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Demonstration Bulletin

X*Trax™ Model 200 Thermal Desorption System

Chemical Waste Management, Inc.

Technology Description: The X*TRAX™ Model 200 Thermal Desorption System developed by Chemical Waste Management, Inc. (CWM), is a low-temperature process designed to separate organic contaminants from soils, sludges, and other solid media. The X*TRAX™ Model 200 is fully transportable and consists of three semitrailers, one control room trailer, eight equipment skids, and various pieces of movable equipment. The equipment requires an area of about 125 ft by 145 ft. The system is shown in Figure 1 and is described below.

The X*TRAX™ system is a thermal and physical separation process; it does not involve incineration. Contaminated solids are fed into an externally heated rotary dryer where temperatures range from 750 to 950 °F. Evaporated contaminants are removed by a recirculating nitrogen carrier gas that is maintained at less than 4% oxygen to prevent combustion. Solids leaving the dryer are sprayed with treated cooling water to help reduce dusting when the treated solids are returned to their original location and compacted in place. The nitrogen carrier gas is treated to remove and recover dust particles, organic vapors, and water vapors.

An eductor scrubber removes dust particles and 10% to 30% of the organic contaminants from the carrier gas. Scrubber liquid collects in a phase separator from which sludge and organic liquid phases are pumped to a filter press, producing filter cake and filtrate. The filtrate is then separated into organic liquid and water phases. Most contaminants removed from the feed solids are transferred to the organic liquids or the filter cake. The filter

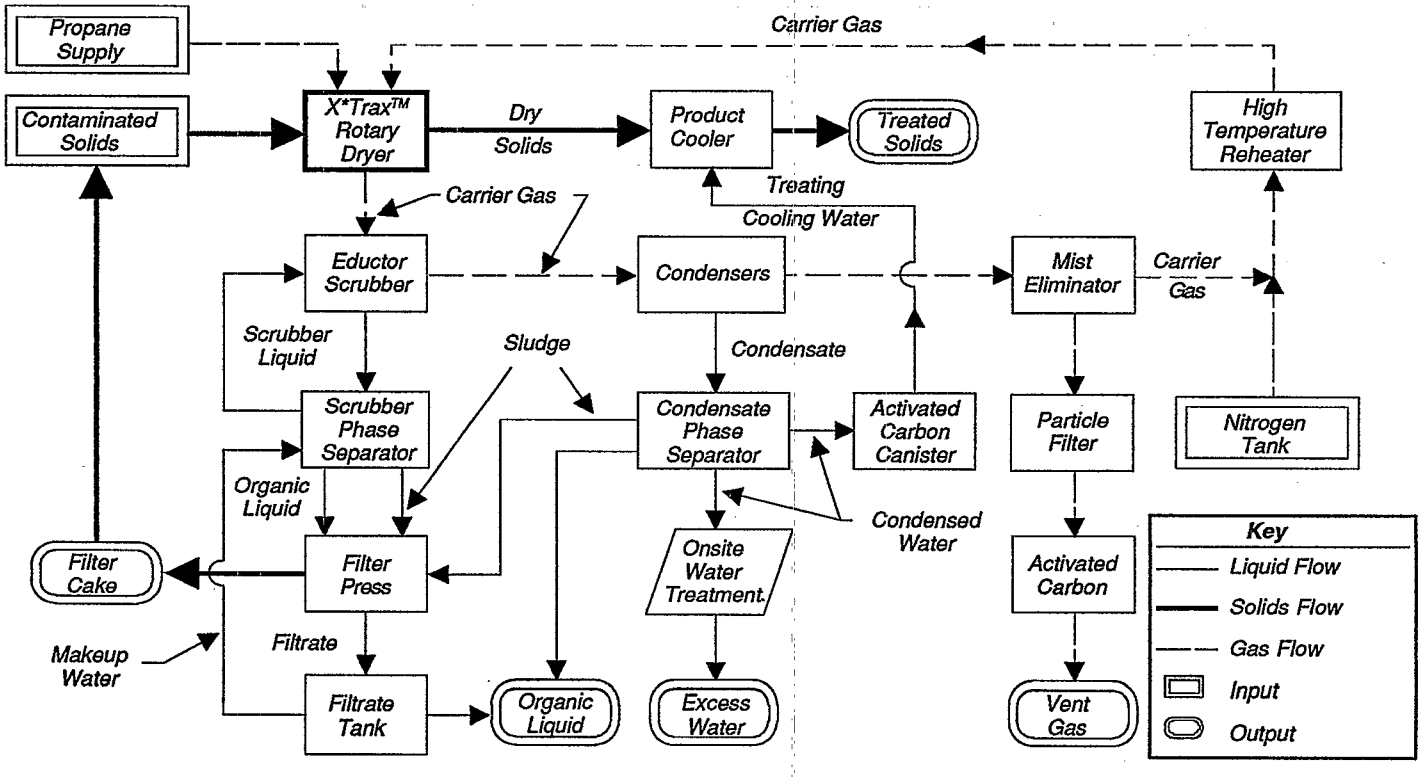

*Figure 1. Diagram of X*Trax system.*

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cake is typically blended batchwise with feed solids and reprocessed in the X*TRAX™ system, while the concentrated organic liquids are typically treated or disposed of offsite.

Carrier gas exiting the scrubber passes through two condensers in series, where it is cooled to less than 40°F. The condensers separate most of the remaining water and organic vapors from the gas stream. Organic vapors are recovered as organic liquids; water is treated by carbon adsorption and either used to cool and reduce dusting from treated solids, or treated and discharged. About 5% to 10% of the gas exits the system through a process vent, passing through a particle filter and carbon adsorption system before being discharged to the atmosphere. The volume of gas released by the X*TRAX™ system is about 100 to 200 times less than the amount released by an equivalent capacity incinerator.

Waste Applicability: CWM reports that the X*TRAX™ system can process a wide variety of solids at feed rates up to 7.5 tons per hour (tph). The technology is most effective for solids with a moisture content of less than 50%. Screening of material greater than 2.25 in. in size may be required for some applications.

Bench-, pilot-, and full-scale X*TRAX™ systems have been used to treat solids contaminated with the following wastes: polychlorinated biphenyls (PCB); halogenated and nonhalogenated solvents; semivolatile organic compounds (SVOC); polynuclear aromatic hydrocarbons; pesticides; herbicides; fuel oils; benzene, toluene, ethylbenzene, and xylenes (BTEX); and mercury. The X*TRAX™ system has also treated Resource Conservation and Recovery Act (RCRA) hazardous wastes to meet Land Disposal Restrictions (LDR) treatment standards. RCRA wastes treated by X*TRAX™ include petroleum refinery wastes (K048 through K052) and multisource leachate treatment residues (F039).

Demonstration Results: The X*TRAX™ SITE demonstration was conducted in May 1992, after a proof-of-process test at the Re-Solve Superfund Site in North Dartmouth, MA. The system is being used to treat approximately 35,000 tons of soil and sediment contaminated with PCBs at the site. For this application, the soil is screened to remove particles larger than 1 in. in size.

During the SITE demonstration, about 215 tons of soil were treated at an average feed rate of 4.9 tph, a residence time of 2 hr, and an average treated soil temperature of 732°F. PCB concentrations in contaminated soil ranged from 181 to 515 milligrams per kilogram (mg/kg). Average flow rates for the carrier gas and process vent gas were 700 and 37 actual cubic feet per minute (acfm), respectively.

The demonstration included three identical tests, each lasting 6 hr. During each test, solid, liquid, and gas samples were collected from feed soil, treated soil, filter cake, filter press filtrate, condensed aqueous liquids, water used to wet treated soil, and process vent gases before and after activated carbon treatment. Condensed organic liquids were collected before the start of the first test and after completion of the third test. Extensive analyses were performed under rigid quality assurance procedures. Key findings from the X*TRAX™ SITE demonstration are summarized below:

- X*TRAX™ successfully removed PCBs from feed soil and met the site-specific treatment standard of 25 milligrams per kilogram (mg/kg) for treated soils. PCB concentrations in all treated soil samples were less than 1.0 mg/kg and the average concentration was 0.25 mg/kg. The average PCB removal efficiency was 99.9%.
- Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) were not formed within the X*TRAX™ system.
- Organic air emissions from the X*TRAX™ process vent were negligible (0.4 grams/day). PCBs were not detected in vent gases.
- X*TRAX™ effectively removed other organic contaminants from feed soil. Concentrations of tetrachloroethene, total recoverable petroleum hydrocarbons, and oil and grease were all reduced to below detectable levels in treated soil.
- Metals concentrations and soil physical properties were not altered by the X*TRAX™ system.

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