance to VDI Germany. We now supply the entire spectrum of "heavy industry" in South Africa, of which an essential part of our product range is radiators.

Friotherm specify hot dip galvanizing as their corrosion protection system where possible due to its metallic bond and heat transferring bridge between the initially loosely assembled parts of the radiator such as tubes, fins and spirals. As such, the galvanizing process is not only used as corrosion protection, but also as a vitally important heat transfer mechanism and improved thermal efficiency.

Using hot dip galvanizing as the corrosion protection system enables us to manufacture our radiators from carbon steel, which results in an extremely robust and strong product, particularly well suited for the mining industry.

A further advantage to our production process is that entire batches of semi-finished radiators can be hot dip galvanized in a single dip, resulting in considerable time saving, thereby increasing efficiency and cost effectiveness.

From past experience it has been ascertained that the average lifespan of our hot dip galvanized radiators is approximately 15 to 20 years, depending on location and use. Furthermore, most of the time failure of these radiators is not due to corrosion, but to improper use of our equipment.

In this particular project, three steam condensers were commissioned by Extractive Technologies for installation in Sasolburg. These steam condensers are used to heat up large volumes of air - 84 735 kilograms per hour from 10 to 130°C and weigh 5 tons each.



Motivation:

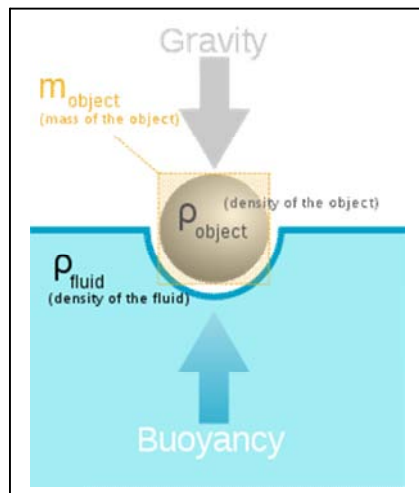
Innovation and the Promotion of Benefits

The use of hot dip galvanizing as the corrosion protection system not only protects our condensers from corrosion, but improves thermal efficiency of our product. By using hot dip galvanizing, we are able to use carbon steel, which is a robust and strong construction material, particularly well suited for the mining industry.

Improved Technology

The hot dip galvanizing of these condensers was extremely challenging due to their size and the fact that these were to be galvanized externally only. Hot dip galvanizing the internal condensers is not suitable due to the fact that condensing steam is circulated inside the radiator.

The Archimedes principle, which is named after Archimedes of Syracuse who first discovered this law, played a role in the hot dip galvanizing of these condensers. According to this principle, “any object, wholly or partly immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object”. Thus, among submerged objects with equal masses, objects with greater volume have greater buoyancy.



The forces at work in buoyancy

Zinc is seven times more dense than water, so a special jig was designed by Robor Galvanizers, which included a super imposed weight required to overcome buoyancy and immerse the fin tube heat exchanger.



Special Jig designed by Robor to overcome Archimedes Principle

Promote Professionalism

In this particular project, where three steam condensers at 5 tons per unit were constructed, much teamwork was required across all stakeholders, including the suppliers and in particular the hot dip galvanizer. Robor Galvanizers provided their vital knowledge and advice in order to successfully hot dip galvanize these condensers.

Provide Service

The hot dip galvanizing of our large condensers was made possible due to the 10m long x 2m wide x 4m deep galvanizing bath at Robor Galvanizers.



Staff “skimming” the surface of the molten zinc in order to prevent ash deposits on the hot dip galvanized coating. The coating is normally intact underneath the ash deposits.

The end-user has better control over quality issues and can closely monitor the production process, thereby ensuring customer satisfaction.

Robor Galvanizers provided an excellent service on the hot dip galvanizing of these condensers as they had to be handled with extreme care.

A “snorkel” was inserted at the top of the condenser in order to help release the pressure which is caused by steam (the air inside is super-heated due to the temperature of the zinc) and needs to escape.

A further advantage to our production process is that entire batches of semi-finished radiators can be hot dip galvanized in a single dip, resulting in considerable time saving, thereby increasing efficiency and cost effectiveness.

Dissemination of Knowledge

Knowledge transfer took place through interpersonal communication with the various parties.

Market Growth

The hot dip galvanizing of these larger condensers has the potential to extend the use of the process to many other large components that are required to operate in corrosive environments and / or rough handling conditions.

The project is of benefit to all stakeholders as this proves to the industry that it is possible to manufacture heat exchangers locally as opposed to costly imports.



Conclusion:

The hot dip galvanizing of these condensers was extremely challenging due to their size and the fact that these were to be galvanized externally only. Robor Galvanizers were able to accommodate this large size in their galvanizing kettle.

Furthermore, a special jig was designed in order to overcome the Archimedes principle and force the condenser under the zinc.

Using hot dip galvanizing for these condensers not only protects them from corrosion, but improves the condensers performance by enhancing thermal efficiency.