LIQUID FILLED GAP TEST DEVELOPMENT

P. E. Kramer

DEVELOPMENT DIVISION

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Normal Process Development
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Mason & Hanger-Silas Mason Co., Inc.

Pantex Plant

P. O. BOX 647
AMARILLO, TEXAS 79105
806-335-1581

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The development of a technique for the liquid-filled gap test which will eliminate problems encountered with previous methods.

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ABSTRACT

Particle size analysis was performed on several lots of HMX. Two lots were selected to provide three sieve cuts which will be used to give a controlled test of the effect of particle size on shock sensitivity.

DISCUSSION

The basic goal of this project is to develop an adequate process for measuring the shock sensitivity of explosive powders (before mixing them into PBX's, ECX's or PEX's, for example). The early work involved trying to fill the interstitial voids with liquids, since it was felt that gas filled voids would render "true" shock sensitivity unmeasurable. Many difficulties were encountered (wetting ability, bubble entrapment, etc.) but the most serious was that various particle distributions could not be compacted to a common density; common densities are desirable because of the very strong relationship between density and shock sensitivity. Subsequent testing showed that (1) with air filled inter-particle spaces at a common powder density, various particle distributions of a given HE did display greatly different sensitivities, and (2) sensitivities with the spaces evacuated were indistinguishable from those with air filled spaces.

Tests with several lots of HMX implied that shock sensitivity of dry powders increased as the particle distribution became more coarse. The primary shortcoming of the tests was the use of "off the shelf" particle distributions, for which labels such as coarse or fine are only partially accurate. There is considerable overlap between the various classes; a very coarse material such as Class C contains an appreciable percentage of very fine particles, and vice-versa.

Five lots of HMX, representing five particle classes have been sieve analyzed, and from these data, two lots were selected to provide three nonoverlapping sieve cuts. A Class A powder was selected to provide a cut from 100 μ to 180 μ ; the distribution should be very flat. The other two cuts will be made from LX-04 type (special) HMX. One spans from 40 μ to 100 μ with a sort of trimodal distribution. The other ranges up to 40 μ and is heavily skewed below 10 μ . It is not certain if this cut can easily be compacted to the desired testing density of 1.10 g/cc.

These cuts will be tested with air filled voids and a few evacuated shots will be fired as a check. It is expected that sensitivity will increase with particle size. (With liquid filled powders, the opposite trend was noted, but powder density decreased with finer powders; this in itself would usually sensitize the fine powders.)