# SECTION 4

# PROCESS INFORMATION

## Attachment 4-6
## Thermal Desorber Operational Requirements

MIXED WASTE FACILITY
RCRA/TSCA PERMIT APPLICATION

**PERMA-FIX NORTHWEST RICHLAND, INC.**

**RICHLAND, WASHINGTON**

# FUNCTIONAL AND OPERATIONAL REQUIREMENTS
*for*
# ROTARY THERMAL DESORBER AT PEcoS

## DESCRIPTION

The thermal desorption system extracts volatile organics from solid materials, condenses the organics and provides the liquids for further treatment and destruction by other processes. The solids are stabilized for disposal in a landfill.

## FUNCTIONAL REQUIREMENTS

The thermal desorption system shall meet the following key functional requirements:

A. **System Function.** The function of the thermal desorber shall be to separate organic material from the solid feedstock material for further treatment in compliance with EPA and Washington State Department of Ecology regulations for RCRA / TSCA. The system will receive mixed low level radioactive wastes, vaporize volatile organics and aqueous substances, separate the organics from the aqueous streams, and cool the residual solids for ultimate landfill disposal and LLRW.

B. **System Availability.** The thermal desorption system shall be designed to operate on a continuous basis to support planned campaigns. The duration of individual campaigns will be established based on test results and permit limitations.

C. **Feed Material Properties.** The system waste feed material will consist of granular material. Oversized objects and containers of liquid will be removed. Material considered "debris", as defined in WAC 173-303-040, will also be removed.

D. **System Pressure Boundaries.** The thermal desorption system pressure boundaries shall operate at or below atmospheric pressure. Fugitive emissions, as defined in WAC 173-303-040, shall be routed to a process ventilation system for control and clean-up prior to discharge.

E. **Redundancy of Critical Components.** Redundancy and/or manual bypass controls shall be included as needed for safety, availability and efficiency of system operation and for the safe and orderly shutdown of equipment to protect worker health.

F. **Feed Material Interface.** The system shall accept mixed low level waste materials for sorting, shredding and repackaging as necessary to provide feedstock. Feedstock may be staged for lengthy periods to provide a backlog of material and permit continuous system operation.

G. **Operation and Maintenance.** Equipment shall be located indoors and laid out and assembled to provide ease of operation and maintenance. Layout shall facilitate handling of materials during operation and disassembly for maintenance.

H. **Design for Purging and Flushing.** The thermal desorption system shall be designed for the safe purging and flushing of wastes and products.

I. **Waste Feed Cut-Off.** The system shall have automatic and manual waste feed cut-off controls to place the system in a safe condition in the event of a critical process malfunction or equipment failure.

J. **Separation of Client Wastes.** The thermal desorber system shall accommodate operational strategies to maintain separation of wastes from different clients during campaigns.

## OPERATIONAL REQUIREMENTS

The thermal desorption system shall meet the following key operational requirements:

### A. General Requirements.

1. The thermal desorber system shall accept wastes and prepare the wastes for treatment in a rotary kiln, indirect fired, thermal desorber. Solids from the desorber shall be cooled and placed in 55 gallon drums for stabilization and disposal as low level radioactive waste in a landfill. Vapors from the desorber shall be routed for further processing.

### B. Solids Preparation

1. Material will be prepared for feed using existing equipment and processes at PEcoS. No changes are required in the feed preparation area to support this project.
2. Wastes shall be sorted to remove containers of liquids, oversized objects, and materials meeting the criteria of "debris". Feed material to thermal desorber shall be mixed waste in a granular form of absorbed liquids and solids.
3. Solids shall be provided in 55 gallon drums for feed into the desorber.

### C. Rotary Thermal Desorber

1. A controlled feed system shall be capable of emptying 55 gallon drums and conveying prepared solid waste into a hopper on the desorber. Fugitive emissions from the feed operations shall be captured and routed to the process vent system.
2. The rotary kiln, indirect fired, thermal desorber shall process a minimum of 150 lbs / hr of solids. This unit is being procured "as is" from Rotary Kiln & Dryer.

3. Solids shall be heated in the desorber with adequate mixing to vaporize organic compounds and provide solids and ash capable of meeting Landfill Disposal Restrictions after stabilization.
4. Nitrogen purge shall be supplied to the seals on the desorber to minimize leakage of organic vapors and dust, and to prevent the in-leakage of oxygen.
5. A conveyor system shall remove solids and ash from the desorption chamber, cool the solids, and discharge to a waste container. Waste containers must be changed out "on-line to provide for continuous operation of the desorber. Fugitive emissions from this operation shall be captured and routed to the process vent system.
6. The discharged solids shall be quickly cooled to a temperature of less than 400°F to reduce the risk of formation of dioxins and furans. (from ATSDR-HA-ML-2002-0001). The temperature of the solids discharged from the system into drums should be less than 120 °F for personnel safety in handling.

## 1) Vapor Condensate and Clean-Up

a) Piping surface temperatures before the quench shall be maintained above or below the 400 to 650 °F range to reduce the risk of dioxin and furan formation in piping prior to dropping the exhaust gas temperature. (from ATSDR-HA-ML-2002-0001). Quench should be located as closely as possible to the desorber to maximize temperature in the pipe.
b) The gaseous organic temperature shall be quickly dropped below 400°F in the quench to reduce the risk of formation of dioxins and furans. (from ATSDR-HA-ML-2002-0001).
c) Non-condensable vapors from the desorber shall be treated through solid removal and carbon prior to discharge. Exhaust gas should be neutral pH to minimize impact on APC equipment.

## 2) Safety & Control Requirements

a) Desorber burners must meet industrial fire protection requirements, including flame safeguards.
b) Control systems shall provide for manual operation of the feed conveyor, kiln, burner temperature control, residual solids conveyor. Handling of 55 gallon drums for feed and discharge solids drums will also be manual.
c) Automatic Waste Feed Cutoffs (AWFCOs) are required. Recommendations for AWFCOs are available in the following documents:
   i) The Agency for Toxic Substances and Disease Registry Document # ATSDR-HA-ML-2002-0001 March 2002
   ii) Interstate Technology and Regulatory Cooperation -Technical Requirements for On-site Thermal Desorption of Solid Media Contaminated with Hazardous Chlorinated Organics 9-18-97.
   iii) Current PEcoS MLLW Permit requirements.