32 INCINERATOR
OPERATION AND MAINTENANCE PLAN

The Dow Chemical Company
Michigan Operation Incineration Complex
Midland, Michigan

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List of Acronyms

acfm	actual cubic feet per minute
APC	Air Pollution Control
AWFCO	Automatic Waste Feed Cut Off
CCS	Combustion Control System
CEMS	Continuous Emission Monitoring System
CERMS	Continuous Emission Rate Monitoring System
CMS	Continuous Monitoring System
CMS PEP	Continuous Monitoring System Performance Evaluation Plan
CPMS	Continuous Parameter Monitoring System
DAS	Data Acquisition System
EMOC	Electronic Management of Change
ESV	Emergency Safety Vent
ESVOP	Emergency Safety Vent Operating Plan
FRP	Fiberglass Reinforced Plastic
GFC	Gas Filter Correlation
SAP	Global Equipment Maintenance Tracking System
GHRIS	Global Human Resources Information System
GMWP	Global Maintenance Work Process
HAP	Hazardous Air Pollutant
HWC MACT	Hazardous Waste Combustor Maximum Achievable Control Technology
ID Fan	Induced Draft Fan
IPT	In Plant Training
IWS	Ionizing Wet Scrubber
ma	milliamp
MMBtu/hr	millions of British Thermal Units per hour
SAP	Material and Services Maintenance System
ODMS	Operating Discipline Management System

O&MP	Operation and Maintenance Plan
PCC	Process Control Computer
PFD	Process Flow Diagram
P&ID	Process and Instrumentation Diagram
ppmv	part per million by volume
RCRA	Resource Conservation and Recovery Act
SCBA	Self Contained Breathing Apparatus
SCC	Secondary Combustion Chamber
SOP	Standard Operating Procedure
SSMP	Startup, Shutdown and Malfunction Plan
UV	Ultraviolet

1.0 Introduction

The Dow Chemical Company (Dow) operates a hazardous waste incineration complex (32 Incinerator) at its Midland, Michigan chemical manufacturing facility. The 32 incinerator consists of a rotary kiln, secondary combustion chamber (SCC), quench, air pollution control (APC) train, induced draft (I.D.) fans and a stack. The 32 Incinerator must meet the requirements of the Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, otherwise known as the Hazardous Waste Combustor Maximum Achievable Control Technology (HWC MACT) rule promulgated under 40 CFR Part 63 Subpart EEE. This rule applies to incineration systems that burn hazardous waste. The HWC MACT requires facilities to develop an Operation and Maintenance Plan (O&MP). The plan must describe in detail procedures for operation, inspection, maintenance, and corrective measures for all components of the combustor, including associated pollution control (APC) equipment that could affect emissions of regulated hazardous air pollutants (HAPs).

This plan has been developed to meet O&M Plan requirements in Section 63.1206(c)(7) of the HWC MACT and Section 63.6(e) of the MACT General Provisions found under 40 CFR 63 Subpart A. This plan is designed to help ensure that Dow's 32 Incinerator is operated and maintained safely and in a manner that is consistent with good air pollution control practices for minimizing emissions to the levels required by the HWC MACT standards. Dow has generated several documents that provide detailed information on how to operate and maintain the 32 Incinerator. Most of these documents are "living" documents, which means that revisions will be made as new information or better ways to accomplish specific tasks are determined. This O&M Plan incorporates these documents by reference and adds details as necessary that completely define how to operate the system. This minimizes the revisions that must be made to the O&M Plan as changes are made to detailed operating and maintenance procedures.

This O&M plan is organized as follows:

- Section 2.0 includes a process description overview of the 32 Incinerator
- Section 3.0 summarizes the operational aspects of the 32 Incinerator
- Section 4.0 summarizes the maintenance aspects of the 32 Incinerator
- Section 5.0 describes corrective measures
- Section 6.0 describes how operations and maintenance are implemented and administered.

2.0 Process Description overview

The following is a description of the 32 Rotary Kiln Incinerator. A complete set of process flow diagrams (PFD's) is located the 34 building library and/or the Dow fileserver. A complete set of process and instrumentation diagrams (P&ID's) is also located in the 34 building library and/or the Dow fileserver

The system consists of a rotary kiln, SCC, quench chamber, APC system, induced draft (I.D.) fans and a stack. The general arrangement is shown on Drawing B01-002-32PERMIT. Wastes are fed to the incinerator as bulk liquids directly from the transport container, as bulk liquids from waste storage tanks, as bulk solids, as wastewater treatment solids, and as containerized solids. Both liquid and solid wastes are fed to the rotary kiln; liquid waste and gaseous vent wastes are fed to the SCC. Ash residue from the rotary kiln is sent to a hazardous waste landfill. The APC train consists of a nitrogen oxides (NO_X) abatement reactor, rapid quench chamber, packed tower condenser, high energy venturi scrubber, chlorine scrubber, and multi-stage ionizing wet scrubber (IWS).

2.1 Combustion System

The combustion system of the 32 Incinerator includes a rotary kiln and SCC. The front face of the kiln includes lance feed locations and a glycol cooling system. The thermal output of the combustion system is 130 MM Btu/hr.

2.1.1 Combustion Chambers

2.1.1.1 Rotary Kiln

The rotary kiln is co-current design (waste and combustion gas flow in the same direction) comprised of the feed chute, front face, front seals, refractory lined shell, discharge seals, kiln drive mechanism and associated burners and lances. The front face is a combination of steel and refractory. The front wall is fitted for the waste feed burners, lances, and solids chute. The primary seals are made of graphite segments. The secondary seals are Webbco Seals. The kiln steel shell is 14.5 ft I.D. by 39.4 ft long. The kiln is lined with high density firebrick. The volume of the kiln is 4,835 cubic feet inside the refractory lining.

The kiln is driven by a variable speed main drive motor. An auxiliary drive system provides back up drive capabilities. The kiln rotation is 0.1 to 1.0 rpm. The kiln slopes at a 1.7 degree angle toward the SCC where the ash is collected and then removed. Typical kiln operating temperature is greater than 800 °C.

2.1.1.2 Secondary Combustion Chamber (SCC)

The SCC is a refractory-lined vertical cylindrical chamber 23 ft. in diameter by 50 ft. high overall with an 8.5 ft. in diameter by 64.9 ft. long duct. The burners are located midway up the SCC (25 ft. from the exit to the duct section). The chamber is operated below atmospheric pressure and is capable of sustained operation greater than 1,100 °C. The total residence volume of the SCC is 14,070 cu. ft.

2.1.2 Emergency Vent System

The combustion system is equipped with an emergency safety vent (ESV). The purpose of the ESV is to protect personnel working at the facility and downstream equipment in the event of certain system failures. The ESV opens under the following conditions:

- Power failure
- ID Fan failure
- High quench chamber temperature
- Low total water flow to the quench chamber
- Extremely high pressure

The counterweighted damper is opened by pneumatically operated cylinders. All waste feeds to the incinerator are stopped immediately in the event that the damper opens. The system cannot be restarted until the damper is closed.

2.2 Burner and Feed Systems

The kiln is equipped with two tri-fuel burners, four lances, a wastewater treatment sludge feed point, and a solid waste feed chute. The secondary combustion chamber is equipped with three dual-fuel burners, two vent nozzles, and one aqueous waste lance. These feed systems are described in this section.

2.2.1 Kiln Tri-Fuel Burners

These burners are equipped with two (2) lances with the capability of firing liquid wastes and supplemental fuel. The burners are rated at 35 MM Btu/hr each. Liquid wastes are atomized with either air or steam. The burners are equipped with flame scanners for burner management control. Each burner has a maximum air flow capacity of 7,000 cubic feet per minute. The turndown ratio of each burner is approximately 6:1.

2.2.2 Kiln Lances

Four lances allow for feed of wastes to the kiln. These lances may be fed without atomization, or it can be atomized with air or steam. The rated firing rate to each lance is typically 10 - 40 lb/minute.

2.2.3 Kiln Deslagging Lance

A fuel oil lance with external atomization is available at the discharge end of the kiln for deslaggiing purposes. The lance is movable to allow deslagging from three locations. This lance is used as needed to melt off the slag that may occur in the kiln.

2.2.4 Wastewater Treatment Sludge Feeder

The front face of the kiln is equipped with a system to meter a controlled rate of dried wastewater treatment sludge from a storage tank H-2170 using a series of screw feeders. This system can feed up to 8,000 lb/hr. Wastewater treatment plant sludge may also be fed to the solid waste feed chute.

2.2.5 Solid Waste Feed Chute

Bulk and containerized solid feed is introduced into the kiln via the feed chute. The feed chute is sloped at approximately 55° downward so as to prevent the accumulation of material in the chute. The chute is cooled with a heat transfer media. The chute extends through the front face where the containers and solids enter the kiln. The solid waste handling system is described in detail in Section 2.2.9.

2.2.6 SCC Dual Fuel Burners

The SCC is equipped with three dual-fuel burners, each capable of firing one liquid waste stream and natural gas. These burners are rated at 30MM Btu/hr each. The burners are equipped with flame scanners for burner management control. Each burner has a maximum air flow capacity of 6,000 cubic feet per minute. The burners are mounted in the side wall of the SCC above the inlet to the chamber. The lower section of the SCC serves as the vestibule for the kiln entrance and as an ash drop to the ash removal system. The turndown ratio for each burner is approximately 6:1.

2.2.7 SCC Aqueous Lances

One aqueous waste feed lance for introduction of wastewater or service water is located near the bottom of the SCC.

2.2.8 SCC Vent Gas Burners

Two vent-gas burners for injection of "off-gases" from the incinerator complex waste storage tank vents and unloading spots are located in the SCC.

2.2.9 Waste Handling and Feed Systems

Liquid wastes are received at unloading stations, which serve the 32 Incinerator. These liquid wastes are fed directly to individual burners or tank storage for future incineration.

The storage tank system contains ten waste tanks. The organic liquid waste tanks are vented as they are filled and the emissions are captured for incineration. The organic liquid waste tanks are all grounded and equipped with a nitrogen purge to allow buildup of an inert cover to prevent accumulation of a flammable vapor mixture in the tanks. V-101 and V-601 are generally water tanks and vent to the atmosphere (no N2 purge).

Containerized solid wastes are received and held in the pack room feed conveyor area and accumulated for placement on the pack conveyor system. Containers are typically 5 gallon to 85 gallon capacity having a maximum heat release rate of approximately 1.5 MM Btu per container. The container feed rate can be adjusted on the process control computer (PCC). The typical range of introduction of packaged waste is one container every three to six minutes.

Bulk solids are received into a ten cubic yard hopper at the 32 Incinerator facility. At the bottom of the hopper there is a volumetric feeder that allows varying amounts of material to fall onto an elevating conveyor that discharges the material into the feed chute via a set of airlock doors. The chute extends through the front face where the containers and solids enter the kiln. Solids feed rate is controlled by varying the speed of the volumetric feeder.

2.2.10 Auxiliary Fuel System

Natural gas is used in the rotary kiln and SCC dual-fuel and tri-fuel burners as primary auxiliary fuel. Diesel oil will also be used as an auxiliary fuel, and is used for deslagging the kiln.

2.2.11 Vent System

The displaced vapors from the tanks as the tanks are filled are treated in the SCC of the 32 Incinerator or using the activated carbon adsorption system.

2.2.12 Combustion Air

One combustion air blower provides primary combustion air to the kiln tri-fuel burners and the SCC dual-fuel burners. The combustion air blower is a centrifugal blower sized to provide up to 34,000 acfm of air. Auxiliary combustion air to the kiln through the feed chute is provided by a second combustion air blower. This combustion air blower is also a centrifugal blower sized to provide up to 28,000 acfm of secondary combustion air to the system.

2.3 Residue Handling System

2.3.1 Ash Removal

Ash discharged from the kiln drops into a water bath located below the SCC. The water bath acts as a water seal to allow the removal of ash out of the rotary kiln and SCC without the loss of vacuum on the system. The ash is cooled and solidified in this bath. The ash is then conveyed by two parallel drag-flight conveyors which remove the ash from the water and transport the material into the ash marshalling area. The ash is subsequently transported to a licensed hazardous waste landfill for disposal.

2.3.2 Front Seal Ash Removal

Ash removed from the front seal of the kiln is recycled to the kiln through the bulk solids feed system.

2.4 Air Pollution Control (APC) System

The APC system provides removal of nitrogen oxides, particulates, acid gas, and halogens from the combustion of wastes. The APC system is described below:

2.4.1 Recycle Water System

Recycled water is provided to each APC device throughout the APC system. Recycle water pumps are provided for the quench chamber, condenser tower, venturi scrubber, chlorine scrubber, and each stage of ionizing wet scrubbers. Fresh makeup water (either service water or Huron water) can be added to each device as needed. Recycle water flow to the packed tower condenser passes through an indirect heat exchanger to remove heat and thereby reduce the temperature of the recycled water. Blowdown from the system is treated by Dow's on-site wastewater treatment plant.

2.4.2 Nitrogen Oxide Abatement Reactor

Following the SCC and the ESV, an 8.5 ft. diameter by 35 ft. reaction chamber is provided for nitrogen oxide (NO_x) abatement as needed. A NO_x reagent (urea) is stored in a 10,000-gallon tank where the temperature of the reagent is maintained at approximately 70 ˚F. The stored urea is mixed with Huron water and fed to the reaction chamber through air-atomized nozzles. The system is designed to achieve 10 to 55% reduction of NO_x depending upon the NO_x loading to the chamber. Maximum removal is achieved at the highest NO_x loading.

2.4.3 Quench Chamber

Flue gases from the SCC are ducted into a vertical quench chamber. The primary purpose of the quench chamber is to adiabatically cool, via saturating water sprays, the gas leaving the afterburner chamber from combustion temperatures to below 100 °C to protect the downstream operating equipment from thermal damage. Secondarily, the quench chamber partially removes acid gases, condenses inorganic vapors, and initiates agglomeration of fine particulate. In addition, employment of a rapid quench provides a reduced potential for post combustion zone de Novo dioxin/furan formation.

The quench chamber is a 14-foot diameter by 30-foot tall, open chamber lined with a combination of refractory and acid resistant brick. The initial co-current makeup-water injection near the top of the quench chamber utilizes a system of high-dispersion atomizing nozzles. The water vaporization reduces the gas temperature to near the adiabatic saturation temperature.

A second, high-volume water stream is injected further down the column to ensure complete adiabatic saturation of the gas and provide initial acid gas removal.

Water from the quench is discharged to the on-site wastewater treatment plant.

2.4.4 Packed Tower Condenser

The purpose of the packed tower condenser is to further lower the temperature of the gas stream to thereby reduce its volume, to increase the agglomeration of the fine particulate, and to provide scrubbing for acid gases. The packed tower condenser is a 14-foot diameter fiberglass-reinforced plastic column and is 43 feet in overall height containing 15 to 20 feet of 2 inch Kynar packing (Norton Snowflake or equivalent). The packed tower condenser normally operates with 3,000 gallons per minute counter-current water flow for cooling and scrubbing. A portion of the recycled water is pumped from the bottom of the packed tower condenser to the second series of water injection nozzles on the quench chamber (described above). Recycled water to packed tower condenser flows through a heat exchanger as needed to remove heat (cooling) before being reintroduced to the top of the packed section.

2.4.5 Venturi Scrubber

The high-energy venturi scrubber removes the major portion of the very fine particulate from the gas stream. By agglomerating the very fine particles in the packed tower condenser, the efficiency of the venturi scrubber is significantly enhanced. Secondarily, the venturi scrubber removes halogens and other acid gases from the gas stream. The pH of the venturi scrubber recycle is controlled by addition of caustic to the chlorine scrubber, which is the source of water for the venturi scrubber. The pH of the water is controlled to a minimum set point value to ensure halogen emissions are minimized. The venturi scrubber has a FRP body and a Hastelloy-C restrictor in the throat to provide a variable pressure drop. The venturi scrubber can be operated at up to 60 inches of water pressure drop.

2.4.6 Chlorine Scrubber

The chlorine scrubber has two purposes--separation of entrained water from the gas stream leaving the venturi scrubber and reaction of halogens with caustic. The water from the chlorine scrubber bottom is recirculated back to the venturi scrubber and to the top of the chlorine scrubber. Excess water is discharged to the on-site wastewater treatment plant.

The chlorine scrubber is an FRP column that is 14-ft in diameter and 46-ft tall. The packed section of the tower contains approximately 28-ft of 2-inch Kynar and CPVC Tellerete packing (Norton Snowflake or equivalent). The packed section is irrigated with water to prevent the packing from being plugged with fine particulate. As mentioned above, the water from this scrubber is pumped to the venturi scrubber and the top of the chlorine scrubber.

2.4.7 Ionizing Wet Scrubber (IWS)

Nine Model 1000 Ceilcote IWS units are installed in three parallel trains each consisting of three stages in series. These units are fabricated from FRP and contain Hastelloy-C ionizing wire and Hastelloy–C plates. The purpose of the ionizing wet scrubber (IWS) is to remove the low levels of very fine particulate remaining in the gas stream. Particulate, as it enters the units, passes through fields that are typically 10,000 to 30,000 volts that impart a slight electrical charge to the sub-micron particles. As the gas passes through the four-foot thick packed beds, the charged particulates are attracted to the flowing water, which is at ground potential, and are removed from the gas. Water is continuously flushed through the beds. The IWS goes through a routine cleaning cycle to remove solids accumulation.

The IWS has three recycled water systems. One system recycles water from the interconnected basins of the 1st stage of each train to each of the 1st stage packed beds. Similar recycled water systems exist for the 2nd and 3rd stages. Each IWS unit has a controlled flow of Huron water provided to the plates. Water level is maintained in each stage by pumping excess water to the proceeding stage (3rd to 2nd, 2nd to 1st). Excess water from the 1st stage is pumped to the packed tower condenser system.

Hazardous waste feed to the incinerator will only be allowed when the IWS system is operating properly. The IWS system is operating properly when it meets the following specifications:

- A minimum of seven units are operating properly.
- A minimum water flow in each recycled water system of the IWS of 900 gpm (one-hour averaging period) and
- A minimum water flow from the IWS to the packed tower condenser of 161 gpm (one-hour averaging period).

An IWS unit is operating properly when it meets the following specifications:

- A minimum voltage of 8 kV (2-minute averaging period)
- A minimum water flow to the plates of 15 gpm (one-hour averaging period)
- The unit is not in a wash cycle.

2.4.8 Induced Draft Fans

The 32 Incinerator is equipped with two induced draft fans. The primary induced draft (I.D.) fan (1,250 horsepower) provides the main motive force for pulling the combustion gases from the rotary kiln and SCC through the quench chamber, packed tower condenser, venturi scrubber, and chlorine scrubber. The fan wheel is constructed of Hastelloy-C and is sized to provide up to 70 inches of water vacuum. This fan assures a negative pressure on all upstream equipment to minimize fugitive emissions. The secondary I.D. fan (500 horsepower) is designed to provide 30 inches of water vacuum. The fan discharges into the base of a 4.5 - foot diameter fiberglass stack.

2.4.9 Stack

The stack for discharging the scrubbed and cleaned gases is a 4.5-foot diameter by 200-foot tall fiberglass-reinforced plastic stack. Sample ports for particulate testing, continuous emission monitoring and gas analysis are installed in the stack.

2.5 Process Monitoring, Control, and Operation

The incineration operation is controlled and monitored by a Process Control Computer (PCC). This computer monitors the process for proper temperatures, pressures, flows, carbon monoxide and oxygen which are part of the Continuous Monitoring System (CMS). The continuous monitors, that are part of the CMS, meet the HWC MACT Rule definition of a CMS. MACT requires the CMS to sample or read each regulated parameter without interruption, evaluate the detector response at least once each 15 seconds, and compute and record the average values at least once every 60 seconds.

The CMS consists of the continuous parameter monitoring system (CPMS), the continuous emissions monitoring system (CEMS) and the continuous emission rate monitoring system (CERMS) which are described in more detail below. A list of all regulatory process monitors and a description of each are provided in the Continuous Monitoring System (CMS) Performance Evaluation Plan (PEP).

2.5.1 Continuous Parameter Monitoring System (CPMS)

The CPMS consists of all monitors used to measure and maintain the process under controlled conditions with the exception of stack gas monitors which are part of the CEMS described below. Monitors that are part of the CPMS include temperature, pressure, flow rate, pH, flow verification, etc.

2.5.2 Continuous Emissions Monitoring System (CEMS)

The 32 Incinerator is equipped with instrumentation that monitors the stack gas for carbon monoxide (CO) and oxygen (O_2) on a continuous basis. These instruments, and the associated equipment, constitute the Continuous Emissions Monitoring System (CEMS).

The oxygen monitor has a range 0-25%. The unit utilizes an electrochemical transducer for signal generation in proportion to the presence of oxygen. Calibration is accomplished with atmospheric air and purified nitrogen.

The CO monitor is a non-dispersive infrared analyzer with an extractive system to monitor CO over dual ranges of 0 – 200 ppmv and 0 – 3,000 ppmv. Calibration is with certified gases. Output of 4-20 ma is received in the PCC for recording and calculation of hourly averages.

The CO and oxygen monitors are installed, calibrated, maintained, and continuously operated in compliance with the quality assurance procedures for CEMS in the appendix of 40 CFR 63 Subpart EEE and Performance Specification 4B of 40 CFR 60 Appendix B.

2.5.3 Continuous Emissions Rate Monitoring System (CERMS)

The 32 Incinerator is equipped with instrumentation that monitors the stack gas for nitrous oxide (NO_X), sulfur dioxide (SO_2) and flow rate on a continuous basis. These instruments, and the associated equipment, constitute the Continuous Emissions Rate Monitoring System (CERMS).

The NO_X analyzer is a Gas Filter Correlation (GFC) ultraviolet photometer. The analyzer has dual ranges of 0 - 600 and 0 - 2,500 ppmvd, and utilizes a beam splitter to direct the light source through the reference and measurement optical path. The source light passes through the sample cell. The light at the analytical wavelength is absorbed by the NO in the sample while the light at the reference wavelength is not absorbed. The detector provides two electrical signals that are proportional to the intensities of each wavelength. The analyzer compares these signals and transmits an electronic signal (4-20 mA) to the data acquisition system consistent with a corresponding NO_x concentration.

SO_2 is measured using an Ultraviolet (UV) analyzer. The analyzer has a range of 0-300 ppmvd. The analyzer is a Gas Filter Correlation (GFC) ultraviolet photometer. A chopper motor rotates the filter-wheel reference and analytical filters alternately and continuously into the optical path. The source light passes through the sample cell. The light at the analytical wavelength is absorbed by the SO_2 in the sample while the light at the reference wavelength is not absorbed. The detector provides two electrical signals that are proportional to the intensities of each wavelength. The analyzer compares these signals and transmits an electronic signal (4-20 mA) to the data acquisition system consistent with a corresponding SO_2 concentration.

Compact ultrasonic transducers are installed at a 45˚ angle across the stack. The transducers send and receive coded pulses through the gas. The meter measures the difference between the upstream and downstream transit times, and uses digital signal processing and correlation detection to calculate velocity and gas flow rate. The correlation transit-time method responds quickly to changes in velocity. The gas flow meter has a range of 0 – 75,000 acfm.

2.5.4 Safety and Automatic Waste Feed Cutoffs (AWFCO)

A number of monitors also serve as “Automatic Waste Feed Cutoff (AWFCO) Devices.” Instrumentation is used to monitor process conditions, to provide data for assuring compliance with regulatory requirements, to assure appropriate process response and control, to provide operational flexibility, to provide safety interlocking, and to provide various safe shutdown scenarios. Safety and AWFCO shutdown responses are relayed to various equipment items when process limits are not met so that the equipment will go to a fail-safe mode. The process parameters, that alert and initiate an AWFCO response to alarm conditions, are summarized and described in the CMS PEP.

The waste feedrate of pumpable hazardous waste may ramp down over a period not to exceed one minute upon initiation of an AWFCO condition other than minimum combustion chamber temperature or maximum hazardous waste feedrate. The ramp down process begins immediately upon initiation of the automatic waste feed cutoff. If the automatic waste feed cutoff is triggered by an exceedance of the minimum combustion chamber temperature or maximum hazardous waste feedrate, the waste feed cutoff will be immediate and will not ramp down.

3.0 Operations

There are four basic operational scenarios associated with operation of any process; 1) Startup, 2) Normal Operation, 3) Shutdown, and 4) Malfunction. The first three scenarios are well defined and typically occur in sequence. Some specific malfunction scenarios can be defined before they occur with specific procedures established to deal with them. However, this may not always be the case and a malfunction scenario can occur that has not been predefined. In these cases, trained operators will be able to safely manage these dynamic periods.

3.1 Startup, Shutdown and Malfunction

Startup, shutdown and malfunction scenarios are highly dynamic and require significant operator interface and attention. The Startup, Shutdown, and Malfunction Plan (SSMP) has been developed to address these dynamic periods of operation. The SSMP addresses activities critical for preparation of the 32 Incinerator for operation, introduction of wastes, planned and unplanned waste shutoffs, system malfunctions, and system cool down. The incinerator is equipped with an emergency safety vent (ESV) that activates automatically during periods of system malfunction, if necessary. When an ESV opening occurs the process computer has been programmed to automatically and safely shut the incinerator down as soon as possible. An ESV Operating Plan has been developed that describes process control steps for rapidly stopping the waste feed, shutting down the combustor. Copies of the SSMP and ESVOP are located in the 34 building and/or the Dow fileserver.

3.2 Normal Operation

Normal operation exists between the startup and shutdown periods. Normal operation may include introduction of several types of waste feeds including:

- Organic liquid waste
- Chlorinated liquid waste
- Chlorosilane liquid waste
- Aqueous liquid waste

- Bulk solid waste
- Containerized solid waste
- Wastewater sludge solid waste

Based on details from the equipment owner's manuals, manufacturer's recommendations, process knowledge, and training documentation, Dow has developed standard operating procedures (SOP's) for operating the 32 Incinerator and processing these waste streams. The SOP's may be grouped into the following example categories:

Process Units SOP's

- SR 1 & Tracing
- Tank Farm
- Kiln, SCC & Burners
- APC
- Utilities
- Liquid & Pack Waste Handling
- Railcar
- Cooling Tower
- Bulk Solids Handling
- Dried Solids Handling
- Ash Handling
- Raw Material Handling
- Stack Monitoring
- Direct Burn Spots

Miscellaneous SOP's

- Startup
- Shutdown
- Process Control
- Troubleshooting
- Maintenance
- Responsible Care
- Emergency
- Administrative

The SOP's are only referenced in this plan to minimize the potential for inconsistencies (through revisions) between regulatory plans and existing facility control operation and maintenance documents. The current SOP's for the 32 Incinerator are located on the Dow file server (ODMS-Operating Discipline Management System).

Incinerator operators go through a comprehensive training program to insure that they are well qualified to operate the 32 Incinerator facility. This training includes:

- Review of all procedures related to the plant operation
- Successful completion of the in plant training (IPT) modules
- Hands on experience with trained subject matter experts
- HWC MACT operator training and certification commensurate with job duties.

The initial training is culminated by an oral board of review conducted by supervision and/or subject matter experts to verify that this operator is capable of operating the facility.

3.3 Operator Inspections

Routine inspections are conducted to inspect monitoring equipment, safety and emergency equipment, and operating equipment that are important to preventing, detecting, or responding to environmental hazards. These inspections help maintain effective and safe operation of the system. Specific targets for the inspections include:

- Leaking tanks or equipment
- Fugitive emissions
- Integrity of pipes and pumping systems
- Integrity of secondary containment systems
- Malfunctioning equipment or instruments
- Noisy equipment or unusual sounds that may indicate potential problems
- Signs of tampering with equipment
- Operation of tank automatic overfill valves
- Safety equipment for potential problems

These inspections will be documented using the following inspection forms:

- 32 Incinerator RCRA Inspection Checklist
- 33 Building RCRA Inspection Checklist
- 32 Pack Room RCRA Inspection Checklist
- Tank Farm Overfill Valve Protection Test
- Tank Farm RCRA Inspection Checklist
- Fire Extinguisher Check Sheet
- Safety Shower and Eye Bath Check
- Siren Switch Test
- Fork Truck Inspection
- Emergency Lights and Fire Door Check
- SCBA Inspection

Each inspection record includes, if applicable, the date and time of the inspection, the name or initials of the inspector, a notation of observations made, and the nature of any repairs or other remedial actions. Copies of these forms and the required schedule and frequency are defined in the individual procedures. These documents are located in the 34 building and/or the Dow fileserver. The inspection forms are updated and modified periodically as necessary.

The operators at the facility receive training during which supervision outlines appropriate responses for when an inspection shows problems or potential problems. On-the-job training with experienced operators compliments this training from supervision. Operations personnel will perform appropriate remedial actions that lie within their power if an inspection reveals a deficiency. If a deficiency lies beyond the means of operations personnel to correct, they will inform supervision and/or maintenance personnel as appropriate.

3.4 Operating Limitations and Alarms

Various operational limitations have been established, based on regulatory testing and good operational practices, that will insure the 32 Incinerator is operated effectively and that emissions from the process are within allowable regulatory standards. The 32 Incinerator has been designed with alarms that alert system operators before and after these limitations are exceeded. A complete list of all regulatory operating limitations and associated alarms are defined in the Continuous Monitoring System Performance Evaluation Plan (CMS PEP) which is located in the 34 building library and/or the Dow fileserver.

3.5 Operational Records and Data Management

The records and data generated during operation of the system are important for demonstration of compliance with regulatory standards and for trouble shooting process problems. Typical data and records that must be managed include:

- Waste feed analytical data
- Operator process data sheets
- Completed operational inspection forms
- Malfunction logs
- Daily Control Room Operators Logs
- Process data
- Alarm logs
- AWFCO logs

Many of these records are in the form of hard copy records that are stored the 34 building and the scheduler's office. However, the process data, alarm logs, and daily control room operator logs are recorded and stored electronically on the process Data Acquisition System (DAS).

4.0 Maintenance

Maintenance activities are periodically performed on the 32 Incinerator in order to preserve the equipment and ensure the equipment is functioning properly. Maintenance activities include corrective maintenance and preventive maintenance. Corrective maintenance includes the repair and restoration of equipment or sub-components or replacement of sub-components that have failed or are malfunctioning. Preventive maintenance includes actions taken prior to equipment failure to maintain a piece of equipment within design operations and extend the life of the equipment. Preventive maintenance includes predictive and periodic preventive maintenance. Preventive maintenance is performed on the equipment and instruments that make up the process.

Preventive maintenance procedures are written in accordance with manufacturer's recommendations and process knowledge. Preventative maintenance procedures for the Dow 32 Incinerator may be grouped into the following example categories:

- Mechanical Integrity Checks
- Mechanical Reliability Checks
- Process Control Instrumentation Checks
- Safety System Checks

Detailed preventative maintenance procedures can be found on the Dow fileserver.

4.1 Maintenance Inspections

Personnel conduct periodic inspections of process equipment looking for equipment wear, vibration, noise leaks, etc. that may indicate maintenance is needed on the effected equipment. Results of the inspections are recorded on inspection forms or in electronic archives. Detailed maintenance inspection procedures are defined in the equipment folders located in the 34 building library and/or the Dow fileserver

4.2 Instrument Calibration

Instrumentation used to control and monitor the operation of the system is checked or calibrated to insure accurate readings are obtained during operation of the process. Malfunctions of instruments or monitors could increase potential emissions from the process. Some checks and calibration of instrumentation are conducted and/or monitored by operators during normal operations (i.e., calibration of continuous emission monitoring systems) while most are conducted by maintenance personnel. General types of data that are measured with the instrumentation and control system include:

- Waste feed rates
- Various process temperatures and pressures
- Differential pressures
- pH
- Stack gas flow rate
- Stack gas composition
- Various liquid and gas flow rates
- Flow switches
- Tank levels

The Continuous Monitoring System Performance Evaluation Plan (CMS PEP) provides a detailed list of all process instrumentation and monitors associated with maintaining acceptable emissions from the process in compliance with the MACT regulations. The CMS PEP defines all aspects of the continuous monitoring system including operation, maintenance and calibration of system components. The CMS PEP is located in the 34 building library and/or Dow fileserver.

4.3 Testing of the AWFCO System

Dow tests the AWFCO system and all associated alarms monthly as required in 63.1206I(3)(vii) of the HWC MACT. The 32 incinerator is equipped with numerous waste feed systems that make a weekly test of the AWFCO system unduly restrictive and likely to significantly increase emissions of HAP's due to upset conditions during AWFCO testing. Each established limit is tested on a monthly basis. Activation of an AWFCO during normal operation constitutes the required test of the system and the associated alarms that activated the AWFCO.

Testing typically consists of simulating a parameter or CEMS exceedance and observing actual operation of the applicable AWFCO system or associated alarms. Waste feed does not have to be flowing when the test is conducted (i.e., manual block valves may be used to stop flow while the automatic valve is opened and tested with an AWFCO signal). Dow has developed software checks to accomplish the AWFCO testing. At a minimum, the waste feed system is tested for physical waste feed cutoff at least once per month.

4.4 Maintenance Management System

Management of process maintenance is important for maintaining efficient and effective process operations. Scheduling, tracking and documenting preventative and corrective maintenance activities is critical to process success. Dow utilizes the Global Maintenance Work Process (GMWP) to manage maintenance at the 32 Incinerator. GMWP uses a global equipment and maintenance tracking system (SAP) to schedule maintenance work orders and record maintenance work on specific equipment. Work orders for preventive maintenance are automatically generated by the system based on a preset frequency. The user's manual describing the use of this system is located on Dow's Intranet.

When corrective maintenance is required, a work request is created. The activity coordinator reviews the work request and generates a work order if necessary. The maintenance work coordinator reviews work orders and assigns resources. Once the maintenance is performed, the work order is completed by the maintenance personnel and closed out in the system. When completing the work order, personnel also record corrective actions as needed. Completed work orders are automatically filed and maintained in the SAP.

4.5 Spare Parts Inventory

The maintenance management system is linked with spare parts inventory for the different parts of the incineration system via a spare parts inventory management system (SAP). Spare parts are identified with unique catalog codes in SAP and are assigned to the corresponding equipment identification numbers in SAP using electronic spare parts listing. In this way, the correct parts for particular equipment are used when maintenance work is performed. When a work order is executed, parts or materials used are issued from inventory and charged against the work order for cost and reliability tracking purposes. When inventory for a particular part reaches the specified re-order point, the system will automatically create a purchase order to re-order additional parts. Purchase orders can also be generated manually from the system.

5.0 Corrective Measures

Corrective measures may take the form of equipment or instrument maintenance, operator response to a specific event or a combination of the two. Corrective maintenance procedures for specific equipment or instruments are usually found in the vendor literature or from process knowledge. Several of the Dow SOP's are written specifically as corrective measures for specific events. These procedures can be found on the Dow fileserver.

6.0 Plan Implementation and Administration

6.1 Responsibilities and Management System

The Production Leader has the overall responsibility for Environmental Operations at the Midland site. Below this level of management is the Operations Leader who has day to day responsibility for how the Environmental Assets operate. There is also a run plant engineer that manages day to day operation by tracking asset utilization and troubleshooting the incineration complex. It is the run plant engineer that insures that operating discipline and other documents, such as this plan, are kept up to date.

Operators perform the routine operation of the incineration system. These personnel perform the day to day functions associated with running the incinerator such as initiating waste feed flow, maintaining operating conditions, responding to alarms, etc.

The maintenance of the incinerator is the responsibility of the maintenance instrument and mechanical technicians and engineers. These personnel perform the regular scheduled maintenance and corrective maintenance identified through inspection, alarms, or daily walk-through rounds.

6.2 Procedure Development, Plan Maintenance, and Document Control

This O&M Plan is included in the HWC MACT operating record. This O&M Plan is available for inspection by the Administrator upon request. The plan is reviewed periodically, and modified as necessary to keep the plan current. The latest revision of this plan is located in the 34 building library and/or Dow fileserver for access by all personnel responsible for the incinerator operation and maintenance.

This O&M Plan references numerous plans and procedures that are dynamic in nature. From time to time modifications to referenced plans may be necessary as new information becomes available or as safer, more efficient, or more effective ways of conducting operations and inspections become known.

Dow maintains a list of all controlled documents and distributes revisions to those controlled documents as necessary. When plans or procedures are modified, an electronic management of change (EMOC) is implemented as necessary so that all impacted personnel have knowledge of the change and understand the change. The training method may be in the form of a formal letter, on the job training or formal classroom training depending on the magnitude of the modification. All significant training activities are documented into Dow's Global Human Resources Information System (GHRIS) system as necessary. Minor training and/or changes are tracked within the EMOC system as necessary.