Source of DNPD Antioxidant Manufacturing Capability

Lot IHM21FDNPD0-051 after drying in vacuum desiccator

PERIOD OF PERFORMANCE:
October 2016 to December 2021

PLATFORM:
Energetics / AMRAAM Missile (AIM-120)

CENTER OF EXCELLENCE:
EMTC

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TOTAL MANTECH INVESTMENT:
$1,897,000

S2720 — Development of DNPD Manufacturing Process

Objective

Many of the currently fielded air- and surface-launched Navy missile programs were initially developed 20-30 years ago. As such, these programs may experience material-related issues – from material obsolescence and discontinued products to inconsistent quality or characteristics of material from manufacturers and diminished manufacturing sources.

This is the case with the antioxidant N,N'-Di-2-naphthyl-p-phenylenediamine (DNPD). DNPD is a component of the new antioxidant package used in certain air-to-air missile propellant. DNPD is considered the primary antioxidant that inhibits oxidation of the binder network with chain-terminating reactions of free radicals. With a reliable domestic source of DNPD, it could become the antioxidant of choice on future propellant development efforts.

The objective of this Energetics Manufacturing Technology Center (EMTC) project was to develop and scale up a cost-effective method for synthesis and purification of DNPD that meets the specification HS 6-0089A.

Payoff

The successful production of DNPD at Naval Surface Warfare Center Indian Head Division (NSWC IHD) will provide a reliable, Continental United States (CONUS) source of the antioxidant with the potential for use in a number of propellant formulations as well.

Implementation

The successful results of this project will enable NSWC IHD to produce large quantities of DNPD that meet specification HS 6-0089A. These large quantities are required to prove out the material utility in final (type) qualification studies for existing as well as future applications. An existing program has an immediate need for DNPD, with potential for wider use in a variety of propellants.

The scale-up effort will be conducted by NSWC IHD Chemical Development and Manufacturing Branch. The analytical effort will be shared by NSWC IHD Material Evaluation Division, and a DoD contractor. The DoD contractor will evaluate the quality of the DNPD manufactured by NSWC IHD as compared to the OCONUS source by performing small-scale propellant mixes and limited accelerated aging studies.