ATTACHMENT 30

DECINERATION™ SYSTEM DESCRIPTION

The Decineration™ System

The Decineration™ system is a rotary furnace system which has been designed by U.S Demil, LLC. for the United States Army for the low temperature thermal demilitarization of ammunition ranging from small arms through 20 mm. Ammunition larger than 20 mm must be sectioned or disassembled prior to feeding into the furnace.

It has many safety and environmental features, which are used to protect the operators and the environment during operation.

The system has three major sections, which are the feed room, the furnace, and the air pollution control equipment.

SECTION #1: THE FEED ROOM

The feed room contains the main control panel, the continuous emissions monitoring unit (located in the APE 1236 test furnace feed room), the waste feed rate monitoring system, and the feed conveyor.

Main Control Panel:

The main control panel contains various pieces of control equipment to monitor and control the furnace operation. Process controllers are used to control the rotary furnace feed end temperature, negative pressure in the rotary furnace, and afterburner temperature.

The control system is equipped with two discrete control systems to monitor and control the electric rotary furnace and afterburner. The afterburner burner controller is a sequence controller which supervises the pre-ignition air purge, ignition, main flame operation, and post operation air purge. The afterburner flame status is monitored by a flame detector.

Logic control for the furnace is performed by a programmable logic controller (PLC). The PLC receives both discrete (on/off) inputs from switches, and analog inputs from transmitters. The PLC controls the motor starters, the waste feed rate monitoring system, safety interlocks, and alarms.

The computer system is a PC based machine running data acquisition software called Wonderware, which provides centralized and integrated data management, process graphics, operator interface, and report generation. Through a hard wired data link, the Wonderware communicates with the PLC. All process parameters and information contained in the PLC is available to Wonderware. The Wonderware generates reports, logs data, develops historical trends, displays process parameters, and logs alarms received from the PLC. The primary function of the Wonderware is to provide a human machine interface to record process data for internal operational use and regulatory compliance records.

Continuous Emissions Monitoring System:

The existing APE1236 test unit air pollution control system is equipped with a continuous emissions monitoring (CEM) system which measures oxygen and carbon monoxide in the exhaust stack. The CEM system includes a sampling system, which continuously pulls a stack gas sample and transports it to the analyzers. The sample extraction point is located in the stack approximately 20 feet above grade. The following are included in the sampling system:

1. Sample extraction probe
2. Heat-traced sample lines
3. Calibration ports
4. Dual stage sample conditioner
5. Sample pump
6. Flow meter

The CEM system is calibrated by the operators daily when in operation.

The percent oxygen is continuously monitored by the oxygen analyzer located in the gas monitoring enclosure. The analyzer is a multi-range unit, which includes a 0-25% scale. The output from the analyzer is recorded at the main control panel and is used by the PLC to correct the carbon monoxide measurement to 7% oxygen content in the stack gas.

The parts per million (ppm) level of carbon monoxide in the stack are continuously monitored by the carbon monoxide analyzers located in the gas monitoring enclosure. The analyzers are non-dispersive infrared (NDIR) analyzers. One analyzer is a 0-200 ppm range and the other is a 0-3000 ppm range model. The output from the analyzers is corrected to 7% oxygen by the PLC. The corrected value is used in controlling the feed rate of ammunition into the rotary furnace.

Waste Feed Rate Monitoring System:

The waste feed rate monitoring system (WFRMS) controls how fast and how much ammunition is fed into the furnace. The WFRMS major components are an explosion proof scale for weighing the ammunition, a push off box, and a slide chute. The scale reports the measured weight to the PLC via a load cell. The PLC verifies that the weight is equal to or below the established limit for the item being demilitarized. Once the PLC has verified that the weight is correct, the push off box pushes the ammunition item onto the slide chute, which is over the feed conveyor. The WFRMS is capable of cycling every 15 seconds. If an out of parameter condition arises, the WFRMS is stopped until the out of parameter condition is corrected.

Feed Conveyor:

The feed conveyor is used to move the ammunition from the feed room through the one inch steel barricade wall into the barricade area. The feed conveyor then deposits the ammunition into the rotary furnace feed chute.

SECTION #2: THE 24D174 ROTARY FURNACE

An equipment pad is surrounded by a safety barrier. It contains the feed conveyor, the rotary furnace and the discharge conveyor. A temporary, fabric skinned structure will be erected over the equipment pad after installation and before the test sequence commences. The temporary structure is intended to contain any fugitive emissions, which would be pulled back into the air abatement system through the air abatement draft fan.

24D174 Rotary Furnace:

The 24D174 Rotary Furnace is designed to demilitarize the ammunition items and effectively decompose the reactive components from the metal shells. The heat to decompose the ammunition is provided by electrical heating elements external to the movement of the ammunition through the rotary furnace tube. Decomposition gases and any particulates exit the furnace at the discharge end of the furnace above the discharge chute. The metal components of the ammunition are discharged at the discharge end of the rotary furnace.

The rotary furnace tube is level in the horizontal position. The ammunition is propelled through the furnace by means of a spiral flight (Archimedes screw), which is mechanically attached to the inside of the furnace tube. As the ammunition travels through the rotary furnace, it is in contact with the tube wall, which is externally heated via electrical resistance elements. The ammunition heats up to a point below the combustion temperature, where the propellants decompose to a vapor state. Any unlikely high order detonations are contained by the thick cast steel walls of the tube. The spiral flights provide physical separation of ammunition or groups of ammunition, discouraging sympathetic propagation of detonations and defeating fragments generated by any detonations. Ammunition feed rates, residence time within the furnace (determined by speed of revolution of the furnace), and operating temperatures have been established for each ammunition item by controlled testing.

The rotary furnace is approximately 30 feet in overall length; 174 inches are within the three (3) heated zones. The internal diameter is 24 inches. The rotary furnace tube is fabricated utilizing three sections of rolled and welded 304 stainless steel plate. The wall thickness is 0.6875 inches. For additional personnel safety, the rotary furnace is surrounded by barricade walls.

The rotary furnace is equipped with three (3) temperature control zones. Each zone is operated by an independent SCR controller. Each SCR controller feeds a set of electric resistance heating elements which are located between the furnace's exterior walls and the outside of the rotary tube.

The feed end temperature of the furnace ranges between ambient and 500^{o}F while the discharge end temperature ranges from 600 to1200^{o}F during normal operation.

The rotary furnace is operated under a slight negative pressure. This pressure is typically -0.15 to -0.25 inches of water column. The negative pressure in the rotary furnace is determined by the flue gas flow rate and pressure drops through the air pollution control system and draft fan. For those short instances where the pressure in the rotary furnace tube goes positive, any emissions are captured in the temporary structure and subsequently routed back to the air abatement control system

The rotation speed of the rotary furnace is automatically controlled so that the munitions achieve demilitarization in the center of the rotary furnace.

Discharge Conveyor and Collection Area:

The solid waste exits the rotary furnace at the discharge end. The solid waste is typically the metal casings (brass or steel) and lead projectiles. This waste is removed from the barricaded area via a wide belt, S shaped, discharge conveyor. The low end of the discharge conveyor is located underneath the discharge end of the rotary furnace. The high end of the conveyor passes through the one inch steel barricade wall and deposits the waste into containers for disposal.

SECTION #3: THE AIR POLLUTION CONTROL EQUIPMENT

The air pollution control equipment area contains equipment for managing the exhaust gases and consists of a cyclone, an afterburner, a high temperature cast ceramic filters baghouse, the high temperature draft fan, and the stack. For this test, the existing APE 1236 test site air pollution control equipment will be utilized.

Cyclone:

The rotary furnace process gases are transported to the cyclone by 24-inch diameter stainless steel ducting. The cyclone is placed between the rotary furnace and afterburner to remove particulate from the flue gas. The cyclone has a 90-95% removal efficiency for particles 10 microns and larger. The pressure drop across the cyclone is 2 to 5 inches of water column. Particles are removed from the cyclone at the bottom by a double tipping valve. The valve has two gates that are motor driven. The gates open alternatively so that only one gate is open at any time, thus the negative pressure is maintained. The particulate is deposited in a collection container for disposal.

Afterburner:

The process gases from the cyclone are transported to the afterburner by 24-inch diameter stainless steel ducting. The afterburner is built to AED specifications by Southern Technology, Inc. They did not assign it a model number. The afterburner is designed to heat up to 4,000 standard cubic feet per minute (scfm) of process gas from 600 to 1200^{o}F, to an exit temperature range of 1500 to 1800^{o}F, with a minimum process gas residence time of 2 seconds. This increase in temperature destroys any organics in the process gas.

The afterburner is heated by a diesel fuel burner with a propane pilot ignition system. The afterburner is equipped with a Hauck WRO164 wide range burner. The burner has a capacity of eight million BTU/hr and a nominal turndown ratio of 10:1.

High Temperature Cast Ceramic Filters Baghouse:

JT Systems, Inc. built this baghouse to AED requirements. It is a Model JTS-GE-CF-154-HC Pulse Jet Dust Collector. The flue gases from the afterburner are transported to the baghouse by 120 feet of 30 inch diameter stainless steel ducting. The steel ducting is long enough to produce a temperature drop from 1600^{o}F at the exit of the afterburner to 750^{o}F entering the baghouse. The baghouse is designed to filter small particulate ash and heavy metals from the flue gas. The baghouse is capable of filtering

below 0.03 gr/dscf using cast ceramic filters. The baghouse contains 154 new filters that are 5.75 inches in diameter and 10 feet long. They are made of cerafil ceramic material. The new filters will be conditioned to OEM standards. This results in a total filter area of 2325 square feet with a filtration velocity of 5.0 ft/sec. The baghouse operates with a delta pressure range of 0.5 to 30.0 inches of water column and a temperature of 800^{o}F.

High Temperature Draft Fan:

Fan Equipment Co., Inc. manufactures the draft fan. It is a type TE, size M-21. The flue gases from the baghouse are transported to the high temperature draft fan by 20-inch diameter stainless steel ducting. The flue gases are drafted through the entire furnace system by an induced draft fan, which is located downstream of the baghouse. The draft fan is used to produce a negative pressure throughout the entire furnace system. The draft fan will produce 6700 CFM and 30" H_2O static pressure at 2579 rpm.

Exhaust Stack:

The cleaned and cooled flue gases from the draft fan are discharged into the exhaust stack and then the atmosphere. The stack is 20 inches in diameter and 37 feet tall. The exhaust stack has various instrumentation ports. The ports for continuous flue gas analyzers and gas velocity are located approximately 20 feet above grade. The flue gas analyzer port services the sampling system, which supplies the continuous oxygen and carbon monoxide analyzers. These analyzers are used to indicate system performance and are interlocked with the automated control system. The gas velocity port accommodates a mass flow meter, which provides the gas velocity in the stack and a stack gas temperature.

Miscellaneous Equipment

Additional items that are a part of the Decineration™ system are as follows:

Environmental Units:
The environmental units are used to keep the main control panels and gas monitoring enclosure at a constant temperature of 70^{o}F year round.

480 Volt 60 Hz Power Panel:
The 480-volt power panel provides power to the rotary furnace (heating elements, controls, and the tube-rotating motor), draft fan, the afterburner combustion air fan, all of the conveyor motors, all of the double tipping valve motors, fuel oil pump, and the air compressor.

Step down Transformer:
Two 112.5 KVA, 3 phase, 480-volt delta 208/120-volt wye, dry type transformers are required to provide the needed power to the control system.

208 Volt 60 Hz Power Panel:
The 208-volt power panel provides power for other equipment on the site.

110 Volt 60 Hz Power Panel:
The 110 volt power panel provides power to the WFRMS, the PLC, all of the controllers, the gas monitoring enclosure, power supplies in the main control enclosure, all of the actuators, the heat trace sample line, and the environmental control unit.

1000 Gallon Propane Tank:
The propane tank is a 1000-gallon horizontal tank with regulator. The tank provides propane for the afterburner propane pilot ignition system.

4000 Gallon Fuel Oil Tank:
The fuel oil storage tank is a 4000-gallon skid mounted tank with pump. The tank provides the required fuel oil flow to operate the afterburner burner.

Air Compressor:
The air compressor provides compressed air to the baghouse, the gas monitoring enclosure, and the WFRMS. The air compressor is rated for 100-125 psi, 33.6 CFM, with an 80-gallon horizontal tank and a 7.5 HP, 480-volt motor.