

Specially-Designed Six-Part Self-Sealing Repair Clamp Prevents Costly Shutdown



Overview

TEAM designed and installed a specialized, semi permanent, on-line clamp following the discovery of a leak on a tee section of a critical steam line.

Project: On-Line Leak Repair of Crack on High-Pressure/ High-Temperature Critical Line

Location: United Kingdom

TEAM Service: On-Line Leak Sealing and Repair

Need and Challenge: The ExxonMobil Mossmorran Chemical Plant detected a small crack on a critical line, operating at pressures of up to 84 bar g (1220psi) and temperatures of some 480°C. The crack had formed between the 16-inch pipe and the branch connection that attached it to a 20-inch header. Although the repair was not termed immediately dangerous by ExxonMobil engineers, repair was clearly essential and, given the operating pressures and temperatures involved, it was initially thought that shutdown was the only option.

The plant at Mossmorran converts the ethane from liquid gas pumped in from offshore, into ethylene – a fundamental building block of the petrochemical industry. Shutdown would not only mean significant costs in terms of lost production but also, to avoid ceasing offshore production, the excess ethane would have to be flared, wasting precious product and raising environmental and community issues.

Solution and Outcome

TEAM was called in to design, engineer and manufacture a long-term solution that could be installed without the need to shutdown production. Within two weeks, an initial bespoke enclosure had been designed taking into account all considerations and operator requirements. A template was then constructed to ensure that all measurements were accurate and that the structure would clear all obstructions.

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Not only was there the issue of complex geometry to consider in designing the solution, but a further consideration was the fact that there was an immovable obstruction just 100mm away from the 180° return, making access awkward. TEAM's solution was a specially-designed six-part self-sealing repair clamp, mitered to match the geometry of the pipeline. Fluoro-elastomer was employed providing a high integrity seal, which is compatible with the hydrocarbon line contents over the required design life of the encapsulation. Once fitted, the enclosure was injected with resin to provide the defective pipeline with support.

The design was validated using Finite Element Analysis (FEA) to ensure that the design met code requirements and that deformation, particularly at the clamp's joint faces, was within acceptable tolerances to ensure leak-tight integrity. The enclosure was engineered to the design pressure of the line (20 bar) and is a long-term solution to the problem of internal corrosion/erosion. The initial phase involved drilling down some 10" through the valve bonnet. The goal was to hit the o-ring cavity location precisely, but fall short of the final breakthrough by a pre-set distance. The work was performed in just four hours (less time than anticipated) using TEAM's specially manufactured equipment.

This work may have been performed by a company subsequently acquired by TEAM.