P75 Impact of the Room Opening Ratio on the Shock Wave Propagation within a Confined Multi-Chamber System

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Abstract:

The need for security within pyrotechnic facilities requires, in particular, an accurate prediction of the behavior of shock waves generated by a detonation propagating inside a building. This study aims at analyzing the behavior of a shock wave within a confined multi- chamber system modeling a pyrotechnic workshop.

Small-scale experiments are carried out using an adjustable model of a four-roomed single-

story building. The rooms are connected to a single corridor. The detonation is generated by a hemispherical charge of a propane-oxygen stoichiometric mixture located in the second room and pressure histories are recorded with pressure transducers distributed on the ground in the four rooms and in the corridor. The explosive gaseous charge corresponds to a TNT mass ranging from 0.27 kg to 3 kg.

This work is focused on the impact of a wall closing partially either the transmitting room, i.e.

the room where the detonation is initiated, or a receiving room, on the propagation of the shock wave in the pyrotechnic workshop. Several tests were carried out in twelve configurations by varying wall lengths and wall locations. Some simulations have been conducted with OURANOS CFD code.

The analysis of the shock wave parameters has been conducted. A very good correlation

between the time of arrival of the incident shock wave and the curve of reference established in free field has been obtained. Maximum overpressure in the rooms can be predicted by an empirical law depending on the rooms opening ratio.

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