A254-016: Innovative Operations for Treatment and Processing of Wastewater

ADDITIONAL INFORMATION
N/A

TECHNOLOGY AREAS:
Materials

MODERNIZATION PRIORITIES:
Advanced Materials | Biotechnology

KEYWORDS:
Closed disposal; Wastewater; water treatment; salt neutralization; solids filtration; wastewater reduction; salinity reduction; water recycling

OBJECTIVE:
The Ammonium Perchlorate Rocket Motor Destruction (ARMD) is designed for the closed disposal thermal treatment of Ammonium Perchlorate (AP) based rocket motors. Innovative approaches are required to reduce process time and volumes associated with wastewater/ effluents generated from the ARMD operations. The main objectives of the industrial wastewater treatment is to boost their operational throughput, reduce costs, and improve their overall environmental posture which will increase process efficiency in solid and liquid waste processing.

DESCRIPTION:
Through the support of the Product Director for Demilitarization (PD Demil), the US Army Aviation and Missile Command (AMCOM) Missile Demil Office and the Combat Capabilities Development Command (DEVCOM) Aviation and Missile Research Center (AvMC) have been implementing the Ammonium Perchlorate Rocket Motor Destruction (ARMD) capability at the Letterkenny Munitions Center (LEMC). The ARMD is designed for the closed disposal of Ammonium Perchlorate (AP) based rocket motors. The destruction of rocket motors consists of enclosed firing of the rocket into a chamber, processing of the combustion gasses through a pollution abatement system (PAS), and disposal of the combustion solids and PAS brine materials. The confined burn of rocket motors allows for the combustion exhaust products to be captured and treated rather than being released directly into the environment. The ARMD is designed to process a wide range of rocket motors of various sizes. The PAS is designed to remove greater than 98% of the acid gasses and greater than 99% of the solid particulates from the exhaust stream.

The ARMD transitioned to Full Rate Production (FRP) operations in 2022. However, one of the limiting factors in production throughput is the processing and handling of the combustion effluents/brine water. The ARMD system requires large amounts of water to neutralize the combustion gasses and to wash out the solid particulates for each motor burn cycle. The solid particulates are removed through a series of settling tanks and filter presses. The ARMD recycles the water in the system, but the filter press system is slow, cumbersome and requires considerable maintenance. The solids are removed from the filter presses through manual operations. The ARMD system is paused numerous times throughout the operational day waiting on the system to “catch up” and process enough water to use on the subsequent cycles. It is also paused to remove the solids from the filter presses and the catch bins.

Additionally, large amounts of neutralized brine water (magnesium salt water) are generated from the combustion process. This salt water is reutilized in the system up to ~20% salt content. Once the water reaches the salt limit it is transferred to holding tanks. Trucks are required to pump the wastewater out of the holding tanks for eventual disposal at a commercial water treatment facility as non- hazardous waste. The ARMD operations must be halted when the trucks arrive to transfer the water. Additionally, costs for disposal of this water continue to increase due to pressures from inflation.

The DEVCOM AvMC seeks innovative approaches related to operational processing and chemical treatment of the wastewater. Operational improvements of interest include overall processing efficiency optimization and methods to remove manual processes related to filter press clean up. Chemical treatment areas of interest include novel Brine Concentration Technologies (BCT) to improve filtering of solid particulates and novel treatment

methods that can reduce the amount of wastewater that is sent for offsite disposal.

IMPORTANT: A prize competition, xTechIgnite, will be used to identify small business concerns that meet the criteria for award for this topic. Winners selected from the xTechIgnite prize competition will be the only firms eligible to submit a SBIR proposal under this topic. All other proposals will not be evaluated. See the full xTechIgnite competition details here: https://www.xtech.army.mil/competition/xtechignite/.

PHASE I:

This topic is only accepting Phase I proposals for a cost up to $250,000 for a 6-month period of performance. During the Phase 1 SBIR project, a feasibility study will be conducted on options for upgrading the ARMD wastewater processing system. The Phase 1 study should include a review of available equipment/capability to address the wastewater processing inefficiencies at the ARMD and a recommended down select of the proposed equipment. The study should also include costs and timelines for implementation of a prototype/production system.

PHASE II:

The Phase 2 SBIR project is expected to result in a prototype capability for the upgraded wastewater processing at the ARMD. The upgraded system will be based on the results of the Phase 1 study. The prototype capability is expected to be procured and installed at the LEMC ARMD. (Note: Equipment potentially could be installed at AvMC for testing. However, final decision would depend on results of Phase 1 study/analysis.

PHASE III DUAL USE APPLICATIONS:

- Municipal Services: Municipalities, especially densely populated ones, need improved and more efficient water management/treatment and waste disposal systems
- Industrial Sectors: Industries like mining, oil & gas, manufacturing, etc., produce water runoff that requires efficient BCT.
- Soft Beverage Industry: The demand for fresh water and desalination can provide benefits to water bottling companies via improved BCT.

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