

Reduction of DDT Run-Up Distance in a Two-Phase Flow by Combined Means

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Abstract

The objective of this paper is the reduction of DDT run-up distance in air suspensions of liquid fuel drops by various combined means, including discharge chambers, Shchelkin spirals, transition cones, and a new element – tube coil. The tube coil introduces expansive and compressive surfaces to the propagating shock wave leading to gasdynamic “focusing” phenomena and promotion of the detonation onset. As a result of replacing a straight, smooth-walled tube 51 mm in diameter by a 28-millimeter tube with Shchelkin spiral, tube coil, and transition cone to a 51-millimeter tube, the initiation energy of spray n-hexane–air and n-heptane–air detonations was reduced by two orders of magnitude, i.e., from 3300 to 30 J, with the DDT run-up distance of about 1 m.