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EXPLOSIVE PERFORMANCE

SANL 712-004

Paul E. Kramer

April, May, June 1970

MASTER

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The determination of detonation velocity, shock sensitivity, impact sensitivity, etc.; and the acquisition of high precision one-dimensional hydrodynamic data for use in establishing detonation product equations of state, performance of explosives, etc.

ABSTRACT

A three-shot wedge test series was fired with RX-08-AZ. In terms of transmitted pressure, its sensitivity is comparable to that of LX-09-0.

An exponential model was studied as a possible substitute for polynomials in fitting cylinder test data.

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DISCUSSION

Wedge Test

A three shot wedge test series was fired with RX-08-AZ. The wedges were machined from Skid Test Piece #3, at a density of 1.820 gm/cc. The average observed detonation velocity was 8.6 mm/ μ sec.

Wedge Tests with RX-08-AZ

<u>Shot No.</u>	<u>Booster (one-inch)</u>	<u>Attenuator(s)</u>	<u>P_i (Kb_{ar})</u>	<u>P_t (Kb_{ar})</u>	<u>Distance to Detonation (mm)</u>	<u>Time to Detonation (mm)</u>	<u>Excess Transit Time (μsec)</u>
1	CB-3	Brass - 1"	244	82	2.6	.57	.27
2	Baratol	Brass - $\frac{1}{2}$ "	179	58	5.2	1.21	.61
3	Baratol	Plexiglas- $\frac{1}{2}$ " Brass - $\frac{1}{2}$ "	149	47	7.1	1.76	.94

It is customary to express shock sensitivity in terms of transmitted pressure and excess transit time. When RX-08-AZ is compared to LX-09-0¹ in this context, they display essentially the same sensitivity. But, from a practical standpoint, some other factors would appear to be worthy of note. For instance, LX-09-0 and RX-08-AZ display about the same excess transit times, but a plot of transmitted pressure against distance to detonation indicates that RX-08-AZ is less sensitive than LX-09-0 from a spatial viewpoint.

¹Kramer, P. E., *Quarterly Report on Explosive Performance for Oct., Nov., Dec., 1968.*

A greater difference becomes apparent when incident pressure is considered instead of transmitted pressure. Of course, the relation between incident and transmitted pressure depends upon the donor material but since all these shots employed a brass donor plate, the comparison is valid. Since a given incident pressure resulted in appreciably less transmitted pressure in RX-08-AZ, then in terms of incident pressure, RX-08-AZ is less shock sensitive than LX-09-0 (see figure).

Cylinder Test Analysis

Plots of curve-fit results for cylinder tests have revealed oscillations in the velocity-expansion curve which can be attributed to the polynomial model. (This may result from single-precision limitation on the IBM 360.) Attempts were made to apply a model of the form $T = A_1 + A_2R + A_3e^{A_4R}$ to the R-T data beyond 2 mm (one-inch diameter test). This model, of course, was free from the oscillations inherent in polynomials but was incapable of suitably describing expansion between 2 and 14 mm. At present, polynomials are still employed but generally limited to the seventh degree.

Fig. 1

Excess Transit Time Versus Incident and Transmitted Pressure
(Brass Donor for Each Shot)