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PERFORMANCE AND SENSITIVITY
TESTING OF TATB

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DEVELOPMENT DIVISION

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ABSTRACT

Gap testing of the LLL thermally conditioned specimens of RX-03-BB, Blend 2 continued with 4 groups being tested. Thus far, it has been possible to predict results fairly accurately by considering only the final density of the samples.

Tests conducted on TATB aminated by an emulsion process raised questions about the correlation between density and sensitivity.

DISCUSSION

Gap testing of the LLL thermally conditioned specimens of RX-03-BB, Blend 2 continued with tests on 3 groups

held at constant temperature (60, 80, and 100 C) for 8 months and a group which was thermally cycled for 250 days. Results of all tests in this series are presented in Table I.

Table I. Gap Test Results for Thermally Conditioned RX-03-BB

Treatment	Final Density (g/cm ³)	G ₅₀ (mm of Brass)	
		Predicted (± 0.25 mm)	Observed
Ambient Control	1.900 ± 0.001	2.0	1.73
100 C - 2 Months ^a	1.887 ± 0.002	2.8	2.36
100 C - 4 Months ^a	1.886 ± 0.003	2.9	2.16
100 C - 8 Months ^a	1.888 ± 0.003	2.7	2.22
80 C - 4 Months ^a	1.893 ± 0.001	2.3	1.91
80 C - 8 Months ^a	1.894 ± 0.002	2.2	2.41
60 C - 8 Months ^a	1.899 ± 0.001	2.0	2.16
Cycled 30 Days ^b	1.858 ± 0.004	5.0	~ 4.7
Cycled 150 Days ^b	1.851 ± 0.003	5.5	4.95
Cycled 250 Days ^b	1.848 ± 0.001	5.7	5.46

^aHeated to specified temperature and held for specified time.

^bCycled to -50 C, then to 92 C, then back to -50 C. Cycle required 80 hours.

Discrepancies between observed and predicted (based on final density) values of G_{50} in this series were greater than normal. It is not known whether this is due to effects of the thermal conditioning or to temperature variations at the test site. (The indoor site was not available but future tests will probably be conducted there.) However, the agreement between experiment and prediction has generally been good enough to continue support of the thesis that the effects of thermal conditioning upon sensitivity are due almost entirely to density changes caused by conditioning.

Tests on thermally cycled groups were completed. Considering that the ambient controls were slightly less sensitive than expected, it is concluded that the sensitivities of the thermally cycled specimens did not differ from predictions based upon density.

Further testing is scheduled for the 100, 80 and 60 C specimens. At present it appears that the 100 C samples may be slightly less sensitive than density would indicate but no conclusions are drawn at this time.

The Pantex synthesis section is currently evaluating an emulsion process for aminating TCTNB to TATB. A sample was provided for gap testing to determine if this process affects shock sensitivity.

The pressing cycle normally used with pure TATB (evacuated punch and die, no powder preheat, 275 MPa pressure, dwell of 1 to 2 minutes) has produced pellets of $1.863 \pm 0.003 \text{ g/cm}^3$ from most lots produced by previous methods. The density produced by this cycle will be referred to as the maximum pressable

density (MPD) even though powder preheat can yield an additional 0.01 g/cm^3 . The MPD for the first lot (7213-16-01) of emulsion aminated material was much higher, $1.883 \pm 0.001 \text{ g/cm}^3$. All existing data for "normal" TATB indicate that density is the primary factor governing shock sensitivity, so it was felt that a meaningful evaluation of the effect of the emulsion process could be obtained only at normal densities. Therefore, the pressing conditions were altered to provide pellet densities of $1.861 \pm 0.001 \text{ g/cm}^3$.

These parts proved to be considerably more sensitive than "normal" TATB (Table II). There was, however, concern about comparing the G_{50} for a lot at 98.8% MPD to those for other lots at 100% MPD, so a test series was conducted at 1.883 g/cm^3 . As shown in Table II, the result was indistinguishable from the average G_{50} of "normal" lots at 100% MPD. Furthermore, interpolation of existing data for "normal" lots to 98.8% MPD (approximately 1.84 g/cm^3) yields an expected G_{50} quite close to that observed for the emulsion aminated material at 1.861 g/cm^3 . These results imply that, for pure TATB, the percent MPD rather than the actual density of pellets controls gap sensitivity. This had not been suggested before because of MPD similarities of previous lots.

A second emulsion aminated lot (7262-16-01B) was selected to confirm the results obtained with the first lot. The process for the second lot included a final acetone wash to assure that the observed effects were not due to residual emulsifier. Pressability was essentially identical (MPD = $1.884 \pm 0.001 \text{ g/cm}^3$) as was G_{50} at 1.861 g/cm^3 . Thus, indications are that behavior of this lot will be identical to the first. A shortage of LX-04 donors has delayed testing the 100% MPD parts. Should those results be as expected, a test will

Table II. Observed and Expected Gap Test Results
for Pantex TATB

Lot	Density		G ₅₀ (mm of Brass)	
	(g/cm ³)	(% MPD)	Expected	Observed
7213-16-01 ^a	1.861 ± 0.001	98.8	-	8.36
7213-16-01 ^a	1.883 ± 0.001	100	-	~ 5.3
"Normal"	1.863	100	-	~ 5.5
"Normal"	1.840	98.8	~ 8.0	-
7262-16-01 ^a	1.861 ± 0.001	98.8	-	8.56
7227-16-01 ^b	1.861 ± 0.001	100	~ 5.8	5.79

^aAminated by emulsion process.

^bProduced with Ashland TCB containing 3.5% impurities (aniline route).

then be conducted at 1.80 g/cm³ (95.5% MPD) and the resulting G₅₀ will be compared to an interpolated "normal" G₅₀ at 1.78 g/cm³ (95.5% of "normal" MPD). This should provide a valid indication whether density or percent of MPD is the governing factor for gap sensitivity.

One additional test was conducted for a lot (7227-16-01) produced from Ashland TCB which contained 3.5% undetermined impurities (aniline route). Pressability and sensitivity were both normal.

CONCLUSIONS

Thermal conditioning of RX-03-BB has produced little, if any, effect on gap sensitivity other than that attributable to density changes.

There is evidence to support the thesis that shock sensitivity of TATB is governed primarily by the percent of maximum pressable density rather than actual pressed density. If this is true, emulsion aminated TATB can be considered to be of "normal" sensitivity and high pressability. Additional tests are scheduled.

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