

ATTACHMENT II-1-12

THERMAL DESORPTION SEPARATION PLAN

1. PURPOSE AND SCOPE

- a. This attachment outlines the requirements necessary to perform Thermal Desorption operations at the Permittee's facility.

2. DEFINITIONS

- a. *Automatic Waste Feed Cut-Offs (AWFCO)* are set point controls within the TD unit that prohibit the feed valve from opening if they are exceeded. The AWFCO is a preliminary safety system to ensure that material is not introduced into the dryer that may exacerbate a problem; in this way, dangerous or hazardous situations are minimized during both normal operations and emergency conditions. AWFCO is usually the first action in any upset condition.
- b. *Carbon adsorption beds* are drums filled with activated carbon through which the dryer off-gas is directed. Activated carbon provides a high surface area designed to remove up to 95% of organic compounds within a gas stream.
- c. The *carrier gas* is a nitrogen gas that is fed into the dryer to provide a reduced oxygen atmosphere within the system and to "carry" volatile contaminants from the dryer through the off-gas treatment train. This carrier gas makes up the majority of the vent gas stream.
- d. *Clean fill* is defined as non-contaminated soil, sand, or absorbent material placed within the dryer.
- e. *CMBST* is a treatment technology code defined in Utah Admin. Code R315-13 (40 CFR 268.42) as high temperature organic destruction technologies, such as combustion in incinerators, boilers, or industrial furnaces.
- f. *CMBST-coded wastes* are those wastes that retain hazardous waste codes that require the CMBST treatment technology prior to land disposal.
- g. *Condensate* is the liquid effluent derived from the off-gas stream.
- h. The *condensate tank system* is a subsystem of the TD unit that includes a condensate transfer tank, a transfer pump, and three 650-gallon storage tanks to collect condensate from the off-gas treatment train. The tanks are designated to collect

condensate from the TD unit. The tanks may also be fitted to perform off-gas treatment as part of the off-gas treatment train.

- i. A *condenser* is a vessel used to cool dryer off-gases to remove denser constituents with lower boiling points.
- j. *Demonstration Testing* is a means to show that the TD unit is operating as designed.
- k. The *discharge system* is a subsystem of the TD unit where the processed material from the dryer is cooled and transferred from the TD unit. The discharge system consists of a hopper and a conveyor.
- l. The *dryer* is a subsystem of the TD unit into which the feed material is placed and indirectly heated, and the volatile contaminant separation takes place. The dryer is a tank with a maximum capacity of approximately 550 gallons (approximately 73.5 cubic feet).
- m. *Feed material* is defined as the waste and other materials that are introduced into the dryer.
- n. *Functional Testing* is defined as initial testing of the TD unit equipment after set-up. Hazardous waste or materials shall not be processed during Functional Testing. Functional Testing includes verifying the operation of all mechanical equipment, completing a Systems Demonstration Test, and verifying operation of the AWFCO system.
- o. *HEPA filters* are High Efficiency Particulate Absorption filters designed to remove greater than 99% of particulates from a gas stream.
- p. *High Volatility Metals* are defined as metals with high vapor pressures and low boiling points. Based upon the MACT regulations, the only metal within this category is mercury.
- q. The *indirect furnace* is a propane-fired heater that indirectly heats the material within the dryer.
- r. *Land Disposal Restrictions (LDRs)* are the concentration limits placed upon contaminated material that must be met prior to land disposal. These concentration limits are promulgated by the US EPA (40 CFR 268) and are detailed in Utah Admin. Code R315-13-1.
- s. *Low Volatile Metals* are those metals that have lower vapor pressures and higher boiling points than semi-volatile metals, but still pose a potential risk. The MACT regulations list arsenic, beryllium, and chromium in this category.

- t. *MACT regulations* are the maximum achievable control technology regulations for the emission of volatile metals as described in 40 CFR 63, Subpart EEE, *National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors*.
- u. The *Off-gas treatment train* is a subsystem of the TD unit consisting of a series of condensers, filters, and carbon adsorption beds. The off-gas treatment train removes contaminants prior to vent gas discharge to the atmosphere.
- v. *Off-gases* are the volatile contaminant gases that are separated from the feed material within the dryer.
- w. *Operational Parameters* are the operational settings for the TD unit. Operational Parameters are a subset of the System Parameters and include the feed rate to the dryer, the temperature of the waste material within the dryer, and the internal pressure of the system. Operational Parameters are operational settings based upon the results of Waste Family Demonstration Testing.
- x. An *oxidizer* is defined as a material that may, generally by yielding oxygen, cause or enhance the combustion of other materials.
- y. The *pre-filter* is a filter that in conjunction with the HEPA filter removes particulate contaminants from the off-gas.
- z. *Pre-Test* is a test performed during Shakedown Operations that provides assurance that removal efficiencies and risk based emissions shall be within acceptance criteria.
- aa. *Primary Known Waste Contaminants* are those volatile contaminants whose individual contribution is more than 1% of the total volatile content of the feed to the TD unit during a RE test.
- bb. *Principal Organic Hazardous Constituents* (POHCs) are specific compounds that are representative of organic waste families processed through the TD unit. POHCs are spiked into the feed material during the Waste Family Demonstration Testing and are monitored to assure removal efficiencies are within acceptance criteria.
- cc. *Processed material* is defined as the processed solid waste generated from the dryer.
- dd. *Processing Temperature* (T_p) is defined as the pre-determined target temperature of the solid material within the dryer. Reaching this temperature, for a specified amount of time, is an indicator that processing has been completed and discharge may begin.

- ee. *A qualified TD operator* is defined as an individual that has been trained in the operation of the TD unit in accordance with Attachment II-4, *Personnel Training Plan*.
- ff. *Recipe* is defined as the combination of Operational Parameters used during processing of waste.
- gg. For the TD unit, a *release* is defined as any solid, liquid, sludge, or gaseous material emitted from the unit from locations not designed to discharge material (e.g., through seals).
- hh. *Removal Efficiency (RE)* is defined as the percentage of POHC and primary known waste contaminants removed from the feed material prior to reaching the vent gas stream. Removal efficiency is defined by the following equation:

$$RE = \frac{\text{mass}_{\text{feed}} - \text{mass}_{\text{vent gas}}}{\text{mass}_{\text{feed}}} \times 100\%.$$

- ii. *Semivolatile Metals* are those metals with a slightly lower vapor pressure and higher boiling point than mercury (high volatility metals), but may still potentially volatilize at the temperatures reached within a combustion unit. The MACT regulations list cadmium and lead in this category.
- jj. *Semi-volatile organic compounds (SVOCs)* are defined as those compounds that are detected using SW-846 Method 8270.
- kk. *Shakedown Operations* is an optimization process for the TD unit. Shakedown Operations are completed to find preliminary operating parameters that shall be used in the initial Waste Family Demonstration Testing. Shakedown Operations shall also include the Pre-Test.
- ll. The *Systems Demonstration Test* is a test of the TD unit using clean fill material that is performed within the Functional Testing phase. This demonstration is used to verify the proper operation of the TD unit.
- mm. *System parameters* are defined as those measurable indicators used to evaluate the performance of the TD unit during processing.
- nn. *TD Subsystems* are the separate units within the TD unit. These subsystems include the dryer, off-gas treatment train, condensate tank system, and discharge system.
- oo. *Thermal Desorption (TD)* is defined as a physical separation process that separates volatile contaminants from a solid waste matrix. Thermal Desorption is accomplished by indirectly heating the waste such that the volatile contaminants are

driven off and the resulting off-gases are collected for further processing. Thermal Desorption, as utilized by the Permittee, is generally performed under vacuum and is commonly referred to as Vacuum Thermal Desorption or VTD.

- pp. *Treatment run* is defined as the time from feed of the waste to discharge of the processed material for a single waste stream or a mixture of similar, compatible waste streams.
- qq. *Vent gas* is defined as the emissions to the environment from the TD unit after the off-gases have been processed through the off-gas treatment train.
- rr. *Verification samples* are the samples collected from the processed materials that are subsequently analyzed to verify that the processed materials are LDR compliant for volatile contaminants.
- ss. *Volatile metals* are defined as inorganic and organic metals or metallic compounds with relatively high vapor pressures and low boiling points and have the potential to be present in the vent gas of the TD unit. The volatile metals definition encompasses the three metal categories (high volatility metals, semivolatile metals, and low volatile metals) described in the MACT regulations.
- tt. *Volatile organic compounds* (VOCs) are defined as those compounds that are detected using SW-846 Method 8260.
- uu. *Waste families* are wastes with similar separation and regulatory characteristics (e.g., volatile organics, semi-volatile organics, PCB's, and volatile metals). Waste families are grouped together for development of Operational Parameters through Waste Family Demonstration Testing.
- vv. *Waste Family Demonstration Testing* is the method of defining and justifying Operational Parameters for specific waste families. Waste Family Demonstration Testing is outlined in Attachment II-1-12-1, *Thermal Desorption Shakedown Operations and Waste Family Demonstration Testing*.
- ww. *Waste matrix* is defined as the physical description of the waste (e.g., soil, liquid, sludge, debris, plastic, etc.) prior to TD processing.
- xx. *Waste stream* is defined as the waste material derived from a generator's specific process. A waste stream is different from a waste family in that a waste stream is generator and process specific while a waste family is based on the characteristics of the hazardous waste.

3. GENERAL REQUIREMENTS

- a. TD may be performed on waste streams requiring treatment for volatile and semi-volatile organic compounds, non-listed dioxin containing ashes, PCBs, CMBST-codes, and volatile metals.
- b. TD processing of mercury meets the EPA treatment technology code for RMERC (retorting or roasting in a thermal processing unit capable of volatilizing mercury and subsequently condensing the volatilized mercury for recovery).
- c. New equipment added to the TD unit shall be tested as described in Attachment II-1-12-1, *Thermal Desorption Shakedown Operations and Waste Family Demonstration Testing*.
- d. The following waste matrices are approved for TD processing:
 - i. soil-like material;
 - ii. granular solids;
 - iii. solidified liquids;
 - iv. sludges;
 - v. incidental debris; and
 - vi. debris waste that meets the size requirement of Condition 6.d.i.
- e. The Director may approve additional waste matrices based on the results of Waste Family Demonstration Testing using the new waste matrix as feed to the TD unit.
- f. The following waste families are approved for TD processing:
 - i. VOCs;
 - ii. SVOCs;
 - iii. Polychlorinated Biphenyls (PCBs);
 - iv. CMBST-coded contaminants; and
 - v. volatile metals.
- g. Descriptions of each of the approved Waste Families are contained in Attachment II-1-12-2, *Waste Family Operational Parameters*.

- h. Additional waste families may be permitted through Waste Family Demonstration Testing, as described in Condition 4.c.
- i. The process flow for the TD unit is outlined in Figure II-1-12-A at the end of this Attachment.
- j. The TD unit shall contain seals on the top and the bottom of the feed hopper to prevent leaks from the feed hopper.
- k. The AWFCO system shall be tested to verify proper operation on a weekly basis during TD operations. This verification test shall be documented in the operating record.
- l. The internal pressure of the TD unit shall not exceed the seal rating of the equipment at any time. Pressure ratings of the seals within the TD unit shall be maintained at the site and a copy shall be provided to the Director.
 - i. A test of the seals shall be conducted at least once every six months during operations.
 - ii. The seal test shall be a positive pressure leak test at 1120 mmHg absolute, or another method approved by the Director.
 - iii. A description of each test, including results, shall be documented in the operating record.
- m. A minimum of two TD operators shall be present at all times during TD waste management. The foreman or supervisor for the operation shall be a qualified TD operator.
- n. Feed material may include one, or several, permitted waste families.
- o. Feed material classified as a DOT oxidizer shall not be processed through the TD unit.
- p. Feed material with a pH less than four or greater than 12 shall not be processed through the TD unit.
- q. Processed material shall not remain in the dryer longer than the duration of a treatment run unless an emergency situation or an unforeseen interruption (e.g., a power outage) occurs.
 - i. If processed material must be left in the dryer for more than one day after the treatment run is stopped (either through completion or earlier due to

unforeseen circumstances), the indirect furnace shall be labeled and managed as a container.

- ii. If processed material must be left in the dryer for more than three calendar days after the treatment run is stopped, the Director shall be informed in writing prior to the conclusion of the initial three-day period.
- r. The Permittee shall maintain at least 1,200 cubic feet of nitrogen in reserve at all times during operation of the TD unit.
- s. Daily inspections of the TD unit shall be performed in accordance with Attachment II-3, *Site Inspection Plan*.
- t. The primary carbon adsorption bed shall be removed from service after seven days in operation.
- u. The integrity of all tanks associated with the TD unit shall be certified by the manufacturer or TD contractor prior to use.
- v. The Permittee shall perform annual Tank Condition Assessments of the TD unit tanks in accordance with Attachment II-3, *Site Inspection Plan*.
- w. The Director may shut down TD operations at any time.
- x. Processing of Toxic Substance Control Act (TSCA) regulated material (e.g., PCBs) shall be conducted in accordance with a US EPA Operating Approval for the TD unit.
- y. The Permittee shall comply with all conditions concerning radiation safety, including emissions of radioactive materials and the potential concentration of Special Nuclear Material, within the Permittee's Radioactive Materials License (UT 2300249).

4. OPERATIONAL AND SYSTEM PARAMETER DEVELOPMENT

- a. Operational and System Parameters specific for each of the approved Waste Families described in Condition 3.f. are provided in Attachment II-1-12-2, *Waste Family Operational Parameters*.
- b. Additional waste families may be added based upon separation and condensing properties, or upon regulatory characteristics, of specific contaminants. Additional waste families shall be defined, and justified within Pre-Demonstration Plans (PDPs) and through Waste Family Demonstration Testing.

- i. Previous PDPs for currently approved waste families are referenced in Attachment II-1-12-2, *Waste Family Operational Parameters*.
- c. Prior to processing of any additional waste family, Operational and System Parameters shall be established for each additional waste family. Operational and System Parameters shall be based upon the result of Waste Family Demonstration Testing. Waste Family Demonstration Testing shall be conducted in accordance with Attachment II-1-12-1, *Thermal Desorption Shakedown Operations and Waste Family Demonstration Testing*.
- d. Waste Family Demonstration Testing shall consist of the following steps:
 - i. Submission of a PDP as an attachment to this Permit, or modification of an existing PDP attachment.
 - A. Required elements of a PDP are described in Attachment II-1-12-1, *Thermal Desorption Shakedown Operations and Waste Family Demonstration Testing*.
 - ii. Performance of Waste Family Demonstration Testing in accordance with the PDP.
 - iii. An interim operational period while the final data from Waste Family Demonstration Testing are being collected and reviewed.
 - A. The Permittee shall make a request for interim operations, in writing, to the Director.
 - B. Interim operations shall not be conducted without written approval from the Director.
 - C. The processing rate and other stipulations for processing during interim operations shall be established by the Director based upon results of preliminary data from the Waste Family Demonstration Testing.
 - D. Interim operations may continue until the Director provides written approval of the Post-Waste Family Demonstration Testing Report and this Permit has been modified as described in Condition 4.d.v.
 - E. The Director may shut down interim operations at any time.
 - iv. The completion of a Post-Waste Family Demonstration Testing Report, prepared within 90 calendar days of completion of Waste Family

Demonstration Testing unless an extension is granted in writing by the Director.

- v. Upon review and Director approval of the Post-Waste Family Demonstration Testing Report, the Permittee shall modify this Permit as follows:
 - A. The Permittee shall request a modification to this Permit in accordance with Utah Admin. Code R315-3-4.3 (40 CFR 270.42) for each waste family. Multiple waste families may be submitted under a single modification.
 - B. Attachment II-1-12-2, *Waste Family Operational Parameters*, shall be modified as part of the modification process for each new waste family. The modification shall include a description of each new waste family and the Operational and System Parameters for that particular waste family.
 - (1) All of the parameters within Attachment II-1-12-5, *Waste Family Operational Parameters*, shall be justified through approved Post-Waste Family Demonstration Testing Reports.
 - C. The attachment which contained the PDP for the Waste Family Demonstration Testing may be removed from this Permit, with a reference to its approval date(s) cited in Attachment II-1-12-2, *Waste Family Operational Parameters*.
- e. Operational and System Parameters established through Waste Family Demonstration Testing shall not be exceeded.
- f. Changing Operational and System Parameters (other than recipe development) shall require separate Waste Family Demonstration Testing.
- g. A processing recipe shall be established, submitted to the Director, and documented in the operating record, prior to commencement of a treatment run.
 - i. Each recipe shall be waste matrix specific.
 - ii. Each recipe shall consist of the following:
 - A. the maximum waste feed rate;
 - B. the minimum solids processing temperature; and

- C. the minimum hold time for material within the dryer at or above the solids processing temperature.
 - iii. Each recipe shall also establish operational conditions unique to the treatment (e.g., feeding method, addition of clean fill, etc.).
 - h. A new recipe shall be established if the waste family loading rate is exceeded, if the solids processing temperature or hold time is not met during TD processing, or if the operational conditions are altered. A new recipe may be established if a treated waste fails to meet LDR Standards.
 - i. Analytical testing of the processed material shall be performed in accordance with Section 10 to verify that the applicable LDR standards have been met.
 - i. Should the results from treatment verification of the waste indicate that the standards or treatment objectives have not been reached; the waste shall be reprocessed or re-tested until proper treatment is verified or another method for management identified. Such waste may also be returned to the generator.
 - ii. If the waste does not meet the treatment standards after two TD treatment run attempts, the Permittee shall notify the Director of any subsequent management plans for the waste.
 - iii. The verification sampling frequency, described in Section 10, shall be restarted if applicable LDR standards are not met.
 - j. Director notification is not required for wastes that require additional treatment for hazardous constituents that are not amenable to TD processing (e.g., heavy metals) by other permitted processes, such as stabilization.
 - k. Establishment of a new recipe requires that the analytical verification sampling frequency, described in Section 11 of this Attachment, be restarted for the new recipe.
5. CONTAINER MANAGEMENT FOR FEED AND PROCESS MATERIAL
- a. Processed material shall be discharged into approved containers as described in Condition III.F.1. of Module III, *Storage and Treatment in Containers*.
 - b. All containers (feed material, processed material, and secondary waste) shall be managed in accordance with Attachment III-1, *Container Management Plan*, when not being processed within the TD unit.
 - c. Waste shall be treated in treatment run.

- d. Processed material containers shall be covered immediately upon removal from the discharge system.
- e. For operations such as transfers, removals, sampling, and inspections, the container may remain open during the operation provided that an operator is present at all times.
- f. Feed or processed material shall not be transported in an open container unless the entire transfer occurs within the confines of the Mixed Waste Storage Building.

6. TD PREPARATION REQUIREMENTS

- a. For each treatment run, prior to processing feed material through the TD unit, the foreman or supervisor for the TD operation shall review the TD operations parameter logs and provide training to all involved personnel to ensure all personnel have an understanding of the processing objective, Operational Parameters, and precautions. This pre-operational briefing shall be documented in the operating record.
- b. Clean fill may be added to the dryer to facilitate heat transfer during TD unit operation.
- c. Liquid waste shall not be fed directly into the TD unit. Management of liquid waste for TD operations may include:
 - i. decanting or otherwise separating the liquids from the solid portion of the feed material and then managing the two phases separately;
 - ii. solidifying the liquids in accordance with Attachment II-1-4, *Liquid Waste Management Plan*, and then feeding the solidified mixture into the dryer; or
 - iii. sending the liquids off-site for further treatment (e.g., fuel recovery or incineration).
- d. Debris Management
 - i. Prior to waste loading into the dryer, debris shall be removed or shredded to less than four-inches.
 - ii. Pre-operational size reduction of waste feed material shall be conducted in the Mixed Waste Treatment Building in accordance with Module IV, *Storage and Treatment in Tanks and Surface Impoundments*, Attachment IV-1, *Tank Management Plan*, and Attachment II-1-11, *Mixed Waste Treatment Building Operating Plan*.

- iii. Pre-operational sorting of waste feed material may be conducted in the Mixed Waste Treatment Building, the Mixed Waste Storage Building, the Mixed Waste Operations Building, or upon a permitted storage pad.

7. TD OPERATION REQUIREMENTS

- a. Feed materials shall be introduced into the TD unit through the feed hopper.
- b. At a minimum, the System Parameters listed in Table II-1-12-A shall be monitored and documented in the Operating Record.
- c. For System Parameters that are not recorded continuously, the time and date that the measurement was collected shall be recorded.
- d. Processing shall be conducted in accordance with a recipe as described in Condition 4.g.
- e. Oxygen Monitoring
 - i. If the oxygen content within the dryer exceeds 5%, an alarm shall alert the operators and an additional supply of nitrogen gas shall be activated to supply more nitrogen to the system.
 - ii. If the oxygen content within the dryer exceeds 7%, the AWFCO shall be activated.
 - iii. If the oxygen content within the dryer exceeds 9% and the temperature of material in the dryer exceeds 500 °F, the following actions shall be taken:
 - A. the burners shall be turned down;
 - B. the Permittee shall have 30 minutes to adjust the system parameters to reduce the oxygen content; and
 - C. if, after 30 minutes, the oxygen content has not been reduced below 9% or the temperature of the material in the dryer has not been reduced below 500 °F, then the burners shall be shut off and the treatment run aborted.
 - iv. If the oxygen content within the dryer exceeds 10% and the temperature of the material in the dryer exceeds 500 °F, or if a rapid uncontrolled rise in oxygen within the dryer is observed, the following actions shall be taken:

- A. the burners shall be immediately shut off and the treatment run aborted;
 - B. the Permittee shall determine the cause of the exceedance;
 - C. the Permittee shall notify the Director within 24 hours of the incident;
 - D. the root problem shall be identified and a written corrective action report shall be submitted to the Director; and
 - E. the Permittee shall not resume operation of the TD unit until authorization is received from the Director.
- v. During the feed process, oxygen concentrations may be allowed to spike beyond 10% for a time not exceeding 15 minutes as long as the temperature of the waste material in the dryer does not exceed 500 °F.
- f. Discharge System Management
- i. Processed material may still be hot during transfer from the discharge system hopper to the processed material container; nevertheless, the Permittee shall discharge processed material in a way that minimizes potential releases from the TD unit.
 - ii. Releases during processed material transfer shall be managed in accordance with Condition 14.b.
 - iii. Water may be added to the processed material during transfer to assist in cooling the processed material and for dust control.
 - iv. After the processed material has been fully conveyed into the discharge system hopper, and the valve between the discharge system hopper and the dryer has been closed, feeding may begin for the next treatment run.
- g. Process monitoring equipment shall be calibrated in accordance with manufacturer's recommendations. Documentation of these calibrations shall be placed in the Operating Record.

8. OFF-GAS MANAGEMENT

- a. All separated off-gasses shall be processed through an off-gas treatment train to control emissions.

- b. The off-gas treatment train shall consist of a series of condensers and filters. A HEPA filter is followed by primary, secondary, and tertiary carbon adsorption beds that are placed in series.
- c. Off-Gas Temperature Monitoring
 - i. The temperature of the off-gas leaving the condenser system shall be monitored.
 - ii. If the temperature of the off-gas leaving the condenser system exceeds 50 °F, the following actions shall occur:
 - A. the AWFCO shall activate;
 - B. an alarm shall alert the operators; and
 - C. the operators shall respond in accordance with the current TD system conditions to lower this temperature below 50 °F.
 - iii. If the temperature of the off-gas leaving the condenser system maintains a temperature greater than 50 °F for more than 30 minutes, or exceeds a temperature of 70 °F for any amount of time, the following actions shall occur:
 - A. the off-gas leaving the condenser shall be redirected through an emergency clean carbon adsorption bed;
 - B. the Permittee shall turn off the burners and allow the system to cool until the condenser off-gas temperature is less than 50 °F; and
 - C. within seven (7) calendar days, the Director shall be informed of the exceedance and all actions taken.
- d. Carbon Adsorption Breakthrough Analysis
 - i. The requirements of this section shall be used to determine carbon adsorption breakthrough. This process is only required to be performed once, but may be redone at the Permittee's discretion.
 - A. Carbon adsorption breakthrough monitoring was conducted in March, 2005 using the procedures described below. Based on that analysis, carbon breakthrough occurs after seven days of operation.

- B. If additional analysis, in accordance with the procedure below, yields a different breakthrough rate, this Permit shall be adjusted accordingly.
- ii. The carbon adsorption beds shall be monitored for organic breakthrough by the collection of grab samples.
- iii. Grab samples shall be collected between the primary and secondary carbon adsorption beds.
- iv. Grab samples shall be collected as follows:
 - A. One grab sample shall be taken on each day that processing occurs. This shall continue through the first two weeks of processing.
 - B. If breakthrough has not occurred within the first two weeks of sampling, additional grab samples shall be collected weekly until breakthrough occurs. Alternatively, the carbon adsorption media may be replaced prior to reaching breakthrough.
- v. Monitoring for breakthrough of the carbon adsorption beds shall be based upon key organic compounds identified within the feed material. Key organic compounds are the highest concentration of organic compounds identified within the feed material.
- vi. Sampling and analysis for breakthrough shall be performed for each new key organic compound processed that is not listed within the database.
- vii. A database shall be compiled of key organic compounds, similarly adsorbed compounds, processing rate, and the results of grab sampling.
- viii. The amount of processing time that was completed and the amount of total organic material processed through the TD unit prior to breakthrough or carbon adsorption media replacement shall be recorded in the database.
- ix. Breakthrough shall be determined by a concentration increase when compared with the previous grab sample. The concentration increase shall be evaluated against the efficiency rating of the carbon adsorption bed for the key organic compound.
- x. The breakthrough period shall be verified by Demonstration Testing.
- xi. Upon breakthrough detection, the following shall occur:

- A. if the breakthrough occurs during a treatment run, the off-gas flow shall be redirected to the secondary carbon adsorption bed and then through the tertiary carbon adsorption bed and an emergency clean carbon adsorption bed;
 - B. the activated carbon from the spent primary carbon adsorption bed shall be removed and managed in accordance with Condition 9.j.;and
 - C. the order of the four carbon adsorption beds shall be switched so that the secondary carbon adsorption bed shall become the new primary carbon adsorption bed, the tertiary carbon adsorption bed shall become the new secondary carbon adsorption bed, the emergency carbon adsorption bed shall become the new tertiary carbon adsorption bed, and carbon adsorption bed with fresh activated carbon shall replace the emergency carbon adsorption bed.
 - D. If the emergency carbon adsorption bed is not utilized during the breakthrough analysis, it will not require replacement and a fresh activated carbon adsorption bed shall replace the tertiary carbon adsorption bed.
- xii. Breakthrough analysis information shall be retained in the operating record.
- e. Carbon Adsorption Bed Temperature Monitoring.
- i. The carbon adsorption drum cooling system shall maintain continuous water flow during TD operations.
 - ii. The internal temperature of the primary and secondary carbon adsorption beds shall be monitored.
 - iii. If the average temperature within the primary carbon adsorption bed exceeds 150 °F, the following actions shall occur:
 - A. an alarm shall alert the operators;
 - B. the operators shall respond in accordance with the current TD system conditions to lower the primary carbon adsorption bed internal temperature;
 - C. within 24-hours, the Director shall be orally informed of the exceedance and be provided a preliminary assessment; and

- D. within seven (7) calendar days, written documentation of the exceedance and the actions taken shall be submitted to the Director.
- iv. If the average temperature within the primary carbon adsorption bed exceeds 250 °F, the following shall occur:
- A. a high-high alarm shall alert the operators;
 - B. the off-gas flow shall be redirected to the secondary carbon adsorption bed and then through the tertiary carbon adsorption bed and an emergency clean carbon adsorption bed;
 - C. the heated carbon adsorption bed shall be cooled;
 - D. the piping network after the primary carbon adsorption bed shall be examined and all condensed liquids shall be removed and field tested for pH. The results of this field test shall be placed in the operating record;
 - E. the treatment run within the dryer may continue to completion;
 - F. based upon the results of field testing, corrective actions shall be examined to minimize the chance of repeat occurrences of the overheating problem;
 - G. within 24 hours of the actuation of a high-high carbon bed temperature alarm, the Director shall be notified of the incident; and
 - H. within seven (7) calendar days of the incident, a written report shall be submitted to the Director describing the incident and including the amounts of any residual condensed liquids removed from the off-gas treatment train piping network, testing results, and corrective actions.
- f. Liquid accumulation within the off-gas treatment train piping shall be examined regularly, no less than once during each 12-hour operating period, and removed if present.
- i. A field pH check shall be taken on all liquid removed from the off-gas treatment train piping. The results of this field pH check shall be recorded in the operating record.

9. SECONDARY WASTE STREAMS

- a. The TD unit produces two potential secondary waste streams in addition to the processed material: secondary solids and condensate.
- b. Secondary solids include spent particle filters, spent HEPA filters, spent carbon adsorption media and decontamination products, as described in Section 12.
- c. Condensate may be collected in the condensate tanks or may be transferred directly into appropriate containers.
- d. The Permittee shall minimize the amount of volatilization during condensate collection and transfer.
- e. Condensate containers shall be managed in accordance with Attachment III-1, *Container Management Plan*, as Permittee generated waste.
- f. The condensate tanks or containers may collect condensate from multiple waste streams.
 - i. Incompatible material shall not be collected in the same condensate tank or container.
 - ii. Prior to processing potentially incompatible material through the TD unit, the condensate tanks shall be emptied or a new condensate container shall be used.
 - iii. If emptying the condensate tanks is required prior to processing incompatible materials, details of the operation shall be documented in the operating record.
- g. Secondary Solid Wastes
 - i. Secondary solid wastes shall be managed as Permittee generated wastes.
 - ii. Secondary solid wastes shall be sampled and analyzed in accordance with Attachment II-1, *Waste Analysis Plan*.
 - iii. Secondary solid wastes that are not LDR compliant shall either be:
 - A. treated using an existing permitted process; or
 - B. sent off-site to an appropriate permitted treatment or disposal facility.
- h. Wastewater generated from TD operations shall be:

- i. managed in accordance with Attachment II-1-4, *Liquid Waste Management Plan*; or
 - ii. sent off-site to an appropriate permitted treatment or disposal facility.
- i. Non-wastewater
- i. Non-wastewater generated by TD operations shall be:
 - A. treated on-site using a treatment plan approved by the Director; or
 - B. sent off-site to an appropriate permitted treatment or disposal facility.
 - ii. Non-wastewater containers shall be kept sealed so that no volatilization occurs. The container may be opened for the addition or removal of material.

10. ANALYTICAL VERIFICATION REQUIREMENTS FOR THE TD UNIT.

- a. Samples for analytical verification of treatment of processed material shall be collected either:
 - i. directly from the discharge system hopper;
 - ii. during removal from the discharge system; or
 - iii. from processed material containers.
- b. Sample containers for volatile organic analysis shall be filled to zero headspace.
- c. The Permittee shall sample and analyze the processed material in accordance with the minimum frequency outlined below, using EPA-approved analytical methods and performed by a laboratory certified in accordance with the requirements of Attachment II-1, *Waste Analysis Plan*:
 - i. One verification sample from each of the initial three treatment runs; thereafter
 - ii. One verification sample from 10% of the treatment runs until 15 samples have been tested; thereafter,
 - iii. One verification sample from 5% of the treatment runs.
 - iv. Verification samples shall be obtained from all process cycles of treatment runs consisting of a mixture of similar waste streams.

- d. Verification samples collected in accordance with Condition 10.c. for each treatment run shall be a composite sample.
- e. Processed material samples shall be analyzed for the contaminants present, or expected to be present, within the feed material.
- f. Processed material with analytical results showing contaminants, amenable to TD processing, exceeding LDR concentration limits shall be managed in accordance with Section 13.
- g. Processed material that meets LDR concentrations for contaminants amenable to TD processing but show TCLP metal concentrations exceeding LDR concentrations shall be managed as Permittee generated waste in accordance with appropriate sections of this Permit.
- h. Processed material, that meets LDR, may be disposed in the Mixed Waste Landfill Cell.
- i. Vent gas emissions shall be monitored as follows:
 - i. Vent gas grab samples shall be collected from an access port located after the primary and secondary carbon adsorption beds, and shall be analyzed for volatile and semi-volatile contaminants. The analytical results shall be used to calculate REs for the primary volatile and semi-volatile constituents within the waste and for any POHCs spiked into the dryer during the feeding process. Successful vent gas emissions verification shall have REs greater than 99.99%, for all primary known waste contaminants within the feed material, or as approved by the Director.
 - ii. Vent gas grab samples shall be collected for RE calculations at the following frequencies:
 - A. every 200 hours of TD operation for the first 1,000 hours of operation; thereafter
 - B. every 500 hours of TD operation for the next 2,000 hours of operation; thereafter
 - C. Every 1,000 hours of TD operation.
- j. If any of the vent gas emission grab samples exceed the RE criteria established in Condition 10.i.i., Waste Family Demonstration Testing for the VOC and SVOC

waste families shall be redone and the sampling frequency of Condition 10.i.ii. shall begin anew.

- k. The continuing performance of the TD unit shall be demonstrated through performance testing. once each permit renewal period, within ten years of the previous sampling event.
 - i. Performance testing shall be conducted at least every 3,000 hours of TD operation or five years (60 months) from the previous test, whichever comes first. However, if 3,000 hours of TD operation is reached within 24 months of the previous test, performance testing will not be required until 24 months from the previous test have elapsed.
 - A. Performance testing shall be done within three months of reaching the milestones described in 10.k.i.; however,
 - B. If the TD unit is not scheduled for operation at the time performance testing is due, the Permittee may request, in writing, that the testing be postponed until the unit is scheduled for operation. Upon resuming operations, limited treatment time may be requested to ensure the unit is functioning properly prior to the performance testing. Operations shall not commence without approval from the Director.
 - ii. Performance testing shall consist of full Waste Family Demonstration Testing for the VOC and SVOC waste families.
 - iii. The Permittee shall provide details of this performance testing in a written demonstration plan.
 - iv. The Permittee shall provide a schedule for the performance testing at least 30 calendar days prior to the event. The demonstration plan shall be provided to the Director at least ten working days prior to commencement of the testing.
 - v. If the TD unit is not operational at the time performance testing is due, the Permittee may request, in writing that the testing be postponed until the unit is scheduled for operation. Upon resuming operations, limited treatment time may be requested to ensure the unit is functioning properly prior to the performance testing. Operations shall not commence without approval from the Director.
- l. Separation performance of the TD unit shall be demonstrated through mass balance calculations during processing.

- i. The Permittee shall provide a report documenting the mass of waste fed to the TD unit, the mass of condensate recovered from the TD unit, and the percentage of separation that was performed.
- ii. This data will be provided in a report that will include the mass balance calculations on a treatment run basis as well as an overall quarterly treatment basis.
- iii. This report shall be completed on a quarterly basis and submitted to the Director prior to the 20th day of the month following the quarter of the report.

11. OFF-SITE TREATMENT.

- a. Waste generated by the TD unit may be sent off-site to an appropriate permitted facility for treatment or disposal.
- b. For wastes destined for off-site treatment or disposal, the Permittee shall follow the applicable waste generator requirements as defined in Utah Admin. Code R315-5.

12. SYSTEM DECONTAMINATION.

- a. Decontamination shall be required for the dryer. Other subsystems of the TD unit may be decontaminated as needed by the Permittee.
- b. Normal decontamination of the TD unit shall be performed prior to processing a different waste stream or between treatment runs consisting of a mixture of waste streams. This normal decontamination shall consist of:
 - i. operating the dryer at the solid processing temperature of the last treatment run for a period of two hours;
 - ii. allowing the dryer and product handling system to discharge any remaining material; and
 - iii. documenting the procedure in the operating record.
- c. Comprehensive decontamination shall occur between treatment runs when material which could cause cross contamination (e.g., PCBs, mercury, etc.) has been processed. This comprehensive decontamination shall consist of:
 - i. completing the last process cycle of the treatment run;
 - ii. heating the dryer to over 1,000 °F for at least two hours;

- iii. allowing the dryer and product handling system to discharge any remaining material;
 - iv. inspecting the inside of the dryer to verify that all remaining material has been removed. A small amount (approximately two gallons) may remain in the dryer as long as it will not react with the waste of the next treatment run; and
 - v. documenting the procedures in the operating record.
- d. Waste created during decontamination activities shall be managed as a secondary solid waste in accordance with Section 9.

13. CORRECTIVE ACTION.

- a. If the process is not successful in removing the target contaminants from the feed material to concentrations below applicable LDRs, at least one of the following corrective actions shall be taken:
 - i. the feed material shall be reprocessed in the TD unit using the same recipe; or
 - ii. the feed material shall be reprocessed after necessary adjustments to the recipe have been completed; or
 - iii. The processed material shall be stabilized in accordance with Attachment II-1-3, *Waste Stabilization Plan*; or
 - iv. The processed material shall be sent to an appropriate facility for management; or
 - v. The waste shall be returned to the facility that shipped the waste to the Permittee.
- b. Processed material awaiting the actions described in Condition 13.a. shall be placed into storage and managed in accordance with Module III, *Storage and Treatment in Containers*.
- c. The verification sampling frequency described in Section 10 shall be restarted for any treatment run that demonstrates unsuccessful target contaminant removal.
- d. All corrective actions shall be documented in the operating record.

14. EMERGENCY RESPONSE

- a. An Emergency Response Procedure Table shall be located next to the TD unit.
 - i. The Emergency Response Procedure Table shall contain operator directions for potential emergency conditions.
 - ii. A copy of the Emergency Response Procedure Table shall be provided to the Director.
 - iii. The Emergency Response Procedure Table may be revised as necessary during operations.
- b. TD unit releases within the Mixed Waste Storage Building.
 - i. Immediately upon the recognition of a release, personnel shall either evacuate the building or don full-face respirators. Corrections to the system that can be executed quickly and will stop or contain the release may be performed prior to evacuating the building.
 - ii. If the release is not stopped immediately, the burners shall be turned off and the treatment run aborted.
 - iii. An investigation into the cause of the release shall be conducted after the release has been stopped.
 - iv. Corrective actions shall be employed to minimize future releases.
 - v. The Director shall be verbally notified of the release, and potential causes, within 24-hours.
 - vi. A written notification of the release, including an estimate of the amount of material released, shall be submitted to the Director within seven (7) calendar days of the release.
 - vii. Once corrective actions are completed, further processing may continue.
 - viii. Releases of respirable dust or vapors from the TD unit that require a sudden change of worker respiratory protection shall be documented in the operating record.
- c. The Permittee shall comply with the requirements of Attachment II-6, *Contingency Plan*.

15. RECORD KEEPING.

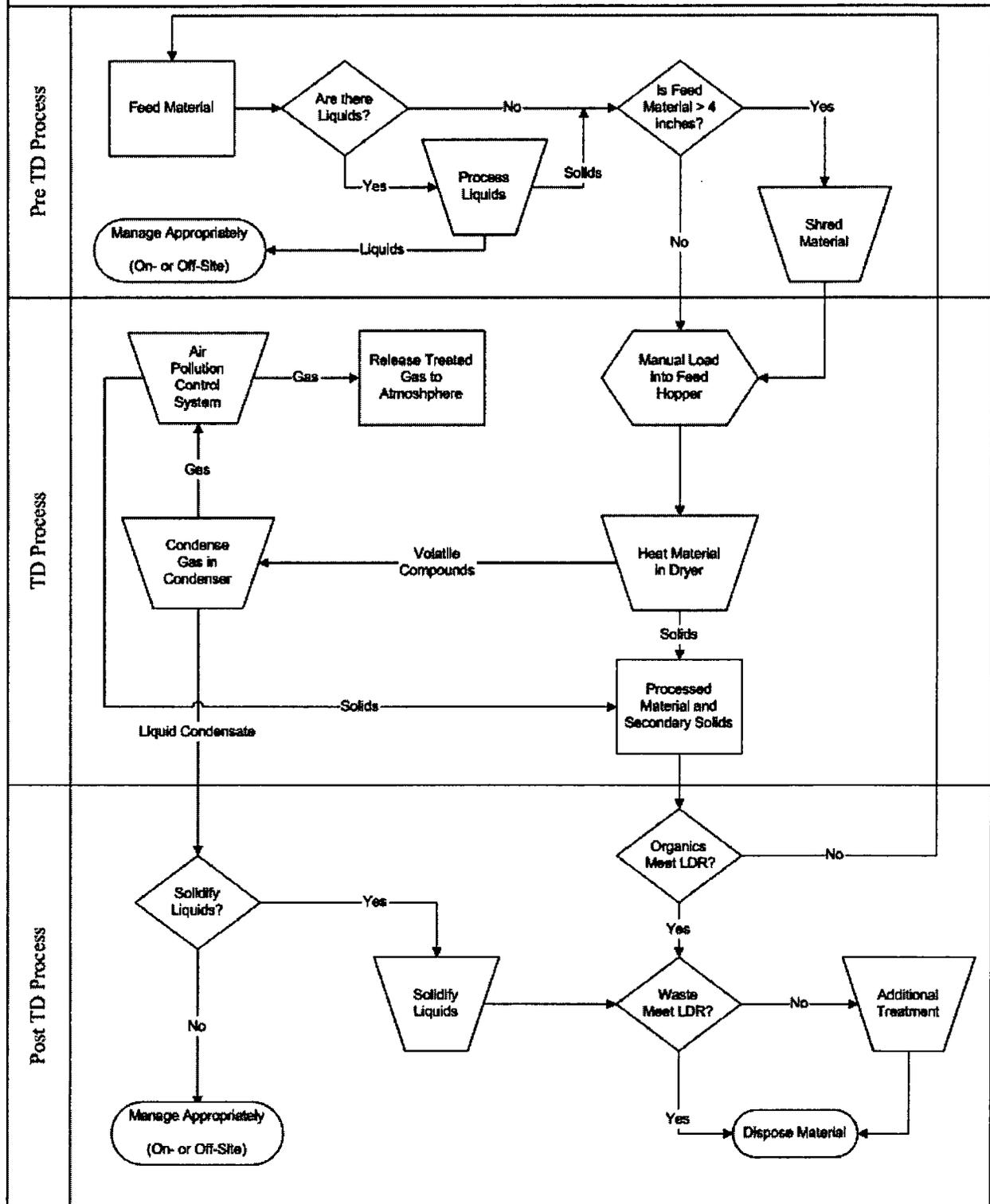
- a. The Permittee shall document the following in the operating record:
 - i. Physical variables (Operational Parameters and System Parameters) associated with the TD unit operations;
 - ii. The reporting requirements identified in this Attachment and Attachment II-1-12-1, *Thermal Desorption Shakedown Operations and Waste Family Demonstration Testing*.
- b. The Permittee shall maintain all TD documentation for a period of at least three years.
- c. Treatment run documentation shall include:
 - i. Generator Number(s);
 - ii. Waste Stream Number(s);
 - iii. dates and times of TD process;
 - iv. quantities of feed material processed;
 - v. quantities of secondary waste streams generated;
 - vi. operators' initials;
 - vii. Operational Parameters;
 - viii. analytical results; and
 - ix. Certification(s) of Treatment based on analytical results.
- d. Documentation of maintenance activities shall be placed in the operating record.
 - i. Required maintenance activities shall include, at a minimum: calibrations; inspections; carbon adsorption bed replacement; filter replacement and condenser cleaning;
 - ii. Other maintenance activities may include: replacing equipment; changing seals and TD subsystem replacements.
- e. All wastes that are successfully processed in the TD unit shall retain a signed Certification of Treatment in accordance with Utah Admin. Code R315-3-1. Certifications shall be kept for a period of five years.

- f. Processed material and secondary waste streams shall be tracked in the operating record in accordance with Attachment III-2, *Waste Identification and Tracking Plan*.

Table II-1-12-A. Monitored TD System Parameters

Parameter	Units	Monitoring Device	Frequency
Feed Rate	cubic feet per treatment run	Feed Log	Once per Treatment Run
Feed Rate	pounds per treatment run	Feed Scale	Once per Treatment run
Daily Feed Rate	cfm	Feed Log	Daily
Daily Feed Rate	tpd	Feed Scale	Daily
Time of Treatment run	minutes	Clock	Treatment run
Final Temperature Hold Time	minutes	Clock	Treatment run
Dryer Internal Temperature	°F	Thermocouple	Continuous
Dryer Solids Temperature, T _p	°F	Thermocouple	Continuous ≥ 10-min Rolling Average
Dryer Off-Gas Temperature	°F	Thermocouple	Continuous
Dryer Internal Pressure	mmHg	Pressure Indicator	Continuous
Condenser Inlet Off-Gas Temperature	°F	Thermocouple	Continuous
Condenser Outlet Off-Gas Temperature	°F	Thermocouple	Continuous
Oxygen Concentration	%, by volume	Oxygen Analyzer	Continuous
Carbon Bed Temperature	°F	Thermocouple	Continuous
Carbon Bed Temperature	°F	Thermocouple	Continuous
Process Vent Flow	scfm	Flow Meter	Hourly
Nitrogen Flow	scfm	Flow Meter	Hourly
Pre-Filter Differential Pressure	psid	Pressure Indicator	Hourly
HEPA Filter Differential Pressure	inches W.C.	Pressure Indicator	Hourly

Figure II-1-12-A: Thermal Desorption Process Flow Diagram



END OF ATTACHMENT II-1-12