

Model-Based Green Gun Propellant (Task N.210)

Statement of Need

The Naval Surface Warfare Center, Indian Head Division (IHD NSWC) contracted Concurrent Technologies Corporation (CTC) through the National Defense Center for Environmental Excellence (NDCEE) to develop a process and environmental cost-analysis simulation for gun propellant processing. The model is specific to the extrusion of both solvent and solventless thermoplastic elastomer (TPE) propellants. This project was initiated by the Naval Surface Warfare Center, Indian Head Division (NSWC-IHD) to address the Department of Defense (DoD)-wide need to be able to accurately predict the cost impacts of alternative processes before implementation can be initiated. The use of these tools could significantly reduce the cost of developing energetic materials.

Demonstration and Justification

Data simulation of the current pilot scale, propellant-manufacturing process was developed using Extend™ (v.4) software. The simulation was demonstrated to representatives of the NSWC-IHD, where data comparisons were conducted. Results of the data simulation were compared with actual production data, verifying the accuracy of simulator predictions. Validation of these predictions established the Extend™ software as a valuable tool for estimating the environmental and overall cost associated with the manufacture of propellant.

The benefit of this task was the development of a reusable tool to be used to calculate cost impacts of process changes within minutes. Additionally, the simulation was designed to be flexible and easily modified to address ever-changing needs.

Implementation

This task leveraged work that was completed under previous NDCEE efforts of process simulation and the Environmental Cost Analysis Methodology (ECAMSM) development project funded by the Strategic Environmental Research and Development Program (SERDP).

The NDCEE approach to implementation was comprised of eight discrete sub-tasks:

- Development of process flow diagram: Critical to the development of a software flow diagram and to ensure that all appropriate and necessary data are identified and gathered
- Identification of process activities: Identification of all steps required for the processing of material being examined including labor, handling, actual manufacturing steps, waste disposal, packaging, and storage
- Development of process parametric relationships: Serves as a basis for predicting process and material relationships (i.e., cost, processing times, waste generation, energy, combustion, etc.)
- Establishment of cost drivers and cost information needs: Necessary for implementation of ECAMSM
- Development of Extend™ model: Necessary for process and material simulations
- Development of cost spreadsheet: Based on ECAMSM to receive data exported by the simulation
- Client demonstration: Proof and validation of model
- Reporting: Documented reporting of all developmental activities.

Government POCs

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Status
Completed

Follow-Up

The modeling work that was performed under this task was the basis for future tasks to use process simulation to predict the impact of process changes.

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Process Flow for ECAM Development

