EXPERIMENTS AND SIMULATIONS OF THE DETONATION OF A GASEOUS CHARGE IN A SEMI-CONFINED WORKSHOP

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Abstract

The detonation of a charge within a pyrotechnic workshop represents a significant hazard to the structure and its employees. In this paper, results of pressures and impulses produced by shock waves are presented in order to investigate how blast propagates through a pyrotechnic workshop.
Small scale experiments are conducted with a Plexiglas parallelepipedic model (or mockup) representing a pyrotechnic workshop and numerical simulations are conducted with AUTODYN hydrocode. The explosive charge is represented by an homogeneous hemispherical gaseous charge (stoichiometric propane-oxygen mixture) located in the centre of the workshop. An expansion chimney and an obstacle representing a machine tool are also located in the workshop and pressure gauges are distributed on the floor. Experimental pressure-time histories are compared with computed pressure-time. Among examined results, it is expected to determine the influence of the chimney on overpressure and impulse levels. The present study highlights that the detonation of an explosive charge in a semi-confined workshop generates many phenomena such as Mach stems along walls. Experiments conducted in this program confirm that this Mach wave significantly increases overpressures and impulses in the vicinity of walls. Therefore, the most probable serious injuries could be observed in the region of Mach reflection.