ATTACHMENT 14

SYSTEM DESCRIPTION

APE 1236M2 Deactivation Furnace

1.0 The APE 1236M2 Deactivation Furnace is a rotary furnace system which has been designed by the United States Army for thermal destruction 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.

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

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

2.0 Section #1: THE FEED ROOM

2.1 The Feed Room contains the main control panel, the continuous emissions monitoring unit, the waste feed rate monitoring system, and the feed conveyor.

2.1.1 Main Control Panel:

2.1.1.1 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.

2.1.1.2 The control system is equipped with two burner control systems to monitor and control the rotary furnace and afterburner burners. The burner controllers are sequence controllers which supervise the pre-ignition air purge, ignition, main flame operation, and post operation air purge. The flame status is monitored by a flame detector.

2.1.1.3 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.

2.1.1.4 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 an Ethernet 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, and 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 use and regulatory compliance.

2.1.2 Continuous Emissions Monitoring System:

2.1.2.1 The rotary furnace system shall be 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 (6 meters) 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.

2.1.2.2 The CEM system shall be calibrated by the operators daily when in operation.

2.1.2.3 The percent oxygen shall be 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.

2.1.2.4 The parts per million (ppm) level of carbon monoxide in the stack shall be 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 outputs from the analyzers are corrected to 7% oxygen by the PLC. The corrected value is used in controlling the feed rate of ammunition into the rotary furnace.

2.1.3 Waste Feed Rate Monitoring System:

2.1.3.1 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 incinerated. 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 shall be stopped until the out of parameter condition is corrected.

2.1.4 Feed Conveyor:

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

3.0 SECTION #2: THE ENCLOSURE BUILDING

3.1 The enclosure building surrounds the barricaded area and contains the rotary furnace, the discharge conveyor and collection area. The enclosure building is designed to be under constant negative pressure so that any fugitive emissions from the kiln will be pulled back into the incineration system through the combustion air fans.

3.1.1 Rotary Furnace

3.1.1.1 The rotary furnace is designed to ignite the ammunition items and effectively burn out reactive components from the metal shells. The heat to ignite the ammunition is initially provided by fuel oil firing countercurrent to the movement of the ammunition through the rotary furnace. Combustion gases and entrained ash exit the furnace adjacent to the ammunition feed chute. Non-entrained ash and the metal components of the ammunition are discharged at the burner end of the rotary furnace.

3.1.1.2 The retort is level in the horizontal position. The ammunition is propelled through the furnace toward the flame at the burner end by means of spiral flights, which are an integral part of the furnace castings. As the ammunition approaches the flame and becomes heated, they either detonate or burn freely, depending upon the ammunition configuration and characteristics. High order detonations are contained by the thick cast steel walls. The spiral flights provide physical separation of ammunition or groups of ammunition, discouraging sympathetic propagation of detonations and defeating fragments generated by the 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.

3.1.1.3 The rotary furnace is 20 feet long with an average integral diameter of 30.5 inches. The rotary furnace is made of four 5-foot long sections, called retorts, which are bolted together. The two center sections have a wall thickness of 3.25 inches and the two end sections have a wall thickness of 2.25 inches. The retorts are constructed of ASTM A217 chromium molybdenum steel for high strength and ductility at elevated temperatures. For additional personnel safety, the rotary furnace is surrounded by barricade walls.

3.1.1.4 The rotary furnace is equipped with a Hauck 783 proportioning burner at the discharge end of the rotary furnace. The burner has a capacity of 3 million BTU/hr and a nominal turndown ratio of 4:1.

3.1.1.5 The feed end temperature of the furnace ranges between 350^{o}-500^{o}F (177^{o}-260^{o}C) while the discharge end temperature ranges from 800^{o}-1100^{o}F (427^{o}-593^{o}C) during normal operation.

3.1.1.6 The rotary furnace shall operate 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 kiln goes positive, any emissions shall be captured in the enclosure building and subsequently routed back to the incinerator.

3.1.1.7 The rotation speed of the furnace is automatically controlled so that the munitions achieve detonation or burn in the center of the furnace.

3.1.2 Discharge Conveyor and Collection Area

3.1.2.1 The solid waste exits the rotary furnace at the discharge/burner end. The solid waste is typically the metal casings (brass or steel), melted lead projectiles, and residual ash. 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/burner end of the rotary furnace. The high end of the conveyor passes through the concrete barricade wall and deposits the waste into containers for disposal. The containers are temporarily held in the collection area within the enclosure building until they are removed to the sorting building for inspection.

4.0 SECTION #3: THE AIR POLLUTION CONTROL EQUIPMENT

4.1 The Air Pollution Control Equipment area contains equipment for managing the exhaust gases and consists of a cyclone, afterburner, high temperature cast ceramic filters baghouse, and the high temperature draft fan and stack.

4.1.1 Cyclone

4.1.1.1 The rotary furnace flue gases are transported to the cyclone by 24-inch (610-mm) 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 shall be deposited in a collection container for disposal.

4.1.2 Afterburner

4.1.2.1 The flue gases from the cyclone are transported to the afterburner by 24-inch (610-mm) diameter stainless steel ducting. The afterburner is built to AED specifications by a qualified manufacturer. Because it has been built to AED specifications the unit does not have a model number. The afterburner is designed to heat up to 4,000 SCFM (standard cubic feet per minute) of flue gas from 350^{o}-500^{o}F (177^{o}-260^{o}C) to an exit temperature range of 1500^{o}-1800^{o}F (760^{o}-871^{o}C) with a minimum flue gas residence time of 2 seconds. This increase in temperature further destroys any organics in the flue gas.

4.1.2.2 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 8 million BTU/hr and a nominal turndown ratio of 10:1.

4.1.3 High Temperature Cast Ceramic Filters Baghouse

4.1.3.1 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 (762mm) 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 136 filters that are 5.75 inches in diameter and 10 feet long. They are made of cerafil ceramic material. This results in a

total filter area of 2,040 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 (427^{o}C).

4.1.4 High Temperature Draft Fan

4.1.4.1 Fan Equipment Co., Inc. manufactures the draft fan. It is a Model 360 HPS. The flue gases from the baghouse are transported to the high temperature draft fan by 20-inch (508-mm) 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 is capable of producing 8500 ACFM (Actual Cubic Feet per Minute) at 30 inches of water column.

4.1.5 Exhaust Stack

4.1.5.1 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 (508 mm) in diameter and 37 feet (11.28 meters) tall. The exhaust stack has various instrumentation ports. The ports for continuous flue gas analyzers and gas velocity are located approximately 20 feet (6 meters) 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 incineration 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 furnace system are as follows:

Environmental Unit:
The environmental unit is used to keep the main control panel and gas monitoring enclosure at a constant temperature of 70^{o}F (21^{o}C) year round.

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

Step down Transformer:
A 112.5 KVA, 3 phase, 480-volt delta 208/120-volt wye, dry type transformer is 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 both the retort burner and 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.