Adams Process Evaluation

Statement of Need

Department of Defense (DOD) facilities and industry have a continuing need to improve the disposal methods for hazardous wastes. The U.S. Army, for example, has large quantities of both energetic and non-energetic materials that must be disposed of in an environmentally acceptable manner. In the foreseeable future, the DOD will not be able to legally dispose of materials via open burning or open detonation. Adverse public opinion regarding incineration and landfill deposition provide further reasons for finding alternative technologies that are capable of treating the large variety of hazardous wastes. The Adams Process, a patented, high- temperature reaction involving liquid and gaseous sulfur, may provide an environmentally acceptable alternative to current methods.

Identified Alternatives

The National Defense Center for Environmental Excellence (NDCEE) evaluated the potential use of the Adams Process for destruction of hazardous wastes specific to DOD installations. Working with the Army, the NDCEE identified six waste streams for consideration. From an initial list, three wastes were selected for further evaluation: sarin (a chemical agent), M-30 (a propellant), and polychlorinated biphenyls (PCBs). Each material presents significant economic, technical, and health and safety issues. These materials are of specific interest to the Army in that they are high-cost, high-volume items targeted for treatment and disposal.

Demonstration and Justification

The NDCEE used computer-based modeling and simulation to predict the Destruction and Removal Efficiency (DRE) and determine the reaction products of the three waste materials. The simulations predicted DREs in excess of 99.99 percent and provided a list of the gaseous, liquid, and solid by-products. To validate the model, the NDCEE performed bench-scale tests on malathion (as a surrogate for sarin agent) and on a PCB. These tests demonstrated DREs in excess of 99.99 percent. The actual results / analyses were consistent with the reaction products that were predicted by the model.

Based on the evaluation, a conceptual plant design was prepared. Additionally, cost estimates were prepared to determine the estimated cost of treatment for sarin, M-30, and PCBs.

Implementation

Based on the preliminary cost estimate for treating the three waste streams, the NDCEE recommended the pursuance of additional testing on a larger scale using a mode of continuous flow. This testing will more fully evaluate the feasibility of using the Adams Process as a replacement for currently used processes.

Follow-Up

A large number of DOD installations have obsolete munitions containing propellants, energetics, and chemical agents. Use of the Adams Process allows a method of destruction that can be proven to be an alternative to the current disposal / destruction processes. Through this effort, the NDCEE is able to assess the needs of facilities in relation to the potential solution(s) presented by the Adams Process.

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