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Partitioning of Initial Energy Release in a Tunnel Environment
JOSHUA FELTS, RICHARD LEE, NSWC IHEODTD, KYLE MYCHAJLONKA, ANDY DAVIS, Nammo Talley Inc — After the detonation of an explosive charge in the closed end of a tunnel, the products and excess fuels mix and partially combust with the available air before expanding down the tunnel. Both the energy of the detonation and from the combustion of the products and excess fuels drive the blast wave. The energy of the blast wave was calculated for several explosives in a small-scale tunnel. The calculations were performed using the methodology of Hutchens, which is an adaptation of the classical approach of Taylor and Sedov. For similarly sized explosives, the detonation energy was measured using a detonation calorimeter. The difference in the initial energy release of the tunnel with that of the calorimeter is the energy from the initial partial combustion of the detonation products and excess fuels in the explosive formulation. This difference is related to the explosive formulations and can be interpolated for new formulations. This relationship can guide new formulation development for use in a tunnel environment. Knowledge of the initial energy release partitioning can lead to better computer models for fuel-rich explosives.

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