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Three-Dimensional Numerical Analysis of the Harmfulness of Defects in Oil Pipes

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Abstract : In this study, the finite element method in 3-D is used to calculate the integral J in the semi-elliptical crack in a pipe subjected to internal pressure. The stress-strain curve of the pipe has been determined experimentally. The J-integral was calculated in two fronts crack ($\Phi = 0$ and $\Phi = \pi/2$). The effect of the configuration of the crack on the J integral is analysed. The results show that an external longitudinal crack in a pipe is the most dangerous. It also shows that the increase in the applied pressure causes a remarkable increase of the integral J. The effect of the depth of the crack becomes important when the ratio between the depth of the crack and the thickness of the pipe (a / t) tends to 1.

Keywords : J integral, pipeline, crack, MEF
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