Manufacturing Blasting Agent
&
Flashless Powder for Small Arms
From
Large Grain Gun Propellants

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Blasting Agent Manufacturing Project Overview

Nitrocellulose based propellants are the single largest generator into the demil account each year.

Development of blasting agent manufacturing facilities will provide the DoD with the ability to demil large quantities of propellant in an environmentally sound way.

NSWC Crane awarded a contract to TPL, Inc. in September 2002 to develop the capability to produce blasting agents from large grain gun propellants.

TPL developed a blasting agent formulation that was tested and accepted by companies within the mining industry in FY04.

TPL Formulation

High propellant content

>= 60 percent propellant

Accepts multiple propellant types

Competes with and complements, supplements ANFO

Higher detonation velocity – better hard rock breakage

Higher relative bulk strength – expanded patterns possible

Water resistant – no need to pump water

Blasting Agent Facility Overview

Produces 1.5D BA and BA ingredient from gun propellants

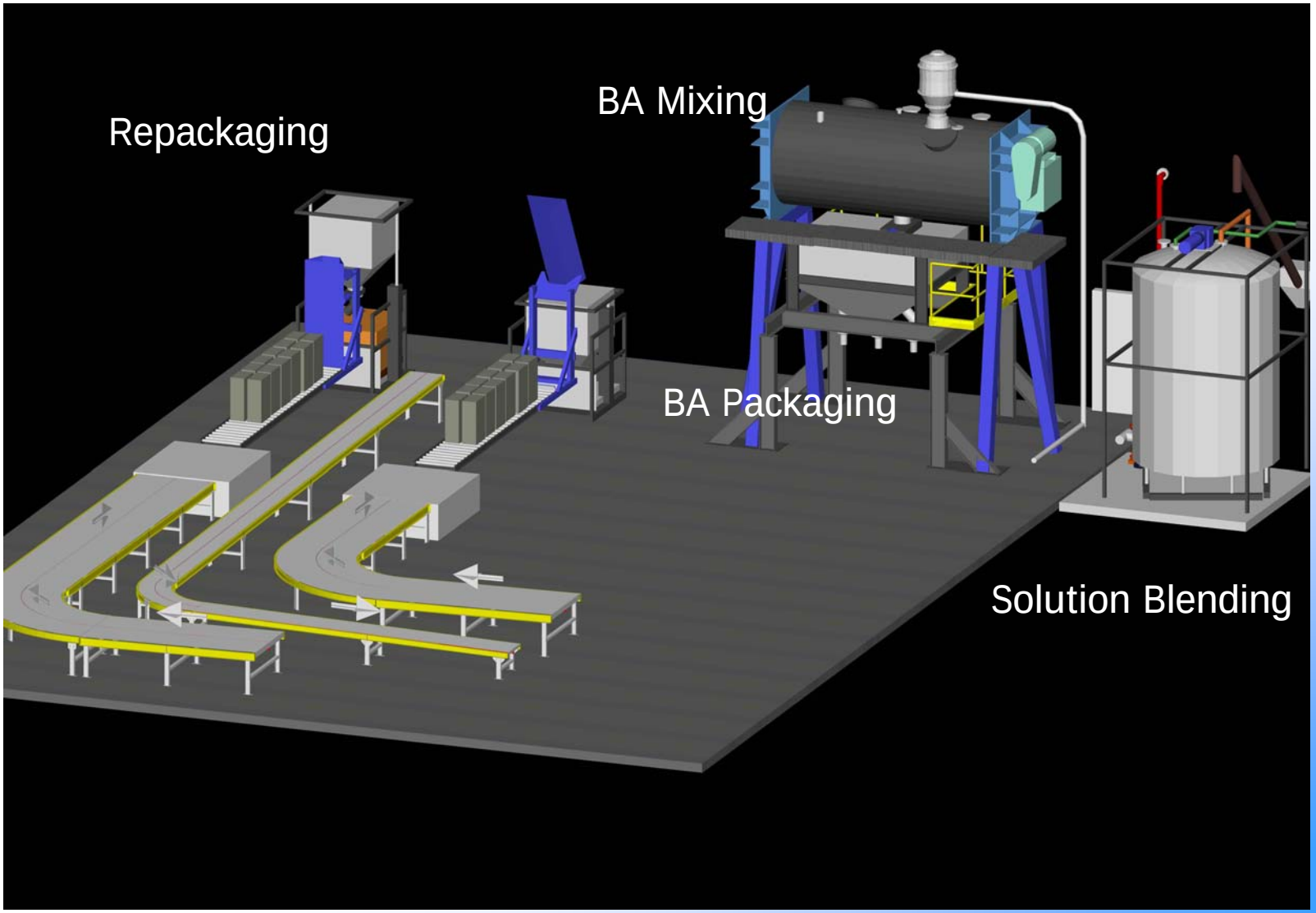
Design production rate of 2000 tons/year

Four Operations

- Repackaging
- Solution/Filler Blending
- Blasting Agent Mixing
- Blasting Agent Packaging

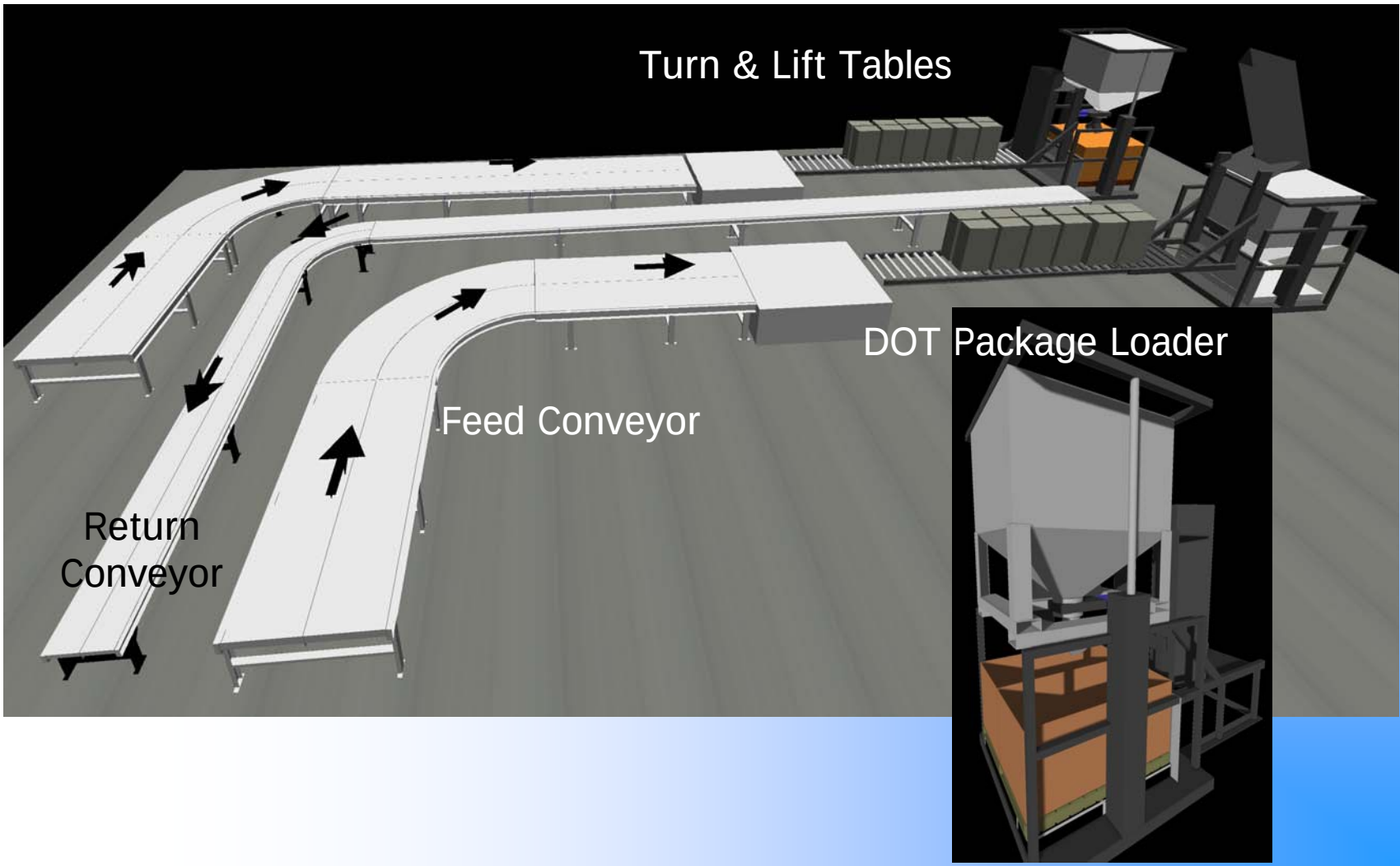
HWAD/D&Z constructing a building to house this system

Blasting Agent Facility Overview

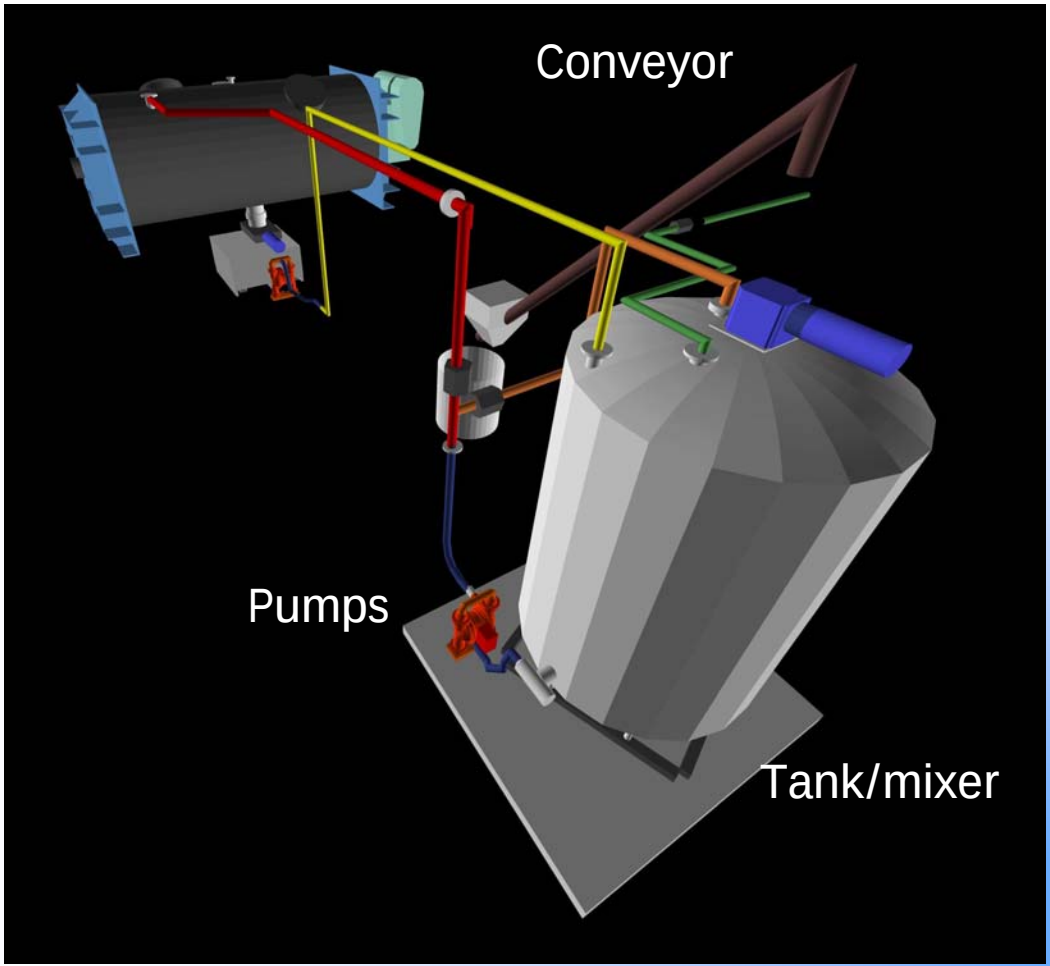


Propellant Repackaging Ops

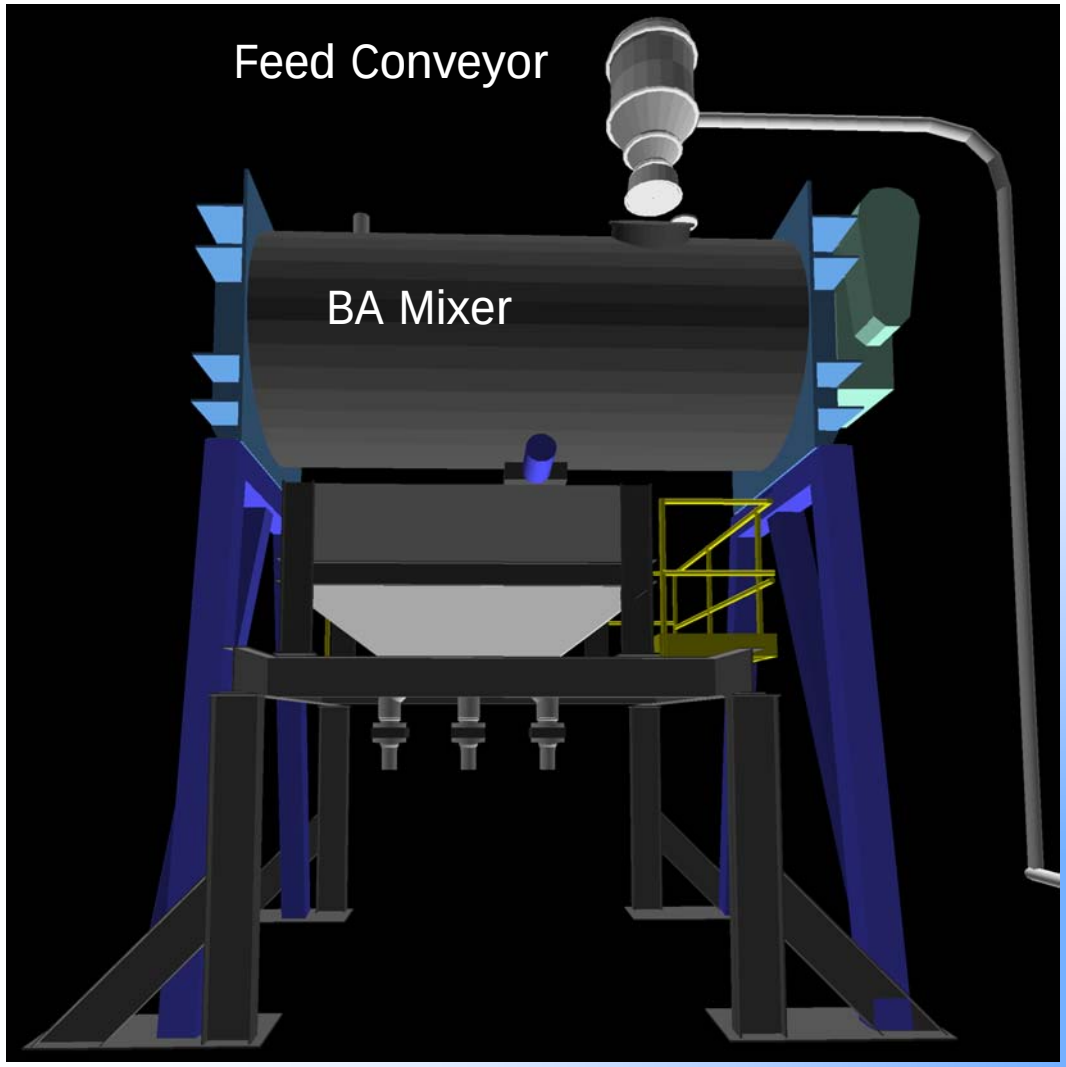
DoD to DOT Packages



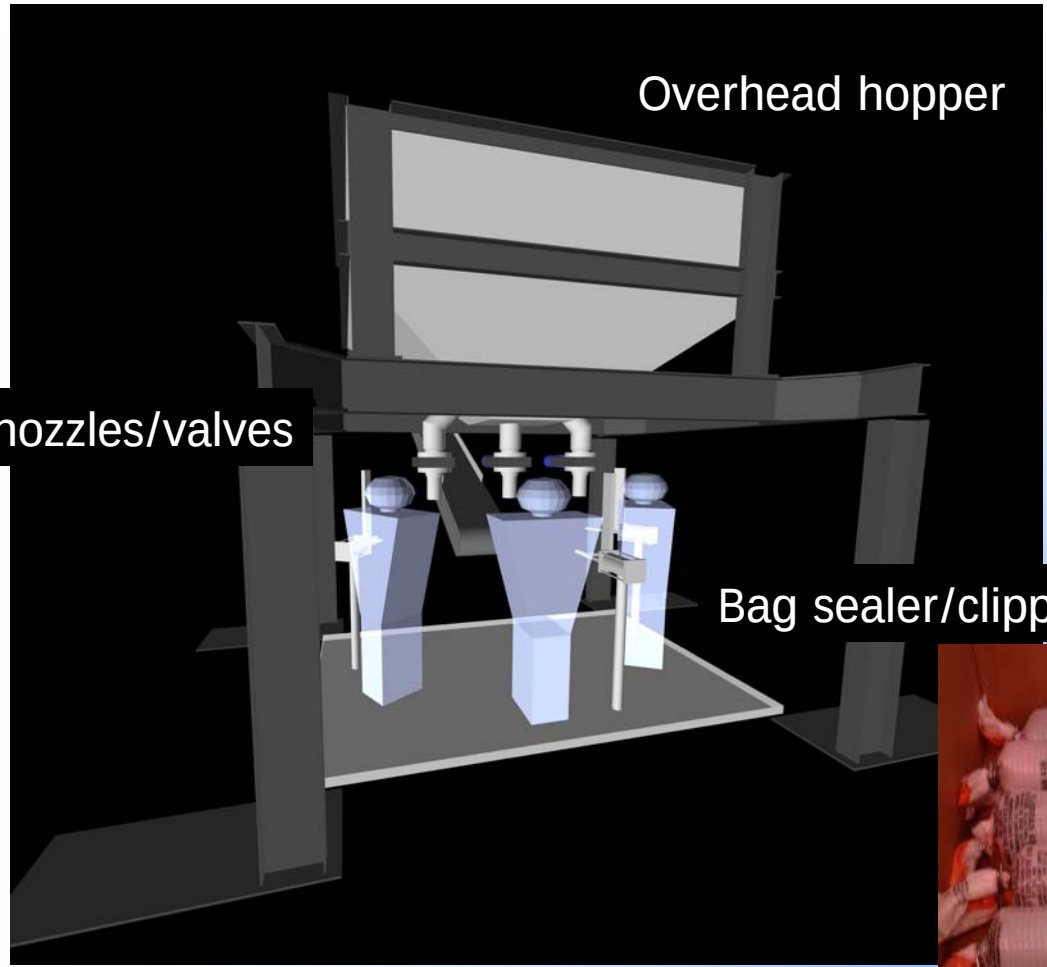
Solution/Filler Blending Ops



Blasting Agent Mixing Ops



Blasting Agent Packaging Ops



Blasting Agent Manufacturing Project Summary

As an environmentally friendly alternative to open burning, TPL (with support from HWAD, Day & Zimmermann Hawthorne Corp., NSWC Crane, and DAC) has developed a system to manufacture a high propellant content blasting agent at a rate of about 2000 tons/yr.

That system will begin operations in 2008.

Flashless Powder Project Overview

- Develop and produce small arms ammunition powder formulations using demilitarized field artillery propellant charges
  - Feed stock may be single, double, or triple-based propellant
- Exploit low flash characteristics of propellants to benefit the warfighter
  - Reduced detection through smaller muzzle signature
  - Improved effectiveness through increased night-firing rate
  - No interference with Night Vision devices
- Ballistics and performance must meet military ammunition standards

Firing Comparison – 45 ACP

Federal

Flashless

Program Objectives

- **Develop new products**
  - **9mm / 45 ACP / .40 Smith & Wesson**
  - **5.56mm for M16/M4 Carbine / 7.62mm**
- **Develop Pilot Plant design**
- **Develop methodology for muzzle flash quantification**
- **Market Flashless ammunition to potential users**
  - **Special Forces**
  - **SWAT**

Viability for Pistol Calibers

- **9mm**
  - **Ballistic match with M30 powders, including over-pressured military loads**
- **45 ACP**
  - **Ballistic match for mil-spec**
  - **Most extensively tested flashless formulation**
- **.40 Cal S&W**
  - **Samples produced at the request of a Navy end-user**
  - **Good ballistic match to commercial specification**

Viability for Rifle Calibers

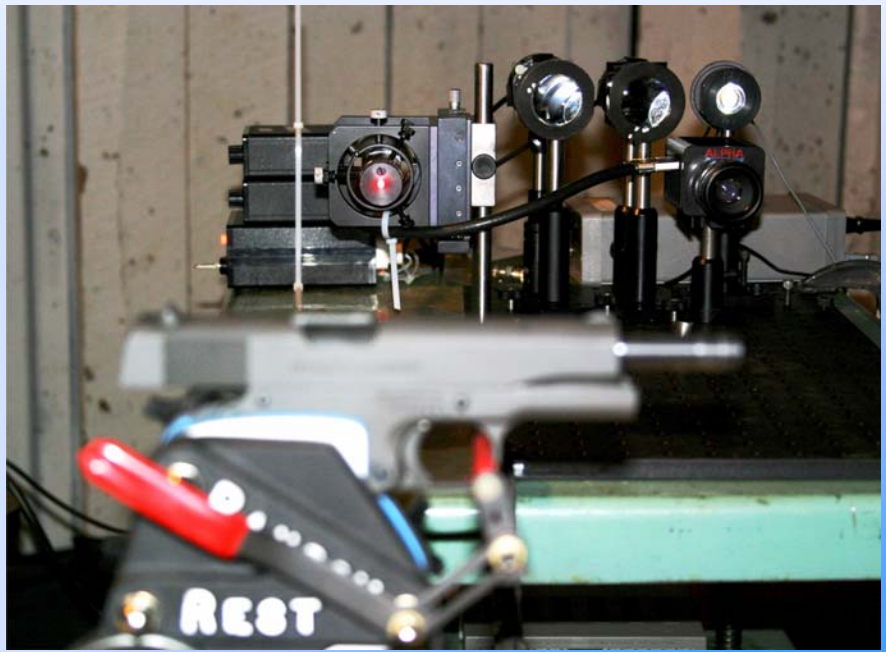
- **5.56mm**
  - Currently not viable with triple based propellant
  - Gas-operated weapon will not cycle properly
    - Quick burning unable to sustain pressure to action on automatic rifles
    - Ballistics acceptable for single shot
  - Investigating inhibit coating and blending with other propellants to slow burning
- **7.62mm**
  - Procuring test equipment; testing not yet begun
  - Should provide better performance than 5.56mm due to larger powder volume

Pilot Plant Design

- **Initially planned to design and install a pilot plant at a DoD facility**
- **Current plan is to develop production process and implement at facility of commercial partner**

Muzzle Flash Analysis

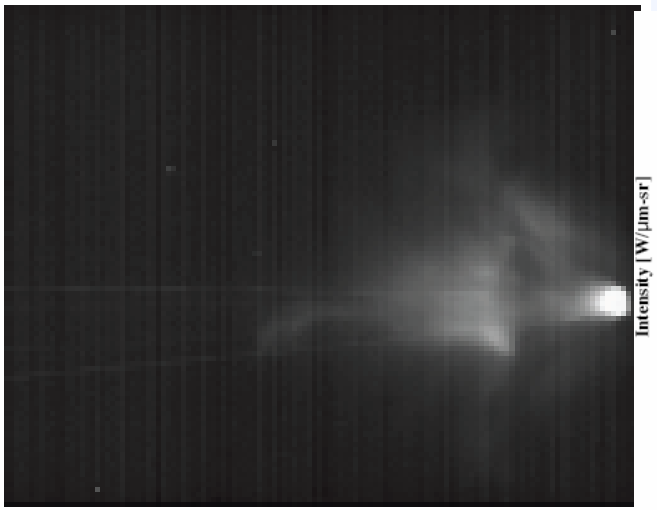
- **Air Force Institute of Technology performed procedure for quantification of muzzle flash signature**
- **Compared the following:**
  - Near infrared signature
  - Radiographic signature
  - Visual signature



Muzzle Flash Analysis

- **Test/Analysis methodology verified TPL's .45 cal ACP Q30 ammo signature**
  - **Brightness was 1/7th of mil-spec ammo**
  - **Flash volume was ½ of mil-spec ammo**

Federal



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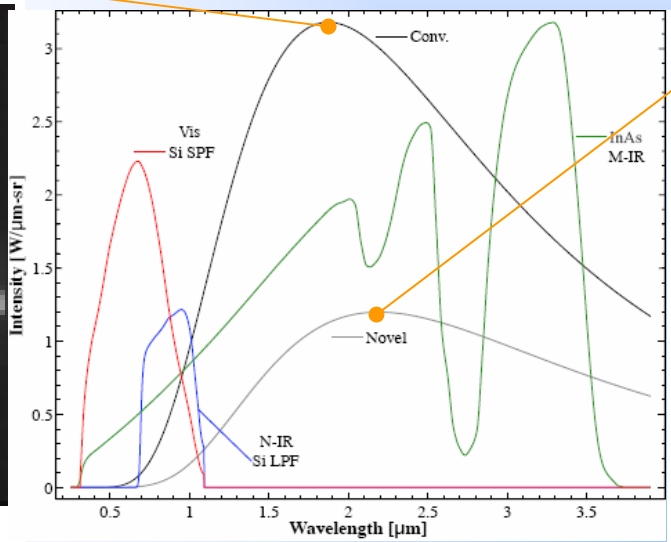
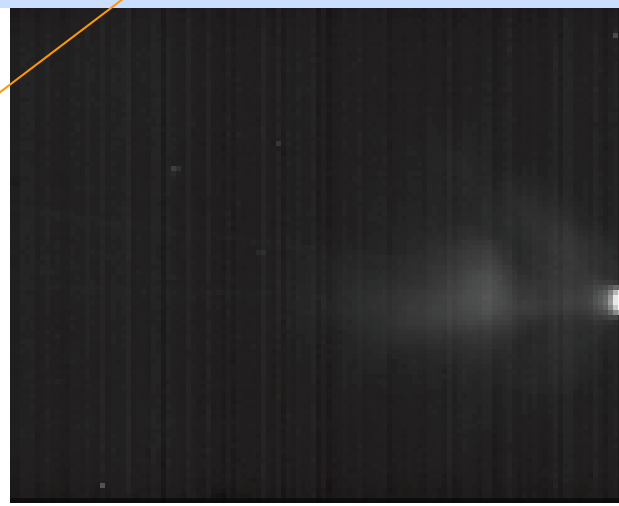


Flashless



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Accomplishments

- Extruded propellant cutting system tested and performing as desired
- “Dirty”-burning propellant problem identified and solved
- 45 cal ACP, 9mm and 40 S&W calibers are ballistic and functional matches
- Determined additional process required to produce suitable powder for rifles
- Muzzle Flash analysis method developed, quantified 1/7 flash reduction in 45 ACP

Future Efforts for FY07

- Refine 9mm, 40 S&W, and 45 ACP formulations
- Continue development of 5.56mm and 7.62mm
  - Evaluate coating of extruded powder for rifles
- Provide samples to potential end users
- Demonstration at Picatinny Arsenal.

Flashless Powder Project Summary

- High-valued reuse of demil stock to directly support the warfighter
- Renewed interest from potential customers for 9mm and .40cal S&W.
- 5.56mm will require powder grain coating for use in gas-operated rifle calibers
- High confidence in matching performance in pistol calibers
- Muzzle flash reduced to 1/7th of MIL standard for 45 ACP.
- AFIT developed Muzzle Flash Testing Protocol is capable of conducting several series per day