

## Cost Improvement of Solventless Propellants

### PROBLEM / OBJECTIVE

The Army and Marine Corps suffered through three fires with 120mm ammunition during training. The root cause was traced to the use of processing solvent (ether) during propellant processing as a contributor to the fires.

The RDECOM Armaments Research, Development and Engineering Center (ARDEC) funded development of a solventless propellant, PAP8386, which has been demonstrated to meet the ballistic requirements, environmental gains and improved safety. The downside of PAP8386 is its cost with the current manufacturing process. The production facility, Radford Army Ammunition Plant (RFAAP), used antiquated technology from the 1940s that was not easily adapted to today's technology and control needs to produce affordable solventless propellant.

The objective of this project was to replace conventional labor intensive manufacturing operations with a more efficient technology in order to provide a domestic source, at lower cost and eliminate the use of solvents during propellant manufacturing to mitigate the safety issue.

### ACCOMPLISHMENTS / PAYOFF

**Process Improvement:** A low rate prototype automated process was demonstrated to reduce the cost of all fielded and future solventless military propellants.

- Replaced the conventional labor intensive manufacturing operations with a more efficient Shear Roll Mill (SRM) and Single Screw Extruder (SSW) technology.
- Reduced process steps from 12 to 6 to generate manufacturing efficiencies.
- Successfully processed 60 pounds of 19 perforated granular double base solventless propellant through SRM/TSE.

**Implementation and Technology Transfer:**

The manufacturing technology was demonstrated at Radford Army Ammunition Plant (RFAAP) and transitioned to PM-MAS in FY13. RFAAP has begun a \$400M facility modernization effort, which includes establishing a solventless propellant manufacturing line.



The project results were published in a paper, "Effects of Processing on the interior Ballistic Properties of Gun Propellants" which was accepted for publication in the Journal of Applied Mechanics and selected for oral presentation in the International Ballistics Symposium in Freiburg, Germany

**Expected Benefits and Warfighter Impact:**

Solventless propellant demonstrated improved safety and reduced cost over existing processes. Benefits include:

- (1) An extruded propellant with desired properties, which resulted in a comparable gun performance as the conventional propellant but safer for the Warfighter.
- (2) Reduced cost from \$30 per pound to less than \$20 per pound for an overall cost benefit of \$6M and a Return On Investment (ROI) of 7.5:1

### TIME LINE / MILESTONE

Start Date	October 2009
End Date	April 2013

### FUNDING

U.S. Army ManTech	\$2.55M
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### PARTICIPANTS

U.S. Army RDECOM Armaments Research  
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