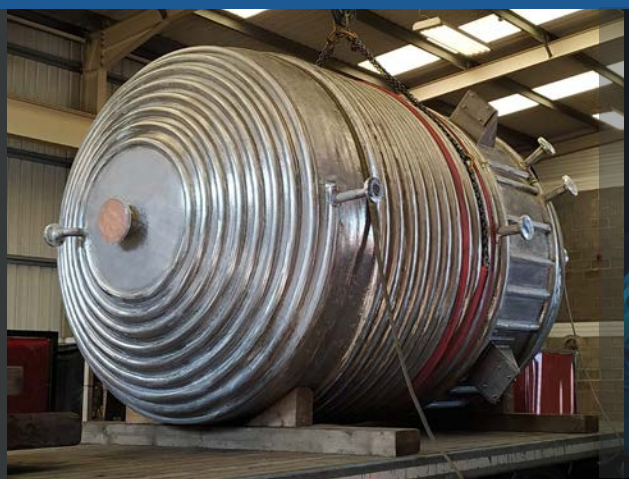
Limpet Coil Vessel for UK chemical plant

Case Study



GFSA was commissioned to design and manufacture a Limpet Coil Vessel for a global supplier of speciality chemicals. The plant where the Limpet Coil Vessel is to be used produces fine chemicals operating under the top tier of the COMAH Regulations in the UK. The site's primary focus is manufacturing actives and intermediates for the agro-chemical industry and pharmaceutical intermediates. Key technologies include chlorination, phosgenation, sodium dispersion and bromine chemistry.

The Background

GFSA designs and manufactures limpet coil reactor vessels for the chemical and process industries. These vessels are used to regulate the temperature of reactants and control exothermic (energy releasing) or endothermic (energy absorbing) reactions with the help of heating or cooling media circulated through coils surrounding the main pressure vessel.

A limpet coil is manufactured by first splitting a pipe and forming it into semi-circular coil sections that are wrapped around the bottom and sides of a pressure vessel. The coil is then welded into place using full penetration welds to ensure that it does not crack. The temperature of the fluid or gas passed through the limpet coil can be used to regulate the temperature within the pressure vessel. Heating and cooling can be achieved within one reactor with a double coil design.

Limpet coils manufactured by GFSA at its Stourbridge, UK, production facility, tend to be provided in stainless steel (typically grades 304, 316, 316L or Duplex SS) and are ideally suitable for medium heat transfer requirement and heating applications where heating media temperature is above 150 Centigrade. Available in a range of sizes from 500 Litres to 60,000 Litres, GFSA Limpet Vessels can also be supplied with all associated process automation, valves and fittings. The design is always fully in accordance with the relevant vessel code. Once welded, the coil is 100% NDT tested prior to full hydro-testing.

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The Challenge

The Limpet Coil Vessel consisted of a cylindrical vertical shell with standard torispherical dish on both ends and was to be used at a speciality chemical plant in the UK where steam was to be used to heat the vessel through the limpet coils.

Design Specification:

- Design Code: PD5500 Cat.2 and PED 2014/68/EU (Welding Code: BS EN 15614/287/9606)
- Design Pressure: 7.59 Bar (Shell) 7.7 Bar (Coil)
- Design Temperature: 175°C
- Hydraulic Test to 12.43 Bar
- NDT: Radiography on 10% Butt Welds, D.P.I on 100% of welds, Ultrasonics on 100% Branch Welds.
- Material: 316 Stainless Steel
- All materials supplied with test certificates
- Dimensions: 3.66m high, 2.15m diameter, Volume 11,200L, Weight 3500Kg

Figure 1 Limpet Coils are welded to the bottom and sides of the pressure vessel

Figure 2 Limpet Coil Vessel being loaded for delivery

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The Solution

The customer needed the Limpet Coil Vessel to be manufactured to a very tight deadline which required GFSA to plan and execute the complex manufacturing process meticulously and to modify procedures in order to meet the customer's schedule. Using normal GFSA procedures would have significantly exceeded the client's delivery expectations, so GFSA developed new procedures and qualified welders to execute via a different process involving GTAW (Tungsten Inert Gas) / MAG (Metal Active Gas) system plus a TIG root with MAG filler on the coil.

Although engineering drawings were supplied by the client, these needed to be updated and modified to meet the latest design codes. Design modifications were also needed to include a manway access cover.

Figure 3 Manway Cover

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About GFSA

GFSA specialises in the design and manufacture of customised, high integrity filters, strainers and flame arresters in carbon steel, stainless steel, duplex, titanium and many other exotic alloys. Established in the UK in 1997 we have become a leading supplier to the oil and gas, petrochemical, power generation, water and process industries world-wide.

In addition to GFSA's core range of filters, strainers and flame arresters, we also manufacture a variety of related process equipment, including hydro-cyclones, stripping columns, heater vessels, pig launchers and receivers, tanks and pipework manifolds. This equipment can be supplied either as single units or as fully assembled skid packages.

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