Requalification of Demilitarized HMX for DOD/DOE Applications

A Joint Program Between:

Authors

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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

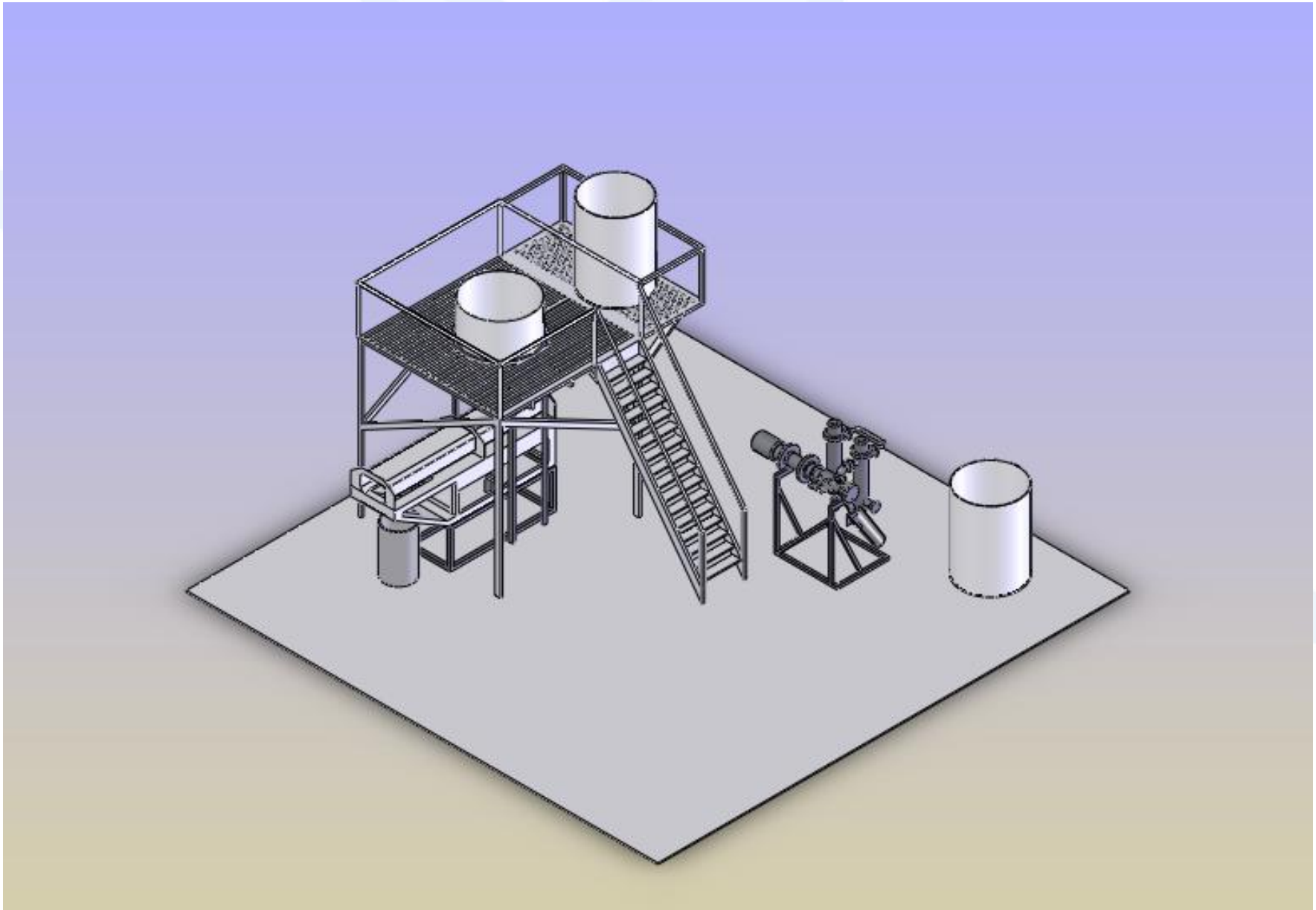
TPL Contribution

- ☐ **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.**

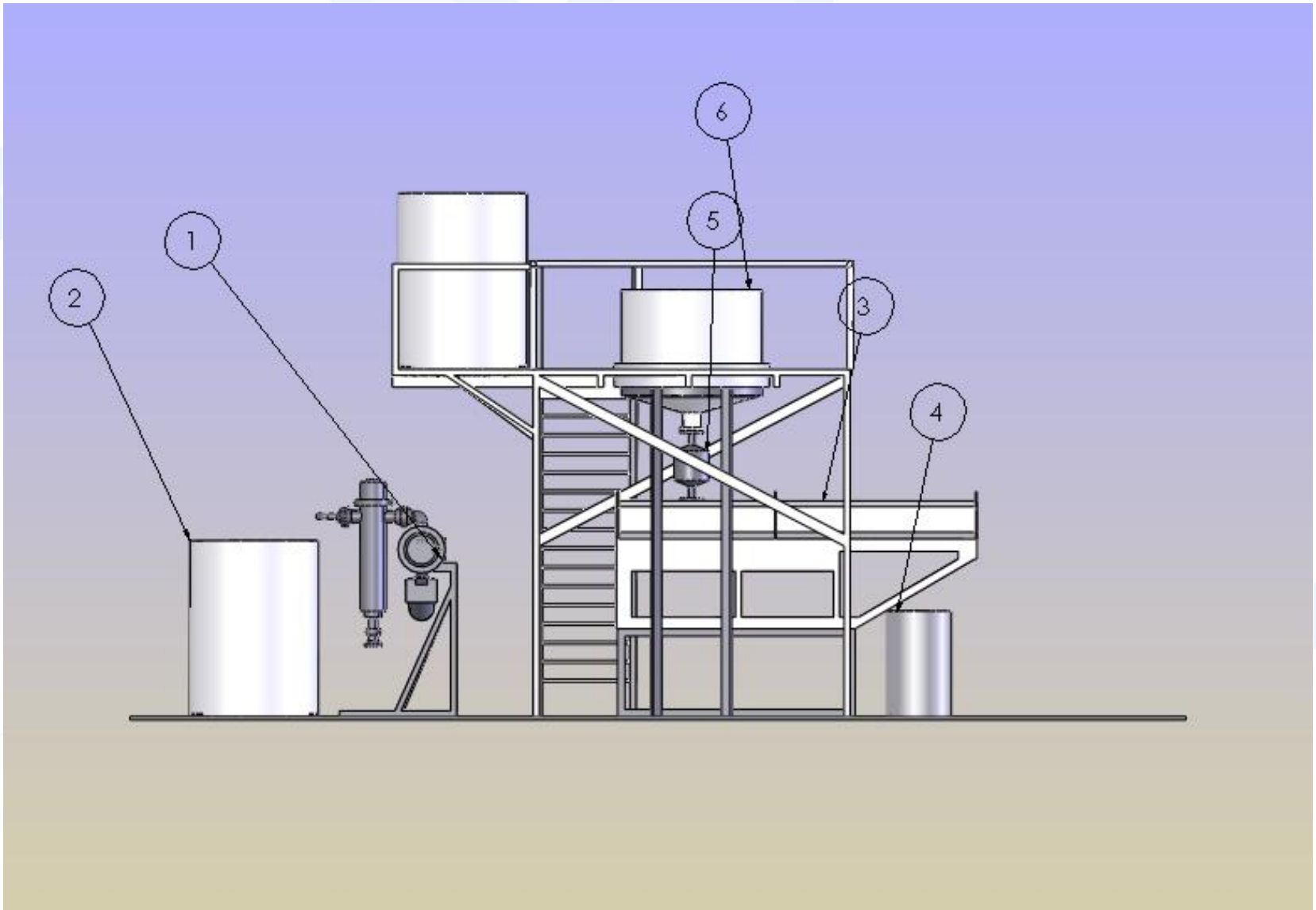
Current Status

- **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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Formulation & Processing

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

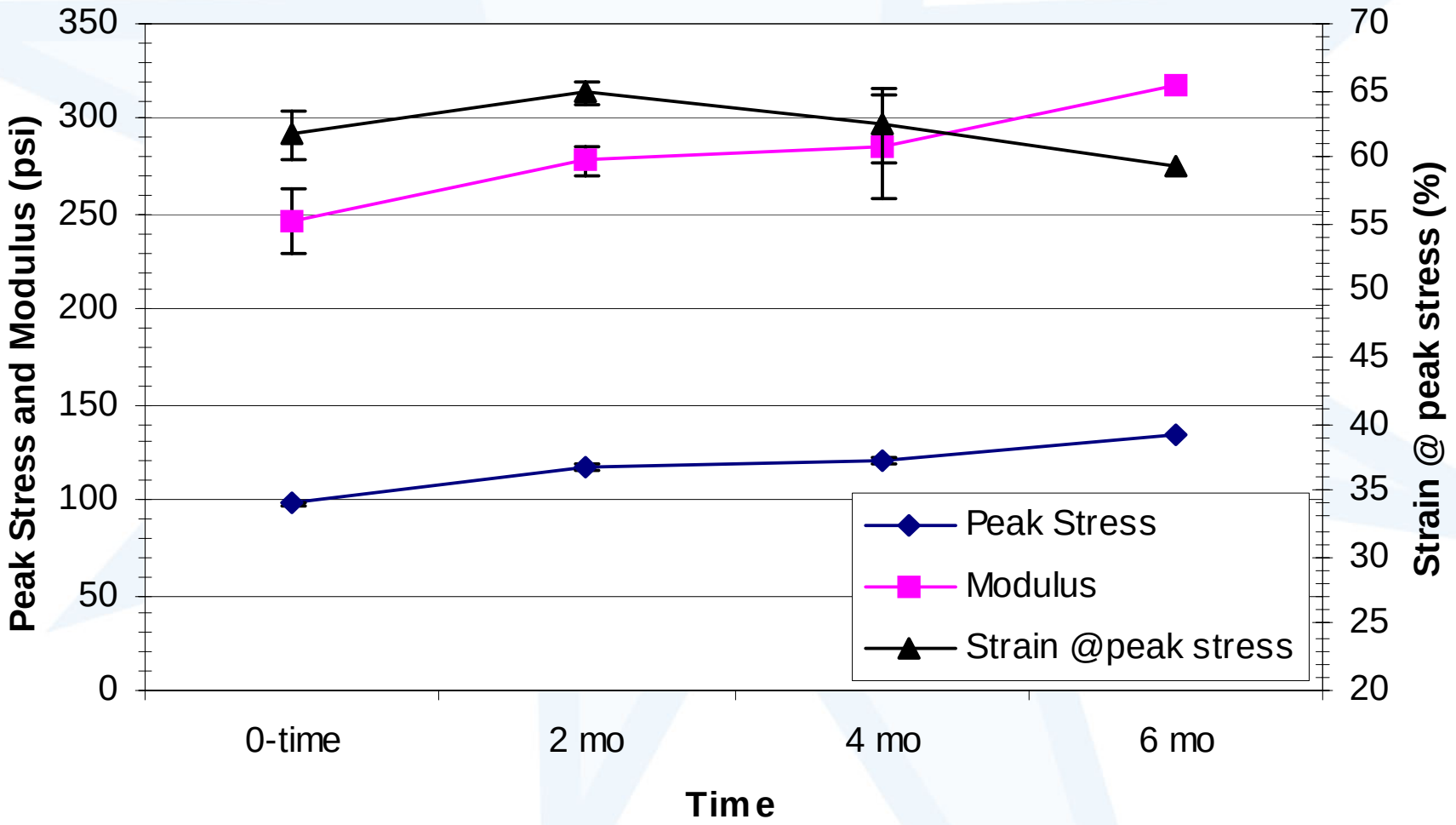
- **HMX recovered from LX-14**
  - **Indian Head milled Class 1 material to Class 5 specs**

  - **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)**
  - ✓ **Pursing 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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