P13 Experimental Study of the Structures Generated by Explosive Dispersal of Inert Particles

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Abstract:

The dispersal of inert particles surrounding an explosive charge generates a complex three-dimensional phenomenon: as a response to the shock compaction process, the particle layer breaks up into packs significantly larger than the particle initial characteristic dimension. These packs are projected with high velocity and submitted to a progressive erosion of their material during their flight in the surrounding air. Some former studies showed that the packs spatial distribution depends on the particle layer physical properties and the crossing shockwave characteristics.

This document focuses on the structures generated by the explosion of a 32g Comp-B spherical charge surrounded by a layer of fine glass particles. After analyzing the number of packs versus the thickness of the particle layer, we introduced a fine gap of air between the booster and the particles, while keeping constant their total mass. As an air gap is often present when using inert material to mitigate blast effect, we considered necessary to assess its effect on the particle dispersal. Direct observation by high speed camera showed a significant modification of the packs distribution. Side-on pressure gauges recording signals at various distances from the charge centre provided the pressure and impulse history for each particle layer type. The presence of an air gap between the booster and the particles decreased the inert material efficiency in quenching the fireball reactions and attenuating the blast impulse.

ISL’s rotating particle trap described in a previous paper was also used to provide time-resolved data on the nature of material projected by the Comp-B booster. Visual analysis of the wax cylinders illustrated the different structures present in the particle dispersal. The first chemical extractions were conducted on wax samples, allowing us to correlate the precise microscopic observations of dispersed material and their time/space distribution in the explosive dispersal.

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