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STRESS INTENSITY FACTORS FOR INCLINED EXTERNAL SURFACE  
CRACKS IN PRESSURISED PIPES

Chun-Qing Li, Guoyang Fu, Wei Yang

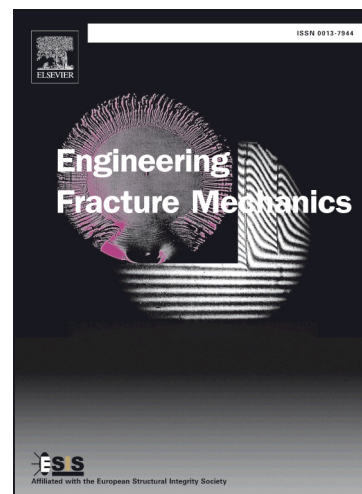
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**STRESS INTENSITY FACTORS FOR INCLINED EXTERNAL SURFACE CRACKS  
IN PRESSURISED PIPES**Chun-Qing Li<sup>1,\*</sup>, Guoyang Fu<sup>1</sup> and Wei Yang<sup>2</sup><sup>1</sup>School of Engineering, RMIT University, Melbourne 3001, Australia<sup>2</sup>School of Civil Engineering and Architecture, Wuhan University of Technology, Wuhan,  
430070, China**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  $45^\circ$ . 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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\*Corresponding author: Professor Chun-Qing Li, Email: [chunqing.li@rmit.edu.au](mailto:chunqing.li@rmit.edu.au)

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