

Case Study:

Risk of repeat fires removed through flange management programme on a Texas Tower heat exchanger

Problem

Texas Tower high temperature channel/shell and channel/channel cover flange connections were failing due to low bolt loads. High temperatures were causing flange rotation and graphite oxidation which in turn were leading to bolt relaxation and leakage. During installation it was found that bolt loads were not verified beyond basic torque tightening values. This ultimately led to the flange catching fire and requiring a steam quenching process to prevent further damage.

Catastrophic fire caused by joint relaxation

Application

Vertical Texas Tower heat exchanger (29 m tall) reducing reactor effluent temperature from 491°C to 115°C.

- Pressure: 0.84 MPa on shell side, 10.8 MPa on tube side
- Media: naphtha and hydrogen

Existing solution

Kammprofile gasket with commercial graphite facing and Inconel 718 studs - bolt stress 360 MPa

James Walker solution

James Walker provided calculation support of the optimum bolt load for the joint. From this analysis it became evident the bolt diameter needed to be reduced from from 1 1/8" to 1" by the use of bolt collars. This would reduce the level of flange rotation under elevated temperatures.

Retaining Inconel® 718 was advised for bolt material, to maintain better creep resistance at the high operating temperature. Although, these bolts were further supported with RotaBolt® technology to ensure all bolts were tightened to the target bolt load.

To reduce the negative impact of graphite oxidation, the kammprofile gaskets were specified with APX-2 and SS321 materials. This reduced graphite oxidation and increased working life for the gasket. It is expected that these flange connections will now perform leak-free between turnarounds as a result of more accurate bolt tension and extended service life of the critical cover flange gaskets.



Results and benefits

These flanges are back in service with no steam quenching required as the risk of flange leakage and fires has been eliminated.

Trouble free operation without process interruptions



Improved operational efficiency



Zero leaks in operation, no leaks to report to authorities



No fire damage risk to the asset



Peace of mind and enhanced productivity on-site

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