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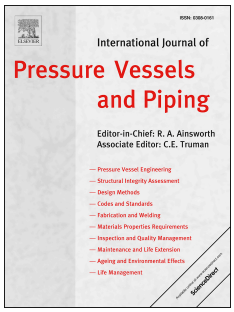

Effect of a new specimen size on fatigue crack growth behavior in thick-walled pressure vessels

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Effect of a new specimen size on fatigue crack growth behavior in thick-walled pressure vessels

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Abstract

Fatigue crack growth in thick-walled pressure vessels is an important factor affecting their fracture. Predicting the path of fatigue crack growth in a pressure vessel is the main issue discussed in fracture mechanics. The objective of this paper is to design a new geometrical specimen in fatigue to define the behavior of semi-elliptical crack growth in thick-walled pressure vessels. In the present work, the importance of the behavior of fatigue crack in test specimen and real conditions in thick-walled pressure vessels is investigated. The results of fatigue loading on the new specimen are compared with the results of fatigue loading in a cylindrical pressure vessel and a standard specimen. Numerical and experimental methods are used to investigate the behavior of fatigue crack growth in the new specimen. For this purpose, a three-dimensional boundary element method is used for fatigue crack growth under stress field. The modified Paris model is used to estimate fatigue crack growth rates. In order to verify the numerical results, fatigue test is carried out on a couple of specimens with a new geometry made of ck45. A comparison between experimental and numerical results has shown good agreement.

Keywords: Crack growth, Pressure vessel, Stress intensity factor, Standard specimen, Fatigue.

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