WASTE HEAT BOILER

CASE STUDY

CATEGORY

PRODUCTS / HEAT EXCHANGERS

SUMMARY

Project Name : *Yarwun Cyanide 80 Ktpa Upgrade*
Industry : *Chemical Manufacturing*
Reference : *LA2159*
Client: *Orica*
Year : *2006 to 2007*

Overview

LA Services were contracted to provide the mechanical design and manufacture of a specialised waste heat boiler to support a major cyanide plant capacity upgrade for Orica. The boiler was developed with a unique process design outcome in mind. Its high pressure shell side and a very constrained installation site, set a project context that required significant collaboration between our trades and designers to come up with a manufacturable boiler to suit the space and output requirements.

Scope

The project had a unique flavour from its inception, although it was effectively a heat exchanger it did not follow the typical exchanger configurations found in TEMA, it was very much a purpose built vertical unit for the specific cyanide objectives. LA Services mechanical engineers and trades people worked closely with the principal design engineer at Orica to develop a configuration that provided the required production output, while remaining within the allowable dimensional constraints for site and a manufacturable design.

PROJECT DETAILS

Design

- Design Pressure : 5450 kPag (shell side)
- Design Temperature : 300°C to 350°C
- Dimensions : 3.1m ID, 4.0m outside diameter x 6.6 long
- Mass : 68,400 kg
- Standard : AS1210 Class 1
- Configuration : 1 pass x 1752 lined tubes

Materials

- Shell AS1548-5-490 x 70mm thick
- Channel AS1548-7-490 x 20mm thick
- Dished end tubesheet AS1548-7-460R, 2.7m ID x 50mm thick

Manufacture

- NDE 100% Visual, RT, UT / MT
- PWHT 635°C =+/-15°C per 25mm
- Hydro pressure 8370 kPag

Planning

The unusual design required a 3.25m diameter forging x 250mm wide x 200mm thick girth flange, this item set the scene for thick materials and heavy forming and machining needs. The acquisition of this critical path component posed a challenge in planning the build while the forging was formed, machined and shipped to the factory. The shell side's high pressure over a 2.5m diameter bundle meant a flat tube-sheet was not an option. This was solved using a 50mm thick dished end tube sheet.

Challenges

The heavy wall requirement presented a number of challenges in fabricating the girth flange with the 70mm thick inner and outer strakes, joined to an 80mm cone stepping down the out-shell side diameter from 3250mm to 2870mm. While the inner strake had to align with the 50mm dished end tube sheet. To overcome the fabrication difficulties, our workshop supervisors engaged with the Orica designer to develop an optimal design that considered weld preps, strake lengths and build sequence to enable the boiler's assembled while mitigating risks such as tube hole alignment between the upper and lower tubesheets.

Notes

The final challenge was developing manufacturing processes to flare the upper end of the tubes and line the lower section with a 1mm aluminum tube that needed to be expanded onto the carbon steel tube wall. This was achieved by designing a hydrostatic expansion device to process the 1752 tube liners in the factory.

Client Feedback

The close relationship between Orica and LA Services supported the required transparency to resolve delivery adjustments and plan for a successful site installation, thanks to the vessel's dimensional accuracy on completion.

Find out more at www.la.services

Contact us for further details on our projects
77A Carrington St
Revesby NSW 2212
+61 2 9780 8000
enquiries@la.services