

DYNAMIC PROPERTIES OF AN ALUMINIZED EXPLOSIVE

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Often times, to make an explosive more energetic, powdered aluminum is added to the mixture. The intent of the aluminum powder is to react with existing fuel, either excessive oxygen or detonation products, to liberate more energy than the simple explosive. The aluminum burns after the explosive detonation front thus creating, by Definition, a non-ideal explosive. We have elected to model the explosive using P. Miller's one-dimensional Lagrangian formulation with an additive energy source term. The Equation-of-State (EOS) uses as a basis the common Lawrence Livermore Laboratory JWL EOS with the late time, additional energy added at a specified rate to the last term which deals with loss of energy due to expansion. The fundamental items which are required for the additional energy are the total amount (Q.) and the rate at which it is added.

While characterizing a mix of TNT and aluminum powder, we found that the resulting non-ideal explosive depends upon the state of initial confinement, geometric configuration and size. For example, charges fully cased with steel scale with size nicely but generally tend to produce lower peak pressures and cooler temperatures than uncased charges. However, measurements which specify the EOS constants have been, at best, illusive. This paper will present specific experiments and measurement results taken to define the EOS. The final EOS constants were then obtained with iteration of a first principle computer code. The results are for a specific explosive and a specific geometry.