



Zotefoams: Support of tee design proposals

Case study

EASL was approached by Zotefoams, a world leader in cellular materials technology, to identify the optimum solution for a recurrent issue from design proposals. This is mainly due to our extensive experience of applying finite element analysis (FEA) to solve complex engineering problems in a timely and cost effective manner.

Above other competition

Randomly dispersed cracks were noted to have initiated at welds along the low pressure (LP) manifold of a piece of Zotefoams' production machinery.

Similar type of cracks had formed and been repaired in the past. The system had therefore been withdrawn from service, and a solution that would last for the fifteen year life of the system was required in time to be fitted during the company's annual outage.

Following an initial consultation, EASL recommended the use of pipe stress analysis (PSA) to investigate the two design proposals presented by Zotefoams. It was suggested that the cracks were formed due to insufficient flexibility in the pipe legs welded to the LP manifold.

Zotefoams commissioned EASL to carry out the PSA to identify the optimum

solution before using FEA to ensure that the solution was appropriate.

EASL undertook a site visit at Zotefoams' Croydon site to review the pipework in scope of the analyses. PSA software 'PSA5' was used to develop, analyse and assess the pipe stress models to design code ASME B31.3:2012.

The assessments considered the following cases:

- Pressure loading
- Dynamic temperature loading
- Dynamic loading caused by the opening of isolating valves.

FEA was used to demonstrate that the optimal modification, identified through the PSA, satisfied the primary stress limit check and shakedown demonstration when assessed using the ASME III sub-section NB design-by-analysis approach.

A fatigue endurance assessment was conducted using both ASME III sub-section NB, and EASL proprietary lower

bound data to identify whether fifteen year operational life could be realised. It was found that although the proposed modification represented an improvement on the current design, PSA and FEA could not definitively rule out the possibility of fatigue cracks developing in the system within the proposed fifteen year life.

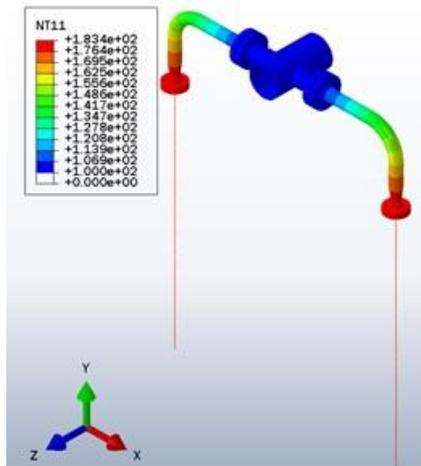


Figure 1 Temperature variation at operating conditions

Our solution

EASL assessed the defect tolerance of the structure at design conditions. The critical length of a postulated fully penetrating defect in the LP manifold was calculated to be such that gas leakage would be anticipated, potentially allowing detection of the defect before complete guillotine failure occurs.

Zotefoams arranged to install the solution that the PSA identified to be optimal on their site. The company have since contracted EASL for further services.

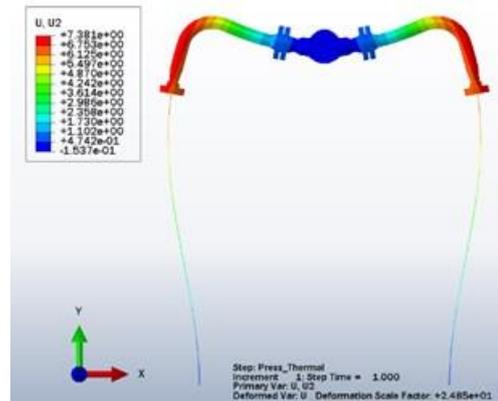


Figure 2 Deformed shape at design conditions

EASL's extensive experience in stress analysis enables us to provide an efficient, cost effective and bespoke service fitted to your needs. To discuss how EASL could support you, please contact us.

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