



Sour Gas Plant Waste Heat Boiler

The Shell Caroline gas plant, one of the largest sour natural gas processing facilities in the world, successfully uses Alonized tubes to eliminate high-temperature sulphidation.

The Caroline plant, which began operation in 1992, is designed to process 8,533,000 m³/ day of raw gas and gas equivalent of liquid hydrocarbons. The overall sulfur recovery for the facility is 99.8% of the total sulfur intake, and sulfur production is expected to be approximately 4,000 tonne/day. Gas is contaminated with H₂S (approximately 35%).

During operation, the total raw gas and liquid hydrocarbons from the field are processed in the inlet feed facilities. The overhead sour gas from the feed fractionator, after being stripped of heavy hydrocarbons, is sent to the gas sweetening facilities where the acid gases are removed by physical and chemical absorption. The acid gas is sent to the Claus sulphur recovery unit.

In the Claus process, H₂S in the acid gas stream is partially oxidized in the reaction furnace. This reaction is highly exothermic. The Caroline plant is designed around a predicted exit gas temperature between 2200°F and 2300°F (1204°C/ 1260°C). The exit gas temperature of other plants is between 1400°F and 2300°F (760°C and 1260°C), with most in the range of 1700°F/ 2200°F (927°C/ 1204°C). The Caroline plant contains two sulphur recovery units,

each having two reaction furnaces and waste heat boilers operating in parallel. Each boiler contains 1010 tubes, 2-1/4" (57.1 mm) diameter, approximately 12 meters in length, and has a generating capacity of approximately 100t/hr at 3650 kPa.

All carbon steel tubes were Alonized to eliminate high-temperature sulphidation. Although the hot gases pass through the inside of the tube, both surfaces were Alonized. Care was taken to eliminate any aluminum alloy in the area of the tube that was welded into the tube sheets during assembly.

In accordance with standard practice, the tubes were Alonized, then rerounded by passing them through a roller straightener to bring them back to ASTM A450 tolerances. The tubes were trimmed to final length, ends dressed, and protective plugs inserted in the ends. The tubes were then trucked to Tulsa for assembly.

NOTE: The heat of the Alonizing process may cause a slight change in tube length. For this reason tubes or pipes with a finish length of longer than about 16' (4,900mm) are typically ordered 1% over length and then trim cut to final length after Alonizing.

Alonized tubing is specified in a number of gas plants to protect the tubes in the waste heat boilers and condensers. A wide variety of metallurgies and configurations are Alonized for use in many types of gas-processing plants.

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