DEVELOPMENT OF SHOCK TO DETONATION TRANSITION MODELS FOR PBXN109, PBXN110 AND PBXN111

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Abstract:

Shock to Detonation Transition (SDT) models have been developed for PBXN109, PBXN110 and PBXN111. These models were constructed by considering the EOS for the unreacted explosive and reacted products derived through literature review and thermochemical calculation in conjunction with go/no-go data. A viscoplastic model and a History Variable Reactive Burn (HVRB) model were fitted to experimental Pop-plot data.

The resulting SDT models showed considerable similarity between the three explosives despite the significant difference in composition: from ideal PBXN110 to the incorporation of Aluminium and AP in PBXN111. The effect of temperature on the sensitivity on PBXN110 was modelled: initially assuming that it acts only to affect the density of the explosive; and subsequently by fitting of the grain size parameter.

Validation of the SDT model for PBXN110 was conducted by comparison to experimental cone test and fragment impact data. This model was used to predict the threshold for takeover of an initiation train, and subsequently matched to trials data.

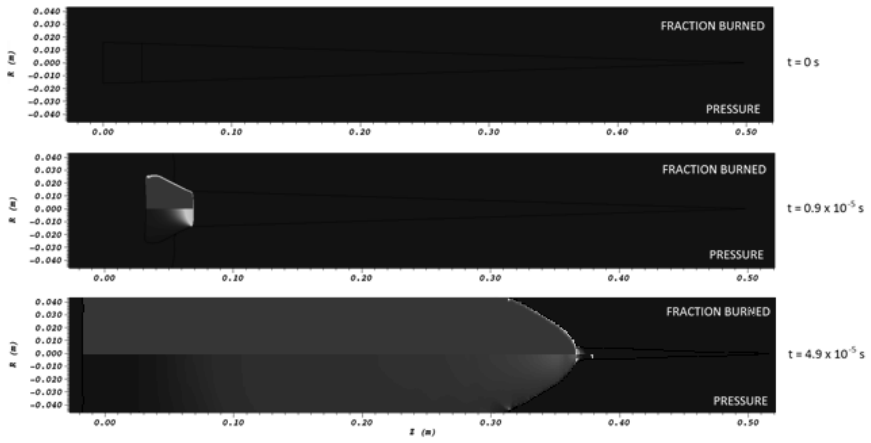

Figure 1: Time evolution of the cone test for PBXN110

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