U.S. Department of Labor
Occupational Safety and Health Administration
Directorate of Enforcement Programs
Office of Health Enforcement

Remediation Technology Health and Safety Hazards: Thermal Desorption

Safety and Health Information Bulletin

SHIB 02-03-03

Purpose

Thermal desorption is a common treatment process used at hazardous waste sites to separate organic contaminants from feedstock like soil or sludge. Operating these units can expose site workers to safety and health hazards such as chemical exposure from site contaminants and process chemicals, fire or explosion, noise, heat stress, confined space entry, and physical injury from pinching or crushing. This bulletin was written to help employers recognize these hazards and control them in a manner consistent with OSHA requirements and other industry standards (e.g., ANSI standards).

To guide an employer in identifying technology-related hazards and implementing controls, this bulletin offers a sample format called a Technology Safety Summary or TSS. Ideally, an initial TSS will be prepared by the technology manufacturer and will be completed by the employer. A well-prepared TSS should increase worker protection by improving the quality and completeness of job hazard assessments, the site-specific health and safety plan, implemented controls, and employee training information. Routine use of TSSs may also result in improved technology designs that reduce worker hazards.

This is the first of a series of bulletins about the health and safety hazards associated with treatment technologies used on hazardous waste sites. It includes a sample format called a Technology Safety Summary (TSS) to help manufacturers and employers document these hazards and the recommended controls. OSHA developed this bulletin as part of its role within the Office of Solid Waste and Emergency Response (OSWER)/Labor Union Health & Safety Task Force to improve worker protection during site remediation. For more information about the Task Force and its work, including the field audit program, visit the Task Force website at

http://www.ertresponse.com/health_safety/index.htm

Background

A thermal desorption unit treats contaminated feedstock such as soil, sludge, sediments or debris by heating the feedstock directly or indirectly (see Figures on page 3). The heating process separates the contaminants from the feedstock by volatilizing them. This part of the process takes place in the primary treatment unit (PTU) and usually does not destroy the molecular structure of the contaminant.

To meet the size and moisture requirements for effective heat transfer, feedstock is manipulated by pretreatment equipment before entering the PTU. Treated feedstock is transferred to a stockpile area

and tested for residual contamination. Depending on the site requirements, treated feedstock will be further treated, disposed of off-site, or used to backfill site excavations. Volatilized contaminants are removed from the primary treatment unit in the off-gas stream and are destroyed or eliminated using air pollution controls (e.g., afterburners, baghouses, scrubbers, carbon adsorption units).

Technical Information

Types of Thermal Desorption Units

Thermal desorption units are commonly divided into high temperature and low temperature units. Low temperature units operate between 200°F and 600°F and are used to treat halogenated and nonhalogenated volatile organic compounds (VOCs), and petroleum hydrocarbons. High temperature units operate between 600°F and 1,000°F and are used to treat VOCs, semi-volatile organic compounds (SVOCs), polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, coal tar wastes, creosote, paint wastes, and mixed wastes.

The configuration of a unit–including the primary treatment unit, pretreatment equipment and air pollution controls–will vary according to the contaminants and the type of material being treated. The unit may be operated under a vacuum and/or low oxygen conditions to lower heat requirements and reduce the likelihood of forming dioxins, furans, and flammable conditions.

Thermal desorption units can also be grouped into three process types: directly-heated units, indirectly-heated units, and in-situ units. The process type is based on the primary treatment unit used in the system. Directly-heated units use a fuel burner (internal or external to the primary treatment unit), a fluidized bed, or an irradiation source to heat the contaminated feedstock or the air/gas coming in contact with the feedstock. Indirectly-heated units use a fuel burner to heat a transfer medium, which heats a surface (generally metal) that comes in contact with the contaminated feedstock. In-situ units heat contaminated soil in place using vertical wells installed in the ground and filled with steam, hot air or a mechanical heater.

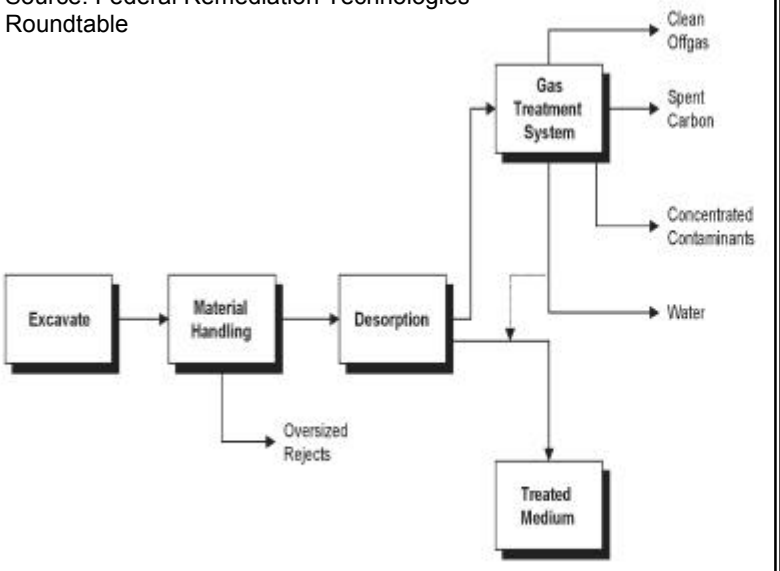
- ***Directly-heated desorption systems:*** Common primary treatment units for this type of system include rotary kilns (dryers), aggregate dryers, and conveyor furnaces. In each of these units, contaminated feedstock enters a heating chamber and is heated (flame or hot air/gas) while passing through. Both the rotary and aggregate units agitate the feedstock by revolving, and most have internal mechanisms (flights) that lift and move the feedstock. Conveyor furnaces use a conveyor or belt to move the material through the unit while exposing it to heated air/gas. Directly heated desorption systems can be used for both low and high temperature applications.

- ***Indirectly-heated desorption systems:*** Common primary treatment units for this type of system are rotary kilns (dryers) and thermal screws. Indirectly-heated rotary kilns are similar to their directly heated counterparts, but the surface of the heating chamber drum is heated rather than the chamber itself. The thermal screw has hollow augers that are filled with hot oil, molten salt or steam, and are used to mix, move and heat the feedstock. Indirect heating produces a lower volume of off-gas, resulting in lower loading for the off-gas treatment and air pollution control systems. Indirectly-heated desorption systems can be used for both low- and high-temperature applications, although thermal screw systems are typically limited to low temperature applications.

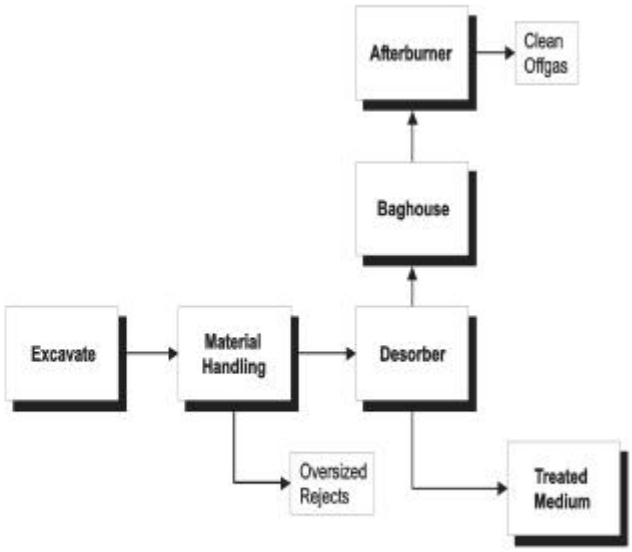
- ***In-situ steam extraction:*** This technology is most applicable for contaminants near the surface, where vacuum extraction is less effective. With this type of system, vertical wells are installed with heaters or are injected with steam or hot air to heat contaminated soil in place and volatilize contaminants. The volatiles are collected under vacuum in a shroud at the surface. Some removal of semivolatiles may also take place.

Directly- and indirectly-heated desorption systems use pretreatment and material handling systems to size and condition feedstock prior to entering the PTU. Equipment like vibrating screens, rock

Source: Federal Remediation Technologies Roundtable



High Temperature Thermal Desorption



Low Temperature Thermal Desorption

crushers, hammer mills, shredders and mixers are used to screen, separate, and size the feedstock. Conditioning generally refers to removing excess water. Equipment like drying beds, belt filter presses, centrifuges, and blending equipment can be used to dewater and condition feedstock. Material handling equipment is used to move feedstock into, through, and out of the entire treatment system. Material handling equipment can include feed hoppers, augers, and conveyors.

All three systems require air pollution control devices to remove contaminants from the water and air emitted. Dust and particulate can be controlled with cyclones, baghouses, or venturi scrubbers. Small amounts of acid vapor might require scrubbing. Residual organic compounds can be condensed and/or captured in activated carbon adsorption units or oxidized in a thermal oxidizer or afterburner.

Residual Material and Waste Streams

The operation of thermal desorption units can create different residual streams:

- treated material,
- oversized material rejected during pre-treatment,
- condensed contaminants and water,
- dust from particulate control system,
- clean off-gas, and
- spent carbon (if used).

Several of these streams may be recycled or reused in the process. For example, systems often recycle contaminant free condensed water and use it to suppress dust emitted from the treated feedstock exiting the system. Scrubber purge water that has been treated in a site wastewater treatment facility (if available) may also be used to suppress dust or can be discarded into the sewer. Often, the concentrated condensed organic contaminants are containerized for further treatment and recovery. The dust collected from a baghouse or cyclone can be mixed with the contaminated feedstock for conditioning. Alternatively, this dust can be mixed with the treated feedstock and backfilled onsite if it is free of contaminants. Spent carbon can be recycled by the supplier or other processor. Finally, the clean off-gas is released to the atmosphere.

Site Requirements

Mobile thermal desorption units are usually transported on specially adapted flatbed trailers. Space requirements typically are less than 50 feet by 150 feet, exclusive of materials handling and decontamination areas. Standard 440V, three-phase electrical service is required, and water must be available at the site. Storage is needed to hold the process residuals until they are tested to determine their acceptability for disposal or release. An area to accumulate and store contaminated waste for treatment may also be necessary. Often, on-site laboratory analysis must be available to determine the organic components in the treated medium for performance assessment. These data can also be used to evaluate decontamination effectiveness and PPE performance.

Description of Hazards

Thermal desorption units, like many types of industrial equipment, pose hazards to workers. If these hazards are properly evaluated and controlled, the technology can be used safely. However, Task Force site evaluations indicated that hazards associated with treatment technologies were often overlooked, particularly during maintenance operations. As a result, workers are often exposed to unanticipated safety hazards and receive unexpected exposure to site contaminants while working in and around treatment technology.

Common health and safety hazards associated with thermal desorption are highlighted in Table 1. The hazards listed are associated with the technology itself, with site-specific contaminants, and with related work operations. Table 1 also lists possible control measures and identifies related health and safety standards.

To minimize or eliminate the hazards of thermal desorption operations, an employer should evaluate each phase of unit operation: installation, operation, maintenance, and disassembly. The employer should also evaluate how the equipment hazards may vary with a site-specific unit configuration and set of contaminants. If the thermal desorption unit is part of a process covered under the Process Safety Management of Highly Hazardous Chemicals (PSM) standard, 29 CFR 1910.119, the employer must compile written process safety information to identify and evaluate the specific hazards associated with the process. The employer must also develop a process hazard analysis (PHA), develop and implement written operating practices for safely conducting process work activities, and provide process-specific employee training. Regardless of the standard's applicability, the hazard analysis techniques described in the PSM standard could help an employer write the technology-specific operating practices and improve worker protection. Another possible approach to organizing technology hazard information is the Technology Safety Summary, described in the next section.

Table 1. COMMON THERMAL DESORPTION HAZARDS, CONTROLS & RELATED STANDARDS			
Hazard	**Sources of Exposure**	**Control Methods**	**Related OSHA and Industry Standards**
Process Chemicals	● Splashing or leaking caustic while transferring it to the air pollution scrubber, from pipelines and storage containers, or while unloading it ● Leaking fuel (propane, fuel oil) from pipelines, storage containers (outside and inside unit), or while unloading it into a storage container ● Responding to an emergency release of process treatment chemicals or fuel	● Use and store smaller quantities of process chemicals ● Use proper storage containers, and inspect both the containers and pipelines for leaks and damage ● Install eye wash and emergency shower ● Prepare and train for spill containment ● Ensure use of PPE when necessary	**OSHA Standards:** 29 CFR 1910.1000 to 1910.1052, 1926.55, 1926.62, 1926.1100 to 1926.1152 (Air Contaminants); 29 CFR 1910.132 to 1910.138, 1926.28, 1926.95, 1926.96, 1926.100 to 1926.107, (Personal Protective Equipment); 29 CFR 1910.1200, 1926.59 (Hazard Communication) See Fire and Explosion for OSHA Standards and Consensus Standards addressing Flammable Materials, like fuel. **Industry Standards:** ACGIH - 2002 Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)
Site Contaminants	● Off-gassing or releasing contaminants as feedstock is loaded, sized, blended, and moved ● Releasing emissions from treatment process ● Releasing or coming in contact with contaminants in feedstock while working on equipment ● Releasing or coming in contact with contaminants (metals, excluding mercury) that are not desorbed while sampling, handling or backfilling treated feedstock ● Releasing or coming in contact with contaminants that are not desorbed while removing and containerizing waste from air pollution controls	●Use negative pressure in the unit to decrease fugitive emissions ● Work "up-wind" of disturbed soil, when possible ● Segregate treated feedstock until tested ● Routinely monitor work areas; some contaminants require an initial assessment of exposure (e.g., lead) ● When possible, spray-off or remove feedstock and slag before working on equipment; do not use compressed air ● Contain treated feedstock ● Ensure workers use proper PPE, when necessary	Same as above
Process Waste Materials	● Removing and containerizing waste materials from an air pollution control device	● Use the applicable controls listed for Process Chemicals, Site Contaminants, and Dusts	Same as above

Table 1. COMMON THERMAL DESORPTION HAZARDS, CONTROLS & RELATED STANDARDS			
Hazard	**Sources of Exposure**	**Control Methods**	**Related OSHA and Industry Standards**
Dust	● Moving feedstock to load and unload unit ● Releasing dust while working on air pollution equipment ● Releasing untreated and treated feedstock, or blending material (sand), from stockpiles or bins ● Sizing, blending, and moving untreated feedstock using vibrating screens, crushers, shredders or other pretreatment equipment ● Removing and containerizing dust from air pollution equipment ● Releasing dust while working on/replacing refractory material in the firebox or desorber	● Spray water or use dust suppressants on storage piles and exposed feedstock ● Do not operate earth moving equipment during high winds ● Cover untreated and treated feedstock or keep the quantity to a minimum ● Where possible, enclose sizing, blending, and moving equipment like screens, crushers, shredders, and conveyors ● Clean surfaces before doing maintenance ● Ensure workers use proper personal protective equipment (PPE), when necessary	Same as above
Ergonomic Risks	● Lifting or performing any other movement with too much force and/or in an awkward position, or repeating the lift/movement too often.	● Provide conveniently located equipment for the job, like carts, adjustable work stations (operators), and correctly sized tools ● Train workers on ergonomic risks and prevention	**OSHA Standard:** No Related Standard **Industry Standards:** ACGIH - 2002 Threshold Limit Values (TLVs) for Hand/Arm Vibration, draft ANSI Z365: Management of Work-Related Musculoskeletal Disorders
Thermal Burns	● Coming in contact with slag that appears to be cool ● Coming in contact with hot surfaces on high-temperature equipment ● Coming in contact with high temperature steam from an In-situ Steam Extractor ● Coming in contact with hot ash/residue that is removed from the desorber ● Coming in contact with the containers used to store treated feedstock or residue	● Perform a Job Hazard Analysis ● Ensure use of engineering controls (e.g., guards), lockout/tagout procedures, work practices (e.g., wait until cooled to certain temperature) and/or personal protective equipment (e.g., heat resistant clothing, face shields, gloves, boots, hard hat) to prevent burns ● Insulate accessible surfaces of high-temperature equipment ● Label hot surfaces and identify them during training	**OSHA Standards:** 29 CFR 1910.132/1926.21 & 1926.28, 29 CFR 1910.138(PPE); 29 CFR 1910.145 (Specifications for Accident Prevention Signs and tags); 29 CFR 1910.147 (Lockout/Tagout) **Industry Standards:** equipment-specific standards exist

Table 1. COMMON THERMAL DESORPTION HAZARDS, CONTROLS & RELATED STANDARDS

Hazard	Sources of Exposure	Control Methods	Related OSHA and Industry Standards
Electrical Hazards	● Working with standard 440V, three-phase electrical service ● Using ungrounded or unguarded electrical equipment ● Working on or testing an electrical system or any electrically powered equipment without properly locking/tagging out energy sources ● Touching (worker or equipment operated by worker) underground and aboveground utilities	● Implement lockout/tagout procedures ● Allow live testing only by employees that are properly trained and qualified ● Ensure workers use proper electrical work practices (i.e., those in 1910.333) ● Ensure workers use proper electrical protective equipment and insulated tools while working live ● Locate and mark any underground utilities ● Ensure proper clearance between power lines and elevated equipment (e.g., crane or drill rig booms, scaffolding, etc.) and designate an observer ● De-energize utilities, when necessary ● Install ground-fault circuit interrupters (GFCI) when feasible ● Routinely inspect electrical cords and equipment	**OSHA Standards:** 29 CFR 1910.137 (PPE); 29 CFR 1910.333 (b)(2)/1926.417 (Lockout/Tagout); 29 CFR 1910.301 to 1910.399/1926.400 to 1926.449 (Electrical Safety); 1910.269/1926 Subpart V (Electrical Power Generation, Transmission, and Distribution) **Industry Standards:** ANSI Z244.1-1982 Personal Protection Lockout/Tagout of Energy Sources; NFPA 70: National Electric Code
Confined Space Entry	● Entering heating chamber, fuel burner, bag house, or other equipment on the unit that is a permit-required confined space. **Note:** Spaces that may contain a hazardous atmosphere (e.g., oxygen deficient, explosive), have physical hazards (e.g., falling material, heat, entrapment), and/or have mechanical hazards (e.g., moving parts) are considered Permit Required Confined Spaces.	● Require a permit for entry ● Test atmosphere (oxygen first) ● Lockout/tagout any electrical and mechanical equipment and isolate any chemical/steam lines ● Provide natural or forced ventilation ● Ensure use of PPE, like heat resistant and flame retardant materials ● Train employees to recognize and control the hazards of a permit-required confined space ● Make sure employees understand the permit system ● Plan and prepare for rescue	**OSHA Standards:** 29 CFR 1910.146/1926.21 and 1926.353 (b) (Permit-Required Confined Spaces) **Industry Standards:** ANSI Z117.1-1995 Safety Requirements for Confined Spaces
Fire and Explosion	● Leaking or emitting stored fuel from damaged storage containers or pipelines, or while transferring it to a storage container ● Overheating fuel tanks ● Leaking or emitting stored flammable liquids recovered from the desorber or pollution controls ● Operating without using a proper vapor inerting system or inert purge gas, or when these systems fail ● Operating the heating chamber at temperatures above its rated	● Forbid smoking and open flames in the area ● Prevent combustibles (e.g., paper, trash) from accumulating ● Routinely monitor the area if highly flammable materials are present in the feedstock ● Use controls to prevent unit from operating above a set temperature or without the inerting gas ● Provide appropriate fire suppression systems and/or equipment ● Train workers in fire prevention	**OSHA Standards:** 29 CFR 1910.106/1926.152 (Flammable and Combustible Liquids); 29 CFR 1910 Subpart L and 1926 Subpart F (Emergency Action, Fire Protection and Prevention); 29 CFR 1910.110/1926.153 (Liquefied Petroleum Gas); 29 CFR 1910.119/1926.64 (Process Safety Management)

Table 1. COMMON THERMAL DESORPTION HAZARDS, CONTROLS & RELATED STANDARDS			
Hazard	**Sources of Exposure**	**Control Methods**	**Related OSHA and Industry Standards**
Fire and Explosion (cont.)	temperature ● Mixing feedstock containing flammable contaminants with enough air to reach the lower explosive limit		**Industry Standards:** NFPA 1(Fire Prevention Code); NFPA 10 (Portable Fire Extinguishers); NFPA 30 (Flammable and Combustible Liquids Code); NFPA 55 (Storage, Use and Handling of Compressed and Liquefied Gases in Portable Cylinders); NFPA 58 (Storage and Handling of Liquefied Petroleum Gases); NFPA 325 (Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids)
Mechanical	● Contacting or becoming entangled in moving/ unguarded equipment like conveyor, hollow screw mixer, belts, chains, gears, moving parts with protrusions, etc. ● Working on any of this moving equipment without isolating the energy source	● Place guards during operation ● Train workers on hazards, use of guards, who may remove guards, and how to remove guards ● Ensure use of lockout/tagout procedures for maintenance	**OSHA Standards:** 29 CFR 1910 Subpart O (Machine Guarding); 29 CFR 1910.147 (Lockout/Tagout) **Industry Standards:** equipment-specific standards exist
Flying Particles and Falling Material	● Getting dust into the air from moving equipment or from high winds ● Falling slag or loosened refractory material in unit ● Falling feedstock, from conveyors and other moving equipment	● Perform a Job Hazard Analysis ● Ensure workers use proper PPE, if necessary ● Spray water or use dust suppressants on feedstock piles and exposed soil ● If possible, remove slag and loose material before working on or in unit ● Where possible, enclose sizing, blending, and moving equipment like screens, crushers, shredders, and conveyors	**OSHA Standards:** 29 CFR 1910.132/1926.21 & 1926.28, 29 CFR 1910.133/1926.102, 29 CFR 1910.135/1926.100, 29 CFR 1910.136/1926.96 (PPE) **Industry Standards:** ANSI Z87.1-1989 (R1998): Practices for Occupational and Educational Eye and Face Protection (reaffirmation); ANSI Z89.1-1997: Industrial Head Protection (revision of ANSI Z89.1-1986); ANSI Z41-1991: Foot Protection
Noise	● Working near feedstock sizing/blending equipment, material handling equipment and air pollution control devices ● Working near air blowers, pumps and fuel burners ● Using powered hand tools, compressed air, welding equipment or any other	● Locate noisy operations away from other workers ● Isolate or insulate noisy equipment components ● Identify and mark areas requiring hearing protection ● Implement a Hearing Conservation Program	**OSHA Standards:** 29 CFR 1910.95; 29 CFR 1926.52 and 1926.101 (Occupational Noise Exposure and Hearing Protection) **Industry Standards:** ACGIH - 2002 TLVs and BEIs

Table 1. COMMON THERMAL DESORPTION HAZARDS, CONTROLS & RELATED STANDARDS			
Hazard	**Sources of Exposure**	**Control Methods**	**Related OSHA and Industry Standards**
Noise (cont.)	equipment that creates noise while maintaining process equipment		
Slips, Trips, and Falls	● Storing construction materials or other unnecessary items on walkways and in work areas ● Creating and/or using wet, muddy, sloping, or otherwise irregular walkways and work surfaces ● Constructing and/or using improper walkways, stairs, or landings or damaging these surfaces ● Creating and/or using uneven terrain in and around work areas ● Working from elevated work surfaces and ladders ● Working in confined spaces ● Using damaged steps into vehicles	● Keep walking and working areas free of debris, tools, electrical cords, etc. ● Keep walking and working areas as clean and dry as possible ● Install handrails, and guardrails on work platforms ● Clean and inspect ladders and stairs routinely ● Perform a Job Hazard Analysis ● Ensure workers use proper PPE, including fall arrest systems ● Train workers on fall hazards and use of ladders ● Use an observer (spotter or signal person) when visibility is limited	**OSHA Standards:** 29 CFR 1910.22, 1926.25 (Housekeeping); 29 CFR 1910.23 to 1910.30, 1926.104 to 1926.105, 1926 Subpart M, 1926.1050 to 1926.1053 (Work surfaces, Stairways and Ladders); 29 CFR 1910.132/1926.21 & 1926.28, 1926.500 to 1926.502 (PPE, Fall Protection) **Industry Standards:** equipment-specific standards exist.
Moving Vehicles	● Moving and stockpiling untreated and treated feedstock using earth moving equipment ● Loading and unloading unit using heavy equipment ● Receiving and transferring process chemicals and other materials from commercial vehicles ●Establish vehicle inspection schedules and procedures	● Train affected employees on limitations of equipment and drivers ● Train equipment and vehicle operators in safe operation ● Set acceptable speed limits and traffic patterns ● Ensure that equipment has, and workers use, back-up alarms, mirrors, and seat-belts ● Set parking brake and if on incline, chock wheels ● Ensure equipment has required roll-over equipment ● Do routine maintenance	**OSHA Standards:** 29 CFR 1910.176, 1910.178 to 1910.184 (Materials Handling and Storage); 29 CFR 1926.600 to 1926.604 (Motor Vehicles, Mechanized Equipment, and Marine Operations). **Industry Standards:** equipment-specific standards exist

Recommendations

Use Table 1 (***Common Thermal Desorption Hazards, Controls & Related Standards***) to identity hazard controls applicable to your site and thermal desorption unit. Evaluate operation and maintenance tasks planned for the unit, identify the hazards site workers may encounter, and implement the recommended controls appropriate. Consider developing a TSS, described below, to document the hazards and controls, and communicate them to site workers.

Developing a Technology Safety Summary (TSS)

The TSS provides a format for documenting and communicating a technology's health and safety hazards and their control. In its most complete form, the TSS contains a blend of manufacturer and site-specific information. For example, the manufacturer would document the components of the technology and its method of operation, identify key shut-off and emergency procedures, and list the hazards from operating and maintaining the equipment such as hazardous energy sources, confined spaces, pinch points, elevated work platforms, and noise sources. The manufacturer would also identify the installed or recommended controls. Using a manufacturer's TSS, the end user (a site employer) would add site-specific information, including hazards that may arise from a particular configuration of the equipment, from site contaminants and from other chemical and physical hazards present at that location. The resulting document should be an accurate description of the hazards inherent in the technology and specific to its operation on site, and the controls used to reduce or eliminate these hazards for worker protection. Please see the sample TSS format and instructions attached to this bulletin.

By preparing an accurate TSS, a manufacturer can provide an end user with the information necessary to operate and maintain a technology safely. In addition, the manufacturer may be able to identify and reduce hazards before a technology is marketed, providing safer technology to consumers. Ultimately, however, the employer is responsible for evaluating and controlling worksite hazards and communicating this information to employees. In the event that a manufacturer does not provide a TSS or its equivalent for site remediation technology, the employer should assume full responsibility for documenting a technology's hazards and their control, and for communicating this information to employees. The information in the TSS is essential for the completion of several elements of the site-specific health and safety plan, including the job hazard analysis, personal protective equipment program, air monitoring procedures, site control, emergency response plan, and procedures for confined space entry and spill containment, identified in 29 CFR 1910.120(b)(4)(ii)(A-J) or 29 CFR 1926.65 (b)(4)(ii)(A-J). This information is also a key element of site-specific employee training.

For Comments and More Information

For assistance in understanding the regulatory information presented, please contact a local OSHA Area Office (http://www.osha.gov/html/RAmap.html)

For assistance evaluating thermal desorption unit hazards, implementing suggested controls, or completing the sample TSS, please contact a local Consultation Office (http://www.osha.gov/oshprogs/consult.html). These offices provide free services to small businesses and are separate from OSHA's inspection and enforcement effort.

To comment on the TSS format, please contact Sven.Rundman@osha.gov.

For more information about EPA/OSHA safety and health audits of hazardous waste remediation sites, please see the audit report posted on OSHA's website at http://www.osha.gov/SLTC/hazardouswaste/sftaskrpt.html

SOURCES

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Online Resources

OSHA Standards and Compliance Information and Tools. http://www.osha.gov.

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U.S. Army Corps of Engineers. 1999. Engineering and Design - Safety and Health Aspects of HTRW Remediation Technologies, Chapter 22, Low-Temperature/High-Temperature Thermal Desorption. EM1110-1-4007. http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-1-4007/toc.htm

Federal Remediation Technology Roundtable. Home Webpage. http://www.frtr.gov/

U.S. Environmental Protection Agency. Technology Innovation Office. Hazardous Waste Clean-Up Information (Clu-in) Webpage. http://www.clu-in.org/

U.S. Environmental Protection Agency. Technology Innovation Office. Remedial and Characterization Innovation Technologies (REACH-IT) Webpage.

http://www.epareachit.org/index3.html

[*Insert Technology Name*] Technology Safety Summary

SECTION 1: TECHNOLOGY IDENTITY	
Manufacturer's Name and Address:	Emergency Contact Name and Phone Number:
	Technology Information Contact Name and Phone Number:
	Prepared by:
	Date Prepared:

SECTION 2: MOST SERIOUS HAZARDS

1) Fire/Explosion:

2) Physical Injury or Death:

3) Acute and Chronic Illness

SECTION 3: HAZARDOUS CHEMICALS	**SECTION 4: EMERGENCY RESPONSE INFORMATION**
Fuel:	Fire and Explosion Sources:
Purge Gas:	Ignition Sources and Shut-off Locations:
Treatment Chemicals:	Special Fire Fighting Procedures:
Feedstock Contaminants: site specific information	Chemical Release Sources:
Fugitive Emissions:	Chemical Incompatibilities:
Residual Contaminants in Treated Feedstock: site specific information	Chemical Shut-off Valve Locations:
Waste Streams (liquid and particulate):	

SECTION 5: TECHNOLOGY INFORMATION

1) Technology Treatment Process Description:

2) Technology Components:

3) Process Chemicals and Wastes:

SECTION 6: TECHNOLOGY HAZARDS AND RECOMMENDED CONTROLS		
CHEMICAL HAZARDS		
Hazard	Source	Recommended Controls
Related Regulatory Standards		Reference Consensus Standards
PHYSICAL HAZARDS		
Hazard	Source	Recommended Controls
Related Regulatory Standards:		Reference Consensus Standards:
BIOLOGICAL HAZARDS		
Hazard	Source	Recommended Controls
Related Regulatory Standards:		Reference Consensus Standards:
RADIOLOGICAL HAZARDS		
Hazard	Source	Recommended Controls
Related Regulatory Standards:		Reference Consensus Standards:
OTHER HAZARDS:		
Hazards	Source	

SECTION 7: POTENTIAL MODIFICATION TO SITE HEALTH AND SAFETY PLAN	
Element	Site Health and Safety Plan Modification

Instructions for Completing the Technology Safety Summary

The TSS can be prepared by the technology manufacturer and the technology end user (employer). A manufacturer-prepared TSS will be very useful to the employer, who can then add site-specific information. The TSS format is designed to place most critical health and safety information at the beginning of the document.

Title Bar: Insert the name of the technology your TSS describes, the date the TSS was prepared, and the name of the person who prepared it.

Section 1: Manufacturer Information - Fill in the manufacturer contact information.

Section 2: Most Serious Hazards - Identify specific serious hazards associated with this technology. Consider the categories of hazards listed and describe the specific nature of the hazard and its source. Some of the information may be site-specific.

Section 3: Hazardous Chemicals - Identify all of the hazardous chemicals associated with this technology. Some of this information will be site-specific.

Section 4: Emergency Response Information - Fill in system information that is critical to emergency response planning and training. Some of the information will be site-specific.

Section 5: Technology Description - Describe the treatment technology as indicated below. Some of the information will be site-specific.

1. Process Description: Describe how this technology treats contaminants. Include the technical aspects of the treatment process and identify the contaminants it will effectively treat. If applicable, describe the general flow of the feedstock through the technology components and critical outcomes for each step. Provide a schematic illustration of the treatment process, labeling the components and identifying the feedstock flow.
2. Technology Components: Identify the individual technology components. List critical operating parameters for each component. Include equipment required to support the technology such as air scrubbers or waste storage tanks.
3. Process Chemicals and Wastes: Identify the chemicals used in treatment process and the types of waste streams generated during treatment. Include information about how the waste streams are recycled back into the technology or discarded.

Section 6: Technology Hazards and Hazard Controls - For each hazard associated with this technology, provide the following type of information. Much of this information will be site-specific.

1. Hazard: List specific chemical, physical, biological, and radiological hazards in the appropriate sections of the TSS. For chemical hazards, identify the appropriate chemical name and any common name referenced in other technology-specific documents.
2. Source: Identify technology components and/or related activities that may create the hazard identified and could result in potential exposure to employees. For chemical hazards, identify the technology components where the chemical is used, stored, created or may be emitted by the technology and/or related activities that could result in a potential exposure to the employees.
3. Controls: Identify the specific engineering controls, work practices and PPE that are used or will be implemented to reduce exposure to the chemical, physical, biological, and radiological hazards listed. Include appropriate equipment-specific procedures like chemical pipeline isolation procedures or ventilation requirements.
4. Related OSHA Standards: Identify the relevant Occupational Safety and Health Administration (OSHA) standards that cover listed hazards and controls.
5. Related Industry Standards: Identify other industry standards (e.g., ANSI, ASTM) that cover the listed hazards and controls.
6. Other Hazards: Identify any other hazards that may be commonly associated with operating and maintaining this equipment, but are not specifically related the technology (e.g., using heavy equipment).

Section 7: Potential Modifications to Site-Specific Health and Safety Plan (HASP) - Identify the sections of the HASP that may need to be modified to address the information in the TSS. List the specific element of the plan that could be affected and the information that must be addressed. For example, potential emergencies associated with the technology must be included in the site emergency response plan. That is plan element (H) in the list of HASP elements found in 29 CFR 1910.120 (b)(4)(ii) or 29 CFR 1926.65(b)(4)(ii).