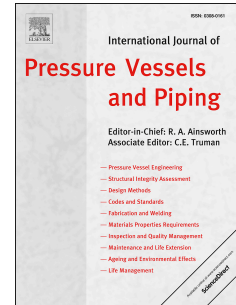


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A Study of Neighbouring Tube Expansion Effect on the Residual Contact Pressure of Tube-To-Tubesheet Joints

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Abstract:

Heat exchangers, steam generators and condensers often fail due to improper tube-to-tubesheet joint expansion. Among the multiple parameters affecting the residual contact pressure is the tube expansion order as adjacent tube expansion alters the central tube residual stress field. The expansion of adjacent tubes decreases the contact pressure of the central tube. Hence the none-optimized residual stresses and contact pressure achieved by trial and error during the expansion process make the joint vulnerable and prone to leakage failure.

This study analyses the elasto-plastic behaviour of a central tube when the surrounding tubes are subjected to hydraulic expansion in turns in a simulated tube-to-tubesheet joint assembly using numerical FEM. Neighbouring tube expansion, expansion order sequence and ligament efficiency are found to have a major influence on the residual contact pressure. Such a study provides general guidelines on how to control the expansion process and help optimize the residual contact pressure.

Keywords: Residual contact pressure, adjacent tube expansion, hydraulic expansion, FE Analysis.

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