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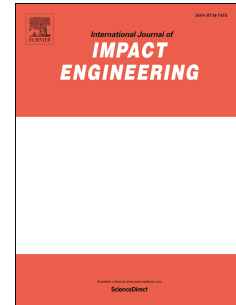
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Abstract: Cylindrical casing filled with charge under eccentric point initiation at one end is commonly used in warheads and can occur in some explosion accidents. The fragment velocity distribution of the casing is an important parameter in warhead design, structure protection and safety. A formula composed of three terms, including the influence formula of eccentric initiation, rarefaction wave and incident angle of the detonation wave was proposed in the present work to determine the fragment velocity distributions of a cylindrical casing under eccentric point initiation at one end. The influence of the incident angle of detonation wave is proposed as the key factor. A numerical simulation model was proposed, validated and used to determine the influence of the incident angle of detonation wave. Its corresponding formula $g(\alpha_c)$ was established and validated with the established numerical simulation model. The rest of two factors can be calculated with previously reported formulas. The formula proposed in the present work was further validated with the established numerical model. The results indicate that the calculation formula can accurately predict the fragment velocity distributions along the axis and circumference of a cylindrical casing under eccentric point initiation at one end.

Key word: Fragment velocity; Gurney equation; Cylindrical charges; Eccentric initiation.

1 Introduction

Cylindrical casing filled with charge is the most common structure applied in explosion security protection, explosion control technique and warhead design. Fragment velocity distribution is one of most important parameters of the casing. Many experiments and numerical simulation model about cylindrical casing filled with charge under axial edge initiation have been reported. However, due to the accident stimuli or poor explosion control technique, the initiation point at the end could be off the axis of the cylindrical casing filled with charge, leading to eccentric edge initiation. The direction

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