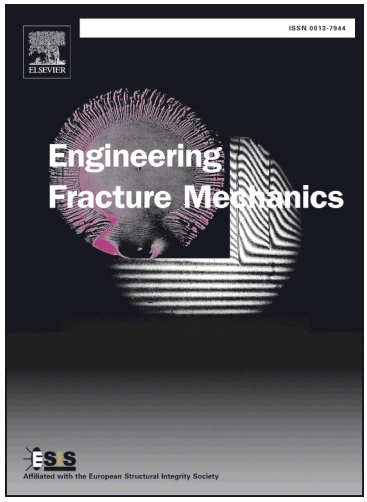

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STRESS INTENSITY FACTORS FOR INCLINED EXTERNAL SURFACE CRACKS IN PRESSURISED PIPES

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ABSTRACT

Corrosion, manufacturing defects or complex stress state can induce inclined surface cracks on pipes that lead to failure by mixed mode fracture. Very few studies have been undertaken on stress intensity factors for inclined cracks with mixed modes. This paper presents a combined *J* integral and finite element method to determine the stress intensity factors for inclined external surface cracks in pressurized pipes. A meshing technique is proposed to model the complex region around the crack. To facilitate the practical use of the proposed method, formulae for the influence coefficients of stress intensity factors with mixed modes are developed. Based on numerical results, it is found that the influence coefficients of Mode I and equivalent stress intensity factors decrease with the increase of the inclination angle along the whole crack front whilst those of Mode II and Mode III reach the maximum when the inclination angle is 45°. It is also found that the influence coefficients of all three modes increase with the increase of crack relative depth along the whole crack front. The results presented in the paper can be used by practitioners to assess the fracture conditions of both brittle and ductile pipes.

KEYWORDS

Inclined surface cracks; Influence coefficient; Pressurized pipes; *J*-integral; Finite element method.

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