Requalification of Demilitarized HMX for DOD/DOE Applications

A Joint Program Between:

NAVSEA
INDIAN HEAD
Surface Warfare Center Division

Los Alamos

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Why Requalify?

- Environmentally responsible
- DOD (Gansler memo of Dec. 00) endorses/promotes military reuse
- Available HMX resource
- Lower cost
- HMX is HMX
Based Around LX-14 Process

- TPL patented nitric acid degradation
- Subscale plant (150 - 200 lb / batch) operated at Ft. Wingate
- By-products recycled into blasting agent
HMX Recovery

TPL Contribution

- Prepared & provided classified HMX from LX-14.
- Processes established for demil of PBX-9501 and PBXN-110 and now for PNXN-3. Samples provided for analyses.
- Tested & established scale-up of classification.
- Provided larger samples of Class 1 and Class 5 LX-14 HMX for formulation testing to IH, LANL, and ATK.
- Scale up recovery processes for other explosives.
Current Status

- Shut down and moved sub-scale HMX facility from Ft. Wingate, NM into storage.
- New full scale prototype to be constructed at Letterkenny Munitions Center, Chambersburg, PA
- Available building chosen – permitting under investigation.
- Developing processing method for recovery of HMX from PBXN-3 (85% HMX, 15% nylon).
- Designing system to enable processing of PBXN-3, LX-14 (93% HMX, 7% estane) and other HMX containing PBX’s.
- Process design changes include:
  - Utilize indexing belt filter instead of centrifuge.
  - Recover majority of nitric acid for reuse instead of neutralization for blasting agent use.
  - In-situ NIR monitoring of HMX quality.
HMX Facility Design
HMX Facility Design
Future Plans

- Finalize PBXN-3 method and use for nylon byproduct.
- Modify building as necessary.
- Purchase and install equipment, mezzanine and containment.
- Prove-out new HMX recovery process facility (600 lbs/batch).
- Qualify new process for HMX recovery from PBXN-3.
- Supply HMX for testing purposes.
- Establish methods for other HMX-containing PBX formulations and scale up to full scale.
QUALIFICATION TESTING FOR PBXN-113 CONTAINING RECLAIMED HMX

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Approved for public release; distribution is unlimited
Formulation & Processing

- Composition of PBXN-113:
  - 45% Class 5 HMX
  - 20% Binder Material
  - 35% Aluminum

- HMX recovered from LX-14
  - Indian Head milled Class 1 material to Class 5 specs

  - Two 5-gallon batches formulated and cast into test charges
    - Processing identical to PBXN-113 with virgin HMX

  - No anomalies in X-Rays of charges
Specification Aging Study

- Samples aged at 70°C for 6 months
- No significant changes in Mechanical Properties
EIDS Testing

- PBXN-113 with virgin HMX qualified as an Extremely Insensitive Detonating Substance (EIDS), NAVSEAINST 8020.8B UN Test Series 7.

- PBXN-113 formulated with R-HMX run side-by-side through entire series of tests.

**EIDS Friability - Passed**

**EIDS Cap - Passed**

**EIDS Slow Cook-off – Passed**

**EIDS External Fire – Passed**

**EIDS Gap - Passed**
Summary

- Comparison of recycled HMX to test results for virgin Holston HMX show few qualitative differences
- Replacement of virgin HMX with R-HMX did not cause any significant changes in sensitivity, performance, or aging characteristics in PBXN-113
Future Plans

- Shoulder-launched Multipurpose Assault Weapon – Novel Explosive (SMAW-NE)
  - Verify quality of R-HMX through specification testing
    - Currently having problem with acidity in larger batches.
  - Formulate R-HMX into PBXN-113
  - Limited qualification required
    - Already have extensive qualification testing of explosive
    - Compare to past PBXN-113 for validation
  - Load SMAW-NE hardware
    - IM testing
    - Penetration testing (Performance and Survivability)
  - Pursuing an agreement with USMC and Talley for future loads

- Use of low cost R-HMX would enable purchase of more SMAW-NE units
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