

Internal and External Overpressure Calculation for Vented Gas Explosion by Using a Combined Computational Fluid Dynamics Approach

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Abstract : Recent oil and gas accidents have reminded us the severe consequences of gas explosion on structure damage and financial loss. In order to protect the structures and personnel, engineers and researchers have been working on numerous different explosion mitigation methods. Amongst, venting is the most economical approach to mitigate gas explosion overpressure. In this paper, venting is used as the overpressure alleviation method. A theoretical method and a numerical technique are presented to predict the internal and external pressure from vented gas explosion in a large enclosure. Under idealized conditions, a number of experiments are used to calibrate the accuracy of the theoretically calculated data. A good agreement between the theoretical results and experimental data is seen. However, for realistic scenarios, the theoretical method over-estimates internal pressures and is incapable of predicting external pressures. Therefore, a CFD simulation procedure is proposed in this study to estimate both the internal and external overpressure from a large-scale vented explosion. Satisfactory agreement between CFD simulation results and experimental data is achieved.

Keywords : vented gas explosion, internal pressure, external pressure, CFD simulation, FLACS, ANSYS Fluent

Conference Title : ICFMHS 2018 : International Conference on Fluid Mechanics and Hydraulic Systems

Conference Location : London, United Kingdom

Conference Dates : May 14-15, 2018