Mitigating Industrial Base Single Point Failure for Lead Azide

Steven J. Rosenberg, Michael Hagn, Emily Cordaro and Neha Mehta

A key Program Executive Office Ammunition (PEO Ammo) industrial base strategic thrust is science-based production and prototyping for meeting emergency requirements, mitigating single point failures and transferring manufacturing knowledge to industry. The PEO Ammo Industrial Base Office sponsored a research, development, test and evaluation (RDT&E) effort through its Life Cycle Pilot Process Program (LCPP) to develop a science-based production process to enable low-cost, on-site production of lead azide in a just-in-time fashion.

Lead azide containment vessel

Lead azide is a primary explosive that is essential to produce fuzes and detonators for 60mm mortar ammunition, artillery ammunition, medium caliber ammunition and hand grenades. Unfortunately, it is no longer produced in the United States and the existing stockpile represents a single point failure in the ammunition supply chain. Current requirements are being met via selective assessment and usage from the deteriorating stockpile. However, stockpile surveillance suggests possible safety issues that could impact sensitivity and performance of this highly sensitive explosive. A long-term solution is needed to ensure an adequate supply of this critical ingredient is readily available to U.S. manufacturers.

Using a science-based, computer-controlled process developed at the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ, a team of engineers is using commercial-off-the-shelf equipment and a semicontinuous processing technique to consistently produce small quantities of lead azide. This science-based process enhances safety and demonstrates prototyping feasibility. The overall size and process simplicity will allow for technology transfer and implementation at facilities requiring lead azide to support their production mission with minimal investment.

The process's science- and computer-based nature makes it possible to fine-tune particle size in addition to ensuring reproducibility across the fuze/detonator production base as needed. Process safety is critical. Because of the small reactor size and minimal quantity of lead azide in process, safety is ensured by enclosing the reactor in a containment vessel, which is approximately 3 feet long by 2 feet in diameter. Because of lead azide's reactive nature, all process components that contact lead azide are nonmetallic and nonmoving to increase safety. These components are also readily replaceable and inexpensive. A patent application is in process to make sure the government retains ownership of this critical technology.

In addition to being able to manufacture lead azide in the United States, the methodology will provide an added benefit in that the Army and DOD will not have to stockpile and ship this highly sensitive material. Nor will new suppliers have to requalify once this Army-owned process is qualified for use.

STEVEN J. ROSENBERG is the PEO Ammo Interface for the Industrial Base to ARDEC. He provides technical and management oversight for numerous PEO Ammo Industrial Base RDT&E and facility efforts. He has a B.S. in chemical engineering from City College of New York. An Army Acquisition Corps (AAC) member, Rosenberg is Level III certified in manufacturing, production and quality assurance.

MICHAEL HAGN is the ARDEC Business Area Manager for Project 859 LCPP providing support to the PEO Ammo Industrial Base Office. The lead azide effort is one of numerous programs conducted under LCPP. He has a B.S.M.E. from Bucknell University and a B.S. in management from Florida Technical Institute. He is an AAC member.

EMILY CORDARO is a Chemical Engineer in the Energetics, Warheads and Environmental Technology Directorate at ARDEC. She has a B.S. in chemical engineering from Rensselaer Polytechnic Institute. An AAC member, Cordaro is Level II certified in systems planning, research, development and engineering (SRPDE).

NEHA MEHTA is a Chemical Engineer in the Energetics, Warheads and Environmental Technology Directorate at ARDEC. She has a B.S. in chemical engineering from New Jersey Institute of Technology. Mehta is Level I certified in SRPDE.