Hydrogen Pressure Swing Adsorption package heading to Nigeria

Case Study

The Background

GFSA, renowned for its expertise in designing and manufacturing industrial filtration systems and process equipment, consistently delivers high-performance solutions across diverse sectors including Oil & Gas, Petrochemicals, Power Generation, and Water Processing. The company's product range extends from small strainers to complex skid-mounted filtration units, all engineered to internationally recognised standards.

As part of the rehabilitation of Port Harcourt Refinery Complex in Nigeria, GFSA was commissioned to design and provide a Hydrogen PSA (Pressure Swing Adsorption) package. This system is a vital element of modern refinery operations, responsible for purifying hydrogen gas utilised in various refining processes.

The scope of the project encompassed the following key activities:

- Design, fabrication, and assembly of adsorber vessels.
- Construction of structural steel frameworks, which included decking, handrails, and access ladders.
- Installation of piping and pipe supports.
- Provision of a lifting beam.
- Incorporation of valves, gauges, instrumentation, and control panels.

The Hydrogen PSA system was engineered to purify hydrogen by removing 99.9% of solid particles larger than 5 microns, as well as eliminating impurities such as hydrogen sulphide, chlorides, and water droplets. This high level of purification was achieved through the integration of high-performance filter elements, activated carbon, and a silicone gel bed.

Case Study

The Challenge

This undertaking required exceptional engineering precision and adherence to rigorous quality assurance standards, in line with both client and refinery requirements. A significant challenge stemmed from the physical dimensions and weight of the skid-mounted unit:

- Height constraint: The unit, standing at over 6.8 metres, surpassed the maximum permitted transportation height for the route from GFSA's Stourbridge facility to the port.
- Logistics and transport: With overall dimensions of 7 metres in length, 3.6 metres in width, and 6.8 metres in height, and a total weight of 10 tonnes, the unit required meticulous planning and development of a bespoke transport solution.

Case Study

The Solution

GFSA's engineering team responded by devising an innovative bolted-type design for the Hydrogen PSA package. This allowed the unit to be manufactured in modular form. After passing final inspection and testing, the adsorber vessels and supporting steel framework were disassembled into transportable sections.

The modular design enabled the components to be packed into standard containers, substantially reducing the transportation height. This approach facilitated safe and efficient road transit, effectively overcoming the height restrictions that would have rendered the shipment of the fully assembled skid impossible.

Furthermore, this solution allowed for straightforward reassembly on-site, maintaining both structural integrity and adherence to design standards.

Key Technical Highlights

- Adsorber Vessel: Constructed from Carbon Steel ASME SA 106 Gr B, designed according to ASME VIII Div 1, and externally painted to client specifications.
- Piping: Manufactured to ANSI B31.3 standards.
- Structural Steel: Conforming to AISC standards.

The Hydrogen PSA package was entirely fabricated and assembled within GFSA's facility, with stringent quality control measures implemented at every stage.

Case Study

The Result

Despite the technical and logistical challenges, the Hydrogen PSA package was completed and delivered successfully and without incident. The project demonstrated GFSA's capability to address complex transport issues through intelligent engineering and design, reinforcing its reputation as a reliable partner for bespoke process equipment worldwide.

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.

GFSA Ltd. Gibbs Road, Lye,
West Midlands, DY9 8SY,
United Kingdom

Tel: +44 (0) 1384 896159
Email: sales@gfsa.co.uk