

DETONATION OF HEAVY ANFO USED IN LARGE HIGH EXPLOSIVE EXPERIMENTS

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The Defense Threat Reduction Agency (DTRA) recently conducted a large 700-ton, near surface high explosive experiment at the Nevada Test Site. Heavy ANFO with 0.8% of plastic microballoons (by weight) was used as the explosive. Investigation of the previous testing history of neat Heavy ANFO leading up to the experiment was inconclusive regarding the steady state detonation velocity of the charge. Data indicated an increasing detonation velocity which did not reach steady state until a distance of 4 meters had been traversed. This “run-up” distance was over half of the total charge dimension. Detonation issues for the recent test were addressed prior to the recent large-scale test by loading two 3-ft diameter, 26-ft long aluminum tubes. One tube held neat Heavy ANFO; the other held sensitized Heavy ANFO with 0.8% plastic microballoons added. Both charges were then detonated and measurements were taken using crystal time of arrival (TOA) gages and commercially available copper tube crushing devices. The neat Heavy ANFO tube demonstrated that the detonation was not constant, had a delayed rise to final detonation velocity, and had a curved detonation front due to edge rarefaction effects. The full steady state detonation velocity was not realized. The sensitized Heavy ANFO mixture demonstrated full detonation velocity within a few feet of the initiator, and showed a planar detonation front across the column. The sensitized ANFO-emulsion mixture was measured to have a reduced in-place the place density compared to the neat mixture. It is believed that in addition to the microballoons, the added air voids created hot spots that helped the detonation process.