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The numerical simulation on the development of crack in pressure vessels based on the extended finite element method

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ABSTRACT

In order to analyze the cracks within the pressure vessels, surface and through cracks within the pressure vessels were numerically simulated based on the extended finite element method. The effects of original sizes of the cracks, sizes of pressure vessels, and internal pressure on the stress intensity factor of cracks were investigated. The critical fracture size of the crack, the distribution and evolution of the stress around crack tips were obtained. The results show that different original fracture sizes and internal pressure would cause varied critical fracture sizes within pressure vessels, and the critical fracture size is independent of the sizes of the pressure vessels.

KEYWORDS: numerical simulation, pressure vessels, crack, stress intensity factor