

MODULE VII – LOW TEMPERATURE THERMAL TREATMENT (DECINERATION™)

This is a Research, Development, and Demonstration (RD&D) permit, per R315-6.5, to allow for the testing and evaluation of a new technology for the demilitarization of conventional munitions and munition components.

The RD&D permit will facilitate a comparative economic study at Tooele Army Depot (TEAD) that intends to evaluate the U.S. Demil, LLC (USD) 24D174 Rotary Furnace, a proprietary demilitarization processing technology, in comparison to the existing incineration and hydrolysis demilitarization processes currently installed at TEAD.

The proposed 24D174 Rotary Furnace munitions demilitarization technology was developed by USD as an environmentally preferable alternative to incineration; USD has coined the term “Decineration”™ for this technology. It is a thermal chemical process in which complex (long chain or cyclo-ring) hydrocarbons are broken down (decomposed) into simpler molecules (i.e. light hydrocarbons) by the breaking of carbon-carbon bonds in the precursors. The process occurs at standard pressure and moderate temperature, approximately 450°F, in a precisely controlled and indirectly heated (electric) vessel. The breaking of the carbon-carbon bonds continues until hydrocarbons are formed that are vapor phase (gaseous) at the processing temperature. The vapors are removed from the processing vessel, leaving behind fully demilitarized materials in a “no explosive hazard” and clean condition. For the purposes of this demonstration, the process vapors will be abated using the existing Ammunition Equipment Directorate (AED) experimental APE 1236 afterburner / baghouse combination at Building 1351. Decineration™ temperatures avert detonation or volatilization of energetic compounds and the formation of undesirable toxic compounds.

The USD Decineration™ 24D174 Rotary Furnace technology is a continuous process. Munitions are feed into the furnace and are demilitarized and discharged at a steady rate.

VII.A. OPERATION AND MAINTENANCE

- VII.A.1. The Permittee shall maintain and operate the rotary furnace system in accordance with the drawings, specifications, and procedures contained in Attachments 27, 28, 29, 30, and 15.

- VII.A.2. Modifications to the drawings and specifications for the rotary furnace system shall be allowed only in accordance with the permit modification requirements in Condition I.D and UAC R315-3-4.3.

- VII.A.3. All process monitors, required pursuant to Conditions VII.E, shall be equipped with alarms operated to warn of deviation or imminent deviation from the limits specified in Condition VII.D.

- VII.A.4. The Permittee shall maintain the rotary furnace and ancillary equipment in good repair. Routine maintenance shall be performed at sufficient frequency to ensure

the rotary furnace remains in good repair. Malfunctions and deterioration shall be corrected as expeditiously as possible.

- VII.A.5. The Permittee shall not feed munitions for more than 10 hour per day.
- VII.A.6. The Permittee may conduct two phases of operation: the recipe development or shakedown phase, and the operational phase. All of the requirements of this module shall be met during both phases of operation.
 - VII.A.6.a. During the recipe development or shakedown phase, total operations shall be limited to 100 hours. No more than 1000 pounds of munitions will be processed during this phase.
 - VII.A.6.b. The Permittee shall not process munitions for more than 300 hours for the operational phase of this RD&D permit. This shall be in addition to any hours used during the recipe development or shakedown phase.

VII.B. FEED LIMITATIONS

- VII.B.1. The Permittee may only feed propellant, explosive and pyrotechnics (PEP) reactive waste munitions. No other wastes except holders and PEP containers may be processed.
- VII.B.2. Only one type of waste munition or propellant shall be processed at a time.
- VII.B.3. Only the following DODICs may be processed as part of this RD&D permit:

G213 DELAY ELEMENT, FUZE, M9, .010 SEC DELAY
G214 DELAY ELEMENT, FUZE, M9, .025 SEC DELAY
G217 DELAY ELEMENT, FUZE, M9, .25 SEC DELAY
MF29 CTG IMPULSE CCU-63/B
MF64 CTG IMPULSE
M837 CTG IMPULSE
MD48 CTG IMPULSE
A652 CTG 20MM TP-T, M220 ELECT
C244 CTG, IGN M2A2 F/4.2" MORTAR
N285 FUZE, MTSQ M577
N523 PRIMER, PERC, M82
N527 PRIMER, PERC M32
K184* Cryofractured M74/75
B519 Ctg 40mm TP M781
M131 Cap Blasting Non-Elect M7
FY53 Booster & Tape Assy
G850 Chg Prac Hand Gren M21 W/O Plug
M934 Ign Elem Elect Mk17 Mod0
EW38 Actuator Expl Stab Mk26 Mod0

UW76 Actuator, Explosure
ML68 Detonator Mk29 Mod0
N525 Primer Perc MK2A4
M471 Cutter Ctg Actuated
K008 Firing Device APERS Mine Elec M57
** modified M42 grenades
** modified M46 grenades

* Treatability Study Material archived from previous cryofracture test
** Modified as described in the permit modification request dated February 24, 2014 (DSHW-2014-004345)

VII.C. OPERATING REQUIREMENTS AND FEED RATE LIMITS

The Permittee may feed the wastes described in Condition VII.B. to the rotary furnace only under the following conditions:

- VII.C.1. The process gas temperature at the rotary furnace exit shall not exceed 680° F. The process gas exit temperature shall be monitored and recorded continuously.
- VII.C.2. The rotary furnace rotation shall not be less than 0.5 rpm. The maximum rotary furnace rotation shall not exceed 3 rpm. The rotary furnace rotation speed shall be monitored and recorded continuously.
- VII.C.3. The pressure within the rotary furnace's rotary tube shall not be above atmospheric for more than 5 seconds. The rotary furnace tube differential pressure shall be monitored and recorded continuously.
- VII.C.4. The combustion gas temperature at the outlet of the afterburner of the air pollution control equipment shall be maintained between 1611°F and 1811°F on an hourly rolling average basis. This temperature shall be monitored and recorded continuously.
- VII.C.5. The carbon monoxide (CO) concentration in the stack exhaust gas, corrected to seven percent oxygen in accordance with the formula specified in Condition IV.B.4, shall not exceed 100 ppmv, dry basis, over a one hour rolling average, and shall not exceed 500 ppmv, dry basis, for more than 60 seconds at any time. The uncorrected and corrected CO concentration in the stack and the one-hour rolling average shall be monitored and recorded on a continuous basis. The oxygen concentration in the stack shall also be monitored and recorded on a continuous basis.
- VII.C.6. The combustion gas temperature at the inlet of the baghouse shall not exceed 1048°F or be less than 750°F on an hourly rolling average basis. The baghouse temperature shall be monitored and recorded continuously.

- VII.C.7. The pressure drop across the baghouse shall not be less than 2.0 inches W.C. (inches H₂O). Pressure drop across the baghouse shall be monitored and recorded continuously.
- VII.C.8. The particulate monitor reading shall not exceed 20% for more than 15 seconds. The reading from the particulate monitor shall be monitored and recorded continuously.
- VII.C.9. The air pollution control equipment combustion gas velocity, measured at the stack, shall not exceed 45 feet per second on an hourly rolling average basis. The combustion gas velocity at the stack shall be monitored and recorded on a continuous basis.
- VII.C.10. The Permittee shall limit the total PEP feed rate to 125 pounds per hour.
- VII.C.11. The Permittee shall limit the total feed rate (gross weight) to 550 pounds per hour.
- VII.C.12. The total potential particulate generation rate of items fed to the rotary furnace shall not exceed 66 pounds per hour. The potential particulate generation rate for the items fed is calculated by the following method. (1) A particulate generation factor (mass of potential particulate emissions per mass of reactant) is obtained from Attachment 12 for each component in the feed. (2) These factors are then multiplied by the feed rates of their respective components to obtain a potential particulate generation rate for each component. (3) The potential particulate generation rate for each component is then summed for a total potential particulate generation rate.
- VII.C.13. The total chloride fed to the system shall not exceed 2.2 pounds per hour.
- VII.C.14.a. The semi-volatile metals (SVM) (lead and cadmium combined) fed to the system shall not exceed 0.22 pounds per hour
- VII.C.14.b. The low volatile metals (LVM) (arsenic and beryllium and chromium combined) fed to the system shall not exceed 0.25 pounds per hour
- VII.C.14.c. The barium fed to the system shall not exceed 19.13 pounds per hour
- VII.C.14.d. Mercury shall not be fed to the system.
- VII C.15. System Stabilization Air shall only be introduced to stabilize the existing air abatement system.

VII.D. MONITORING, RECORDKEEPING, AND CALIBRATION REQUIREMENTS

- VII.D.1. Munition items may be fed to the rotary furnace only when all instruments required by this permit are on-line and operating properly.

- VII.D.2. The Permittee shall maintain and operate the monitoring and recording equipment and record the data specified in Conditions VII.C.1 through 9 and Conditions VII.D.5 through 6 while processing munitions. The data shall be monitored and recorded as specified in Conditions VII.C and VII.D. The monitoring equipment shall provide accurate data.
- VII.D.3. The oxygen concentration and uncorrected CO concentration shall also be recorded continuously during the daily calibration checks.
- VII.D.4. The monitoring instruments shall be calibrated in accordance with Attachment 29. Records shall be maintained of any calibrations or maintenance performed on any of these instruments.
- VII.D.5. The munition feed rate shall be monitored and recorded. This shall be accomplished by recording the time the system is feeding munitions and the number of items and/or the weight fed during each processing run. The rotary furnace is designed for continuous feed operation. This test is intended to determine the economic feasibility of this technological approach to munitions demilitarization. The type of munition fed shall also be recorded. The feed rate shall be quantified in pounds per hour.
- VII.D.6. The feed rate of all waste materials shall be monitored and recorded on a daily basis. The feed rate shall be quantified in pounds per hour
- VII.D.7. Prior to processing any munition, the Permittee shall have sufficient analysis data for that material to demonstrate that the feed rates specified in Conditions VII.C.10 through 14 will be met at the programmed munition feed rate. This information must be available for review by the Director at the rotary furnace whenever the material is being processed.
- VII.D.8. Alarms generated by the plant control system shall be recorded and made available for review by the Director.
- VII.D.9. The Permittee shall record the date and time of all automatic waste feed cut-offs, including the triggering parameter(s), reason for the cut-off, and corrective action(s) taken. The Permittee shall also record all failures of the automatic waste feed cut-off system to function properly and corrective actions taken.
- VII.D.10. The Permittee shall comply with UAC R315-14-7, which incorporates 40 CFR 266 Appendix IX, Section 2.1, *Performance Specifications for Continuous Emission Monitoring of Carbon Monoxide and Oxygen for Incinerators, Boilers, and Industrial Furnace Burning Hazardous Waste*, by reference.
- VII.D.11. Copies of the data collected under this condition shall be provided to the Director upon request. The data shall be provided in electronic format if requested.

VII.E. WASTE FEED CUT-OFF REQUIREMENTS

The Permittee shall operate and maintain the systems to automatically cut-off the munitions feed to the rotary furnace under any of the following conditions:

SYSTEM PARAMETER	IMMEDIATE CUTOFF LIMIT	DELAYED CUTOFF LIMIT	DELAY PERIOD
1. Rotary Furnace exit temperature	>680°F	N/A	N/A
2. Rotary Furnace rotation	<0.5 rpm	N/A	N/A
3. Rotary Furnace rotation	>3 rpm	N/A	N/A
4. Rotary Furnace pressure	N/A	>atmospheric	5 seconds
5. Afterburner temperature	<1611°F HRA	N/A	N/A
6. Afterburner temperature	>1811°F HRA	N/A	N/A
7. Baghouse temperature	<750°F HRA	N/A	N/A
8. Baghouse temperature	>1048°F HRA	N/A	N/A
9. Baghouse pressure drop	<2.0" W.C.	N/A	N/A
10. Particulate monitor	N/A	>20%	15 seconds
11. CO concentration in the stack (corrected to 7% O ₂ , dry basis)	>100 ppmv HRA	>500 ppmv	60 seconds
12. Stack gas velocity	>45 fps HRA	N/A	N/A
13. Afterburner flame out	loss of flame	N/A	N/A
14. CO/O ₂ gas monitor	Failure	N/A	N/A
15. Waste feed scale	Failure	N/A	N/A
16. Afterburner controls	Failure	N/A	N/A
17. Afterburner combustion air fan	Failure	N/A	N/A
18. Draft fan	Failure	N/A	N/A
19. Draft fan controller	Failure	N/A	N/A

VII.E.19. In addition to the waste feed cut-off systems and associated set points specified in Conditions VII.E.1 through 19, the Permittee shall construct and maintain additional systems to manually or automatically cut-off the waste feed to the rotary furnace under any of the following conditions:

- VII.E.19.a. Any mechanical malfunction with either the rotary furnace system or controls which would compromise the integrity of the system.
- VII.E.19.b. Air pollution control device waste residue collection bins, hoppers, or containers are full and additional waste feeds would cause these receptacles to overflow.
- VII.E.20. The waste feed rate monitoring system shall be programmed so that the combination of weight allowed per cycle and the cycle frequency will not allow the feed rates specified in Conditions VII.C.10 through VII.C.14 to be exceeded.
- VII.E.21. In the case of a malfunction of the automatic waste feed cut-off system, the Permittee shall immediately initiate the furnace shut down procedure as described in Attachment 28. The Permittee shall not restart the waste feed until the problem causing the malfunction has been identified and corrected.
- VII.E.22. If the automatic waste feed cut-off system fails to function properly, the Permittee shall notify the Director in writing within seven days indicating the reason for the malfunction and also describing corrective measures taken by the Permittee to preclude future occurrences.
- VII.E.23. The Permittee shall test the emergency waste feed cut-off system and associated alarms listed in Conditions VII.E.1 through 19 at least weekly to verify operability. For purposes of this waste feed cutoff test, weekly is defined as 168 hours of operation on munition materials. Shutting off the fuel supply to the afterburner will be considered sufficient for testing the cutoff systems associated with Condition VII.E.13. Additionally, the waste feed cutoff test may be run with the afterburner low temperature interlock set at 1300°F.

VII.F. INSPECTION REQUIREMENTS

- VII.F.1. On at least a daily basis, when in operation, the Permittee shall thoroughly, visually inspect the rotary furnace, afterburner, off-gas pollution control system, and associated equipment (piping, valves, ducting, feed systems, etc.) and containment systems for leaks, spills, fugitive emissions, deterioration, excessive wear, and signs of tampering per Attachment 4. These inspections shall be accurately documented.
- VII.F.2. On at least a daily basis, when in operation, the Permittee shall thoroughly, visually inspect the monitoring instrumentation for out of tolerance and recorded operational data. These inspections shall be accurately documented.
- VII.F.3. The metal and particulate residues from the discharge of the rotary furnace shall be separated and inspected before these items are removed from the paved area of the AED Test Site. This inspection shall be performed within the next twenty-four hour operating period or within seven calendar days following the processing of

the muntions. Particulate residues shall be placed in a container and managed in accordance with Attachment 2 – Waste Analysis Plan. Any un-demilitarized munition shall be recycled back into the rotary furnace. This event, along with the quantity and type of un-demilitarized munition, shall be recorded in the operating log.