Very High Energy Explosives Systems

K. Scribner

August 15, 1968

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MEMORANDUM

TO: John Kury

FROM: Kenneth Scribner

SUBJECT: Very High Energy Explosives Systems

August 15, 1968

There has been a lot of discussion lately about where to go next in exploring HE systems with energy equal to LX-09, or better. As I see it, they fall generally into four classes, as follows:

<table>
<thead>
<tr>
<th>Energy Relative to HMX</th>
<th>Typical System</th>
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<tbody>
<tr>
<td>110%</td>
<td>HMX/LiClO₄/FDNBA/FEPPO</td>
</tr>
<tr>
<td>100%</td>
<td>Solvent pressed HMX</td>
</tr>
<tr>
<td>98%</td>
<td>98% Vol HMX</td>
</tr>
<tr>
<td>95%</td>
<td>95/5 - HMX/Viton</td>
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</tbody>
</table>

I will discuss them in inverse order:

95% LX-09-0 and 95/5 - HMX/Viton

The story of LX-09 is legend and won't be considered here. An equivalent energy system we have been asked to look at is 95/5. The first attempt to make 95/5 on a large scale (300 lb) was actually 94/6 (RX-04-CW). Skid and Susan test parts have been prepared and are in test. We subsequently produced 400 lbs. of RX-04-CX (95/5) for additional test and hydro work by Sack. The specific tests in progress, or being prepared, are compressive creep, beam bend, skid, and Susan. Mechanical pressings at 30 Kpsi, 120°C, Vac, 10 min. dwell gave 1.863-4 g/cc eleven times.

Frank Helm and I are covering the progress of this work and preliminary results will be available by October 1.

98% Vol HMX

There are a lot of interesting areas to explore in this world but the work has not really begun yet. My notion is that the work would be divided into two primary categories:
1. Preparation of Materials and Parts
   
a. What kind of a binder and/or void filler to use?
   
b. What class, or combination of classes, of HMX will allow compaction to high density?
   
c. What are the beneficial effects of using up to $5\% \text{NH}_4\text{ClO}_4$? (We might get a better $\% \text{TMD}$.)
   
d. Continued nonaqueous slurry techniques.
   
2. Sensitivity and Physical Properties

   This is probably a new world of sensitivity. Not only will these materials probably be very sensitive to plant handling-type accidents, but we will probably limit the part size to 3 lbs. This is not unreasonable since the primary reason for developing this material is Shoat. The limit on size will be beneficial and may balance against the increased sensitivity of 98% HMX.

   This all means that a new test will have to be devised to realistically evaluate this material, and a positive correlation must be made with our current understanding of plant handling sensitivity.

   I think Pantex should do the major development under my portion of this year's SANL, with the chemical input from Paul Archibald.

100% Solvent Pressed HMX

Paul Archibald has already pressed two pieces of ~3-lbs each and is doing some thermal shock investigations. We are also going to try to find out if Shoat parts can be machined from these pieces. This is probably the worst material from the sensitivity aspects and a careful evaluation will be necessary. We will probably know if a hydro shot could be made of this material by October 1. Paul is following this.

110% HMX/LiClO$_4$/FDNEA/FEPO

This is the longest range, and potentially most attractive, system. The problem of the hygroscopicity of the LiClO$_4$ will require completely dry (H$_2$O) handling techniques. If we use a nonaqueous slurry technique we will also have to learn how to deagglomerate fine, dried HMX. These are the major problems, in addition to all of the normal problems of developing a completely new PBX. One other big potential advantage to this system is that it will have enough binder in it so that it may not be size-limited for safety reasons. I plan that Paul will spend the remainder of his available time here.

K. Scribner
Chemistry Department

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