Mixed-base Hydrogen Peroxide (MHP) Rapid-Production Plant and Chemical Logistics for Airborne Laser (ABL) Deployment

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Background

The deployment and operation of directed-energy weapon systems require strategies, systems, and training that have not been previously demonstrated in the Air Force, the Department of Defense, or industry. Chemically driven, directed-energy weapons utilize large quantities of reactive chemicals for energy storage and operation. The equipment, supplies, and facilities necessary for the operation of these weapons includes chemical storage, chemical production, chemical analysis, waste treatment and disposal. These material and process requirements must be fully integrated, automated and deployable as a comprehensive unit. These units must have the smallest possible logistics burden, cost, and number of operating personnel. The deployment unit must be capable of producing chemicals at operational rates, while being sufficiently compact, so it can be rapidly deployed in 72 hours or less.

Objective

The objective of this effort is two-fold. First, develop a deployable rapid-production chemical plant to produce combat quantities of MHP under deployed force conditions to meet weapon system specifications. Second, complete a mock-deployment and operation, within 72 hours of notification. This deployment would include a pilot-scale chemical production facility that would demonstrate the ability to provide all chemicals necessary to sustain the operation of the ABL system. The program will reduce technical and programmatic risk for system logistics, sustainment, and compress deployment time.

Research & Engineering Development

The sub-scale, 1,000 kg batch, process equipment located in building 1708 (*Photo*), Tyndall AFB, represents the first phase of the engineering effort to develop a rapid-production system for MHP manufacturing. Mixed-base Hydrogen Peroxide, a flight-critical chemical for the ABL weapon system, is produced by blending high-concentration caustic solution with high-strength hydrogen peroxide. The heats of mixing and reaction associated with this process are very high and require rapid heat removal. In addition, MHP must be kept cold (-15°C), and free of contaminants since small amounts of contamination or heat contribute to the decomposition of MHP reducing its useful life. In addition, parallel efforts are underway to produce a waste disposal process, off-spec MHP rejuvenation process, and field analysis methods for quality assurance and quality control. The next phase of the engineering development involves the design and construction of a pilot-scale system that is robust, industrialized, and fully automated. The pilot-scale system will ultimately be used to demonstrate the complete deployability of all aspects of a chemical production and chemical logistics

strategy for the ABL. The final phase of this effort will include full-scale development and system acquisition to be performed by any of a number of architectural and engineering firms that produce chemical process equipment.

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