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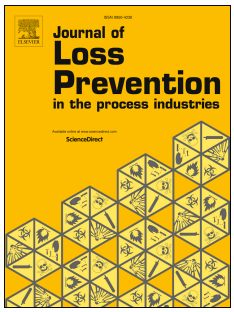

Internal and external pressure prediction of vented gas explosion in large rooms by using analytical and CFD methods

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Internal and external pressure prediction of vented gas explosion in large rooms by using analytical and CFD methods

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Abstract

This paper presents an analytical and a numerical method to predict the internal and external pressures from vented gas explosion in a large enclosure. The first peak internal pressure near the venting of enclosure, which is the primary factor related to the external pressure in far field, is predicted by using analytical correlations. The accuracy of the analytical method is verified by using data from a series of experiments with idealized conditions. However, the incapability of external pressure prediction and over-prediction of peak internal pressure are seen in the realistic scenario by using the analytical approach. Therefore computational Fluid Dynamics (CFD) simulations are consequently performed to accurately estimate both the internal and external pressures of vented explosions. A CFD modelling procedure is suggested in this paper to model the turbulent flame inside the enclosure by using FLACS and to calculate the blast wave propagation with low turbulence in free air by using ANSYS Fluent. This combined CFD modelling approach is proven yielding good predictions of internal and external pressures from vented explosions.

Keywords: external gas explosion; internal pressure; far-field pressure; vented gas explosion; CFD; FLACS; ANSYS Fluent