STARTUP, SHUTDOWN, MALFUNCTION PLAN FOR THE BUILDING 32 ROTARY KILN INCINERATION SYSTEM

The Dow Chemical Company
Michigan Operation Incineration Complex
Midland, Michigan

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1.0 Introduction

The Dow Chemical Company (Dow) operates a hazardous waste incineration complex (Building 32) at its Midland, Michigan chemical manufacturing facility. The incineration system consists of a rotary kiln, secondary combustion chamber (SCC), quench chamber, air pollution control (APC) train, induced draft fans and a stack. The incineration system includes a continuous monitoring system (CMS) which includes the continuous parameter monitoring systems (CPMS) and continuous emission monitoring systems (CEMS) and continuous emission rate monitoring systems (CERMS) that continuously measure process parameters, stack gas concentrations, and stack gas emission rates. The rotary kiln incineration system operates under Air Permit 226-15 (and or any subsequent revisions).

The upgraded hazardous waste incineration complex is subject to the requirements of the National Emissions Standards for Hazardous Air Pollutants for Hazardous Waste Combustors, otherwise known as the Hazardous Waste Combustor MACT (HWC MACT). The HWC MACT standards are codified under 40 CFR 63 Subpart EEE.

Section 1206(c)(2) of the HWC MACT and Special Condition VI.5.B of Air Permit 226-15 (or any subsequent revisions) requires the affected facility to develop a startup, shutdown, and malfunction plan (SSMP) as specified in Section 63.6(e)(3) of the MACT General Provisions.

The purpose of the SSMP is to (1) ensure the combustion system, including emission control and monitoring equipment, is operated and maintained in a manner consistent with safety and good air pollution control practices for minimizing emissions at least to the levels required by the standards; (2) to ensure that owners and operators are prepared to correct malfunctions as soon as practicable and (3) to minimize the reporting burden associated with excess emissions. The SSMP addresses startup, shutdown, and malfunction events on the incineration system and tank farm that could result in a HWC MACT emission or operating limit exceedance and an exceedance of any other applicable emission limitation.

To meet the SSMP objectives, this Plan includes a description of:

1. Procedures for operating and maintaining the source during periods of startup, shutdown, and malfunction
2. The corrective action program for responding to malfunctioning process, air pollution control, and related monitoring equipment used to comply with the HWC MACT standard

3. Potential causes of the identified malfunctions, including releases from emergency safety vents, that may result in significant releases of hazardous air pollutants (HAPs), and proactive measures that will reduce the frequency and severity of those malfunctions.

Section 1206(c)(2)(v)(A)(2) of Subpart EEE exempts facilities from HWC MACT emission standard and operating limit violations during startup, shutdown, and malfunction events, even if hazardous waste is in the combustion chamber while the violation occurs, providing the SSMP is followed. The Standards give facilities the option of complying with RCRA requirements or CAA requirements to achieve the equivalent objective of minimizing emissions exceedances during malfunction events.

This plan has been developed as required under the "CAA option" specified in Section 1206(c)(2)(ii) of the HWC MACT. Under the CAA option, the SSMP is submitted to the delegated CAA authority for review and approval. The SSMP must be both proactive and reactive to minimize emissions of hazardous air pollutants (HAPs) from malfunctions when hazardous waste is in the combustion chamber and include a description of potential causes of malfunctions and actions to minimize the frequency and severity. Under Section 1206(c)(2)(ii)(B)(1), the CAA authority is required to notify Dow of the intent to approve or deny the SSMP within 90 calendar days after receipt of the SSMP or within 60 calendar days after receipt of any supplemental information.

2.0 Plan Organization and Objectives

This plan has been developed to meet the SSMP requirements pursuant to Section 1206(c)(2) of the HWC MACT, Section 63.6(e)(3) of the General Provisions, and Sections 336.1911(2)(c) of the Michigan Air Pollution Control Rules. This plan is designed to help ensure that Dow's rotary kiln incineration system is operated and maintained in a manner consistent with safety and good air pollution control practices for minimizing emissions to the levels required by the relevant standards. This plan focuses on the malfunctions associated with components of the rotary kiln incineration system that could cause hazardous air pollutant (HAP) emissions, toxic air contaminants, and all other air contaminants to exceed regulated levels. This SSMP is organized as follows:

- Section 3.0 defines startup, shutdown, and malfunction as they apply to this Plan, and provides other details required in the Plan. Practices for preparing new procedures and revising existing procedures are also discussed in this section.
- Section 4.0 describes the standard operating procedures (SOPs) pertaining to startup and shutdown of the rotary kiln. This section also addresses proactive measures of the rotary kiln

intended to prevent system malfunctions, and response measures to be taken in the event of malfunctions.

3.0 SSMP Implementation

The HWC MACT provisions place significant emphasis on operation and maintenance of MACT sources during periods of startup, shutdown, and malfunction. The presumption is that startup, shutdown, and malfunction events have a higher chance of excess emissions or operating limit exceedances compared to normal operation. Although the rotary kiln incineration system's sophisticated process monitoring and control system is configured to shut off hazardous waste prior to exceeding any permit limits and upon malfunction of any instrument, potential operating limit exceedances could occur prior to expiration of the hazardous waste residence time in the kiln after hazardous waste has been shut off. In addition, potential emission limit and operating limit exceedances could occur if the emergency safety vent (ESV) opened. This section defines the periods of startup, shutdown and malfunctions as it applies to the SSMP and provides other details required in the Plan.

3.1 SSMP Periods

3.1.1 Startup

Startup is defined under Section 63.2 of the MACT General Provisions as " the setting in operation of an affected source or portion of an affected source for any purpose". For the purposes of this plan, startup will begin when the second I.D. fan becomes operational during a cold startup. Startup will end when hazardous waste feed has been initiated. Dow will begin hazardous waste feeds once all hazardous waste feed permissives have been met. After hazardous waste feed has been initiated the incineration system will be considered in normal operation. Periods considered startup for the rotary kiln incineration system are depicted in Figure 4-1.

During startup, rolling average calculations of the HWC MACT operating parameters and emission standards will resume upon initiation of the second I.D. fan. Once the second I.D. fan is operating, the first one-minute average value will be added to the previous valid 59 or 719 one minute averages, as appropriate, from the previous shutdown. This is consistent with Sections 63.1209(a)(6)(ii) and 63.1209(b)(5)(ii) of the HWC MACT regulations. For the initial startup Dow will begin recording 1-minute, hourly rolling average and 12-hour rolling average values within 60 seconds, 60 minutes, and 720 minutes respectively, from the time at which compliance begins, This is consistent with Sections 63.1209(a)(6)(i) and 63.1209(b)(5)(i).

3.1.2 Shutdown

Shutdown is defined under Section 63.2 of the MACT General Provisions as the cessation of operation of an affected source or portion of an affected source for any purpose. For the purposes of this plan, shutdown will begin when the residence time has passed and the incineration system drops below the minimum combustion chamber temperature for either the rotary kiln or SCC. The shutdown period includes system cooldown when auxiliary fuel feed is being ramped down and the incineration system is being cooled. The shutdown period will end when either the second I.D. fan is shut off or hazardous waste feed is reintroduced. Periods considered shutdown for the rotary kiln incineration system are depicted on Figure 4-1.

Rolling average calculations will continue until the second I.D. fan ceases operation. Once the secondI.D. fan is shut off, the rolling averages will be frozen and stored in the data register as provided in Sections 63.1209(a)(6)(ii) and 631209(b)(5)(ii). The last valid 59 or 719 one-minute average values will be stored and added to the first valid one-minute average value during startup when the rolling average calculations resume.

3.1.3 Malfunction

Section 63.2 of the MACT General Provisions defines a malfunction as any sudden, infrequent, and not reasonably preventable failure of air pollution control and monitoring equipment, process equipment, or a process to operate in a normal or usual manner. For the purposes of this plan, failures resulting in part from inadequate maintenance or poor operation practices will not be considered malfunctions.

3.1.4 Startup, Shutdown, and Malfunction Event

As stated earlier, pursuant to Section 63.6(e) of the General Provisions, the purpose of the SSMP is to ensure the combustion unit, including emission control equipment is operated and maintained in a manner consistent with good air pollution control practices for minimizing emissions at least to levels required by the air permit. For the purposes of this plan an exceedance of a permitted emission standard or operating limit during startup, shutdown, or malfunction periods while hazardous waste is in the combustion chamber will be considered a SSMP event that will be documented and reported as appropriate. Malfunctions or startup and shutdown periods that do not result in a permit exceedance with hazardous waste in the combustion chamber will not be considered a startup, shutdown, or malfunction event and will not trigger any SSMP reporting

For the purposes of documenting malfunction events, a malfunction event will begin once a permitted emission standard or operating limit is exceeded during a malfunction. The malfunction event will end

once hazardous waste has cleared the combustion chamber or the permitted emission standard or operating limit is no longer being exceeded.

3.2 Methodology for Identification of Malfunctions

This SSMP was developed to be both proactive and reactive to malfunctions. As part of the exercise to identify potential and credible malfunctions, Dow used the incinerator process flow diagrams (PFDs) and process knowledge to identify critical equipment/instruments and scenarios that could cause the system to malfunction and result in exceedances of HWC MACT operating limits or emission limits and other permitted emission limits. From these identified malfunctions, Dow identified proactive responses that would prevent these malfunctions from occurring as well as the reactive procedures that would instruct operators how to operate and control the system in the event that the malfunctions actually occurred. A summary of these malfunctions are presented in Table 4-1. Further discussions involving the proactive measures and corrective actions for the rotary kiln incineration system malfunctions is provided in Section 4.4 of this plan.

3.3 Procedure Development and Plan Maintenance

This section describes the methodology for creating or revising the startup, shutdown, and malfunction plan and referenced procedures for the incineration system. Dow has developed Standard Operating Procedures (SOPs) that provide step-by-step instructions for startup, shutdown, and the malfunction events identified in this plan. In addition the process control system is programmed to take automatic action during specific malfunction events. These procedures and process control programs are maintained at the facility and will be made available to the agency for review upon request.

Procedures and process control programming for startup, shutdown and malfunction events are developed and communicated to plant personnel following the Management of Change (MOC) practices. This practice requires new or modified procedures and programming to be developed by knowledgeable personnel, reviewed by appropriate subject matter experts and approved for use by authorized approvers. Upon approval the change is communicated to all effected personnel who receive appropriate training. Procedures and process control programming are periodically reviewed and updated as required to address needed changes. Dow does not consider these maintenance changes to procedures and process control programming to be changes to the SSMP.

Pursuant to Section 63.6(e)(3)(viii) of the MACT General Provisions, Dow may periodically revise the SSMP as necessary to address changes in equipment or procedures that are currently addressed in the plan. Each revision to the SSMP will be reported in the semiannual Periodic Startup, Shutdown, and Malfunction report required under Section 63.10(d)(5) of the General Provisions. If a change is made to the SSMP that may significantly increase emissions of hazardous air pollutants Dow will submit the

revised plan to MDEQ-AQD for review and approval within 5 days of making the change consistent with the requirements of 40 CFR 63.1206(c)(2)(ii)(C). As stated previously Dow does not consider maintenance changes to procedures and process control programming that do not significantly increase emissions to be a change to the SSMP and therefore, will not be submitted or reported.

3.4 Projected Oxygen Correction Factor Associated with Startup and Shutdown

The stack gas oxygen concentration is used to calculate an oxygen correction factor, which is applied to correct the stack gas CO concentration to 7% oxygen. The oxygen correction factor is determined by the following equation:

$$OCF = \left(\frac{21-7}{21-O_2} \right)$$

where: OCF = oxygen correction factor

O_2 = stack gas oxygen concentration (vol %)

During startup or shutdown, conditions may be such that the stack gas oxygen concentration approaches 21%, resulting in an oxygen correction factor approaching infinity. To prevent this from occurring, Section 1206(c)(2)(iii) of the HWC MACT requires facilities to develop a projected oxygen correction factor based on normal operation to use during periods of startup and shutdown. Dow will use a projected oxygen correction factor of 1.4, whenever the oxygen stack concentration is greater than 11 % during startup and shutdown. This oxygen concentration is based on an oxygen concentration of 11% which is the typical oxygen stack gas concentration expected during normal conditions.

3.5 Automatic Waste Feed Cutoff System Requirements During Malfunctions

As stated in Section 63.1206(c)(2)(v) of the HWC MACT, the AWFCO requirements will continue to apply during malfunctions. If an emission limit or operation limit is exceeded during a malfunction, the automatic waste feed cutoff system must immediately cut off hazardous waste feeds, except as allowed for waste feed ramp down. If the malfunction itself prevents immediate and automatic cutoff of hazardous waste feed, Dow will cease feeding hazardous wastes as quickly as possible.

4.0 Startup, Shutdown, and Malfunction Plan Procedures

The procedures for operating the Building 32 rotary kiln incineration system during startup, shutdown and malfunction are delineated in detailed standard operating procedures maintained in the incinerator complex for access by personnel responsible for the operation of the rotary kiln system.

4.1 Startup Plan

As specified in Section 3.1.1 and Figure 4.1 of this plan, startup will begin when the second I.D. fan becomes operational during a cold startup and will continue until hazardous waste feed has been initiated. Most startup activities are executed by the process control system and do not require operator interface. This ensures the safety and consistency of the operation.

Detailed procedures for startup of the 32 Incinerator are contained in the Dow SOPs that are maintained at the facility. These procedures prescribe the pre-startup checks and walk-through, including checks of instrumentation, equipment, and supply lines essential for the safe and compliant operation of the 32 Incinerator. Hazardous waste cannot be introduced to the system until the system's defined operational process parameters are met.

4.2 Shutdown Plan

As specified in Section 3.1.2 and Figure 4.1 of this plan, shutdown will begin when the residence time has passed and the incineration system drops below the minimum combustion chamber temperature for either the rotary kiln or SCC. The shutdown period includes system cooldown when auxiliary fuel feed is being ramped down and the incineration system is being cooled. The shutdown period will end when either the second I.D. fan is shut off or hazardous waste feed is reintroduced.

Detailed instructions associated with shutdown of the 32 Incinerator are contained in the Dow SOPs that are maintained at the facility. These procedures cover the steps to shutdown the incinerator in both emergency and normal shutdown situations. The safe and compliant operation of the 32 Incinerator depends on the operation of programmed operational permissives and interlocks. Most shutdown activities are initiated and executed by the process control system and do not require much operator interface. This ensures the safety and consistency of the operation.

A mechanism for emergency shutdown is in place that can be activated from the control room that will completely shutdown the entire incinerator system including operation related to burning auxiliary fuels, non-hazardous waste, and hazardous waste. The purpose of this emergency control mechanism is for worker protection and equipment protection.

4.3 Startup and Shutdown of Liquid Wastes

Dow experiences erratic readings from liquid flowmeters when starting or stopping liquid waste feeds to an incinerator nozzle. A waste pipeline to a nozzle fills or empties in approximately 10 minutes. During most of this fill or empty cycle the flow meter will read near zero while nitrogen gas flows through the meter. When the liquid/gas interface reaches the meter two-phase flow will briefly occur inside the meter until the meter completely fills or empties of liquid. While two-phase flow occurs inside the meter the flow signal is very noisy with many rapid flow signal spikes up to full scale and back down. For a truck load of waste, pipeline filling and emptying represents approximately 1.5% of the total time a truck is unloaded. The erratic flow readings will occur for only part of the time the pipeline fills or empties.

The following practices are followed during startup and shutdown of liquid waste feeds to ensure compliance with requirements-

A. During pipeline filling the flow control is maintained at a lower than normal valve position until stable flow is measured by the flow meter. Only after stable flow is measured will the control valve be allowed to open further to control flow at the desired flow rate.

B. The flow meter reading will be used in all feedrate rolling average calculations including during filling and emptying of the pipeline. The erratic full-scale readings will be used in these calculations. This will ensure that data is available to verify compliance with all feedrate limits.

C. Waste feed to the lance will be shut off if the 1-minute average flow reading meets or exceeds the span value. This will differentiate the erroneous full-scale readings caused by two-phase flow inside the meter during startup and shutdown from an actual meter problem.

4.4 Malfunction Response Plan

Section 3.2 described the methodology that Dow utilized to identify possible malfunctions on the 32 Incinerator that, if they occurred, could possibly lead to an exceedance of a HWC MACT limit or other permit limit. Table 4-1 provides the corrective and reactive procedures for each malfunction. For each malfunction, the following is provided:

- A description of how the malfunction could credibly occur and lead to an exceedance.
- Design and operational proactive measures that have been taken to prevent occurrence of the malfunction, and
- Corrective measures that should be taken in response to the malfunction

Table 4-1

Potential Exceedance/ Potential Problem	Potential Malfunctions	Preventive Measures and Response Procedures
1) High CO and/or low O2	High Btu solids feed (bulk solids or packs)	**Preventative Measures:** 1) Waste characterization process restricts the BTU content and other reactive properties of a container of packaged waste. **Response Procedures:** 1) Waste feed is shut off at conditions that are more restrictive than AWFCO limits 2) If there is an AWFCO, the event is investigated, if possible waste stream that caused problem is identified, inventory of that waste is quarantined if necessary, if possible specific cause is identified and appropriate changes to waste stream or feed conditions are made if necessary.
2) High CO and/or low O2	Waste/fuel flow problems (e.g. blip in gas/diesel flow, clearing/flushing/ purging lines, establishing flow –starting/stopping, erratic flow, flow meter problems, low air to fuel problem)	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on flowmeters and flow transmitters. 2) Smart transmitter signals control system that instrument is malfunctioning. 3) Control valve is maintained at a lower than normal valve position until stable flow is measured during start up **Response Procedures:** 1) Liquid feed from the feed line with the malfunctioning instrument will cease and/or 2) In cases of start up and shut down of a direct burn waste, flowmeters will show error and/or erratic readings until two-phase material is purged from the line. Liquid feed will not be shutdown in these cases unless flowmeter one-minute average flow indicates full scale and/or 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

3) High CO and/or low O2	Failure of refractory lining which may cause the combustion chamber to leak.	**Preventative Measures:** 1) Periodic inspection looking for hotspots. 2) Periodic inspection of refractory. 3) Periodic observation of cameras in combustion chamber. 4) Infrared line scanner that monitors the kiln shell temperature. **Response Procedures:** 1) Orderly shutdown of incinerator to repair refractory when problem detected 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
4) High CO and/or low O2	Failure of flame detector	**Preventative Measures:** 1) Redundant flame detectors (UV and IR) on each burner in kiln and SCC. 2) The unit will not warm up on natural gas if the flame detectors are non functional. **Response Procedures:** 1) Shut off waste and fuel feed to burner if both detectors indicated loss of flame and temperature is below defined autoignition setpoint 2) Once above autoignition setpoint, waste will not shut off because the unit is operating at above the autoignition temperature of the waste being fed 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

5) High CO and/or low O2	Loss of atomization fluid	**Preventative Measures:** 1) Two atomization fluids - steam or air. 2) System would alarm if atomization pressure or flow is low. **Response Procedures:** 1) Waste liquid feed to lance is shut off until the atomization pressure and flow are back into the correct range and/or 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
6) High CO and/or low O2	Failure of liquid feed rate flowmeter (Quench)	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on liquid flowmeter. **Response Procedures:** 1) Waste feed will shut off in the event the instrument fails. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
7) High CO and/or low O2	Failure of refractory lining which causes the device to leak (NOx chamber)	**Preventative Measures:** 1) Periodic inspection looking for hotspots 2) Periodic inspection of refractory. **Response Procedures:** 1) Orderly shutdown of incinerator to repair refractory when problem detected. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits

Table 4-1, continued

8) High CO (possible D/F limit) and/or low O_2	Loss/failure of Carbon Monoxide Analyzer	**Preventative Measures:** 1) Dual sample systems with dual instruments. 2) Preventative maintenance and calibration performed periodically on analyzer. **Response Procedures:** 1) If one analyzer fails control system will switch to valid analyzer. In this scenario there may be up to 20 minutes per day of analyzer downtime per day for calibration as allowed per the Subpart EEE Appendix. 2) If both units fail, all waste will be shut off from going into the unit. 3) Waste feed is shut off at conditions that are more restrictive than AWFCO limits.
9) High CO and/or low O_2	Failure of kiln or SCC temperature devices	**Preventative Measures:** 1) Redundant instruments **Response Procedures:** 1) If one temperature fails control system will switch to valid temperature 2) Waste feed is shut off at conditions that are more restrictive than AWFCO limits.

Table 4-1, continued

10) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions >ambient pressure)	Malfunction of pressure device in combustion chamber. High pressure in kiln could cause puffing and fugitive emissions around the kiln seals. Extremely high pressure in the kiln will cause ESV to open	**Preventative Measures:** 1) Redundant pressure devices. 2) Preventive maintenance and calibration is performed periodically on the pressure devices. 3) The pressure devices have smart transmitters so the control system can sense a failed pressure device. **Response Procedures:** 1) Upon loss of a single pressure device, control system would switch to valid instrument. 2) Loss of both devices would cause hazardous waste feed to the kiln and SCC to cease. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.
11) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	High Btu solids feed causes high pressure (bulk solids or packs).	**Preventative Measures:** 1) Waste characterization process restricts the BTU content and other reactive properties of a container of packaged waste. **Response Procedures:** 1) Waste feed is shut off at conditions that are more restrictive than AWFCO limits 2) If there is an AWFCO, the event is investigated, if possible waste stream that caused problem is identified, inventory of that waste is quarantined if necessary, if possible specific cause is identified and appropriate changes to waste stream or feed conditions are made if necessary.

Table 4-1, continued

12) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Waste/fuel flow problems causes high pressure (e.g. blip in gas/diesel flow, clearing/flushing/ purging lines, establishing flow –starting/stopping, erratic flow, flow meter problems)	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on flowmeters and flow transmitters. 2) Smart transmitter signals control system that instrument is malfunctioning. 3) Control valve is maintained at a lower than normal valve position until stable flow is measured during start up **Response Procedures:** 1) Liquid feed from the feed line with the malfunctioning instrument will cease and/or 2) In cases of start up and shut down of a direct burn waste, flowmeters will show error and/or erratic readings until two-phase material is purged from the line. Liquid feed will not be shutdown in these cases unless flowmeter one-minute average flow indicates full scale and/or 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.
13) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Hot molten slag/ash dropping into ash discharge system causes steam/pressure buildup. This could result in puffing around the kiln seals or an ESV opening. Possible piece of slag wedges kiln seal door open	**Preventative Measures:** 1) Periodic observation of slag build-up by field observation and/or cameras 2) Periodically use deslagging burners to remove slag build up. **Response Procedures:** 1) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

14) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	High quench chamber temperature due to low quench flow	**Preventative Measures:** 1) Three sources of cooling water. 2) Primary source is Huron water (clean water supply). 3) Secondary source is a surge tank full of Huron water. 4) The third source is the service water supply. 5) Dual (spare) pumps on the upper and lower ring quench water. 6) Periodic inspection of pumps. **Response Procedures:** 1) If the first source of water is lost, switch to the second source which can supply water for approximately 5 minutes. 2) If the Huron water supply cannot be restored within approximately 5 minutes, will switch to the service water supply. 3) If on line pump fails switch to installed spare. 4) Shutdown waste feed at conditions more restrictive than AWFCO limit
15) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Power failure	**Preventative Measures:** 1) Separate motor line electrical power feeds with automatic switch gear to transfer power if power lost. 2) Periodic preventative maintenance on switch gear and electrical distribution equipment. **Response Procedures:** 1) Auxiliary air motor for kiln to keep kiln turning. 2) Upon power loss, all fuels will immediately shut off and the ESV will open to prevent severe equipment damage.

Table 4-1, continued

16) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Loss of pumps to provide water to quench cooling	**Preventative Measures:** 1) Use of dual (spare) pumps on the upper and lower ring quench water. 2) Periodic inspection of pumps. **Response Procedures:** 1) If on line pump fails switch to installed spare pump and/or 2) Shutdown waste feed at conditions more restrictive than AWFCO limits.
17) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Loss of level transmitters in condenser absorber which controls rate of water to quench. High quench chamber temp could result in ESV opening.	**Preventative Measures:** 1) Dual instruments installed. 2) The level devices have Smart transmitters so the control system can sense which transmitter has failed. 3) Preventative maintenance and calibration is performed periodically on level transmitters. **Response Procedures:** 1) Upon loss of single instrument control system will switch to valid instrument. 2) Upon failure of both instruments, the make-up water would go wide open ensuring adequate water to quench 3) Shutdown waste feed at conditions more restrictive than AWFCO limits.
18) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Nozzle failure/plugged nozzles. Could result in high quench chamber temp could result in ESV opening.	**Preventative Measures:** 1) Preventative maintenance performed periodically on quench. 2) System will alarm if quench water conditions outside acceptable range. 3) Multiple nozzles installed limiting the impact of a malfunction of a single nozzle. **Response Procedures:** 1) Identify and repair nozzle that has malfunctioned 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

19) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	ID fan impeller erosion, loss of balance, high vibration.	**Preventative Measures:** 1) Vibration checks on fan 2) Preventive maintenance performed periodically on fan 3) Periodic inspection of fan. **Response Procedures:** 1) Shutdown of incinerator to repair ID Fan 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
20) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Vibration instrument failure	**Preventative Measures:** 1) Periodic inspection of instrument **Response Procedures:** 1) Shutdown of incinerator to repair instrument 2) Waste feed is shut off at conditions more restrictive than AWFCO limits
21) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Kiln seal failure	**Preventative Measures:** 1) Periodic inspections to insure that seals are intact. **Response Procedures:** 1) Orderly shutdown of incinerator to repair seal. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

22) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	ID Fan Bearing failure	**Preventative Measures:** 1) Temperature transmitters and alarms on bearings 2) Bearings oilers 3) Preventative maintenance performed periodically 4) Periodic inspections performed on fan **Response Procedures:** 1) Orderly shutdown of incinerator to repair ID Fan 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
23) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Failure of first ID fan	**Preventative Measures:** 1) Vibration checks on fan 2) Preventive maintenance performed periodically on fan 3) Periodic inspection of fan. **Response Procedures:** 1) Shut off waste feeds and fuels 2) Open damper actuator to full and shut off flow to venturi 3) Attempt to keep pressure low enough with 2nd ID fan to keep ESV from opening.
24) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Accumulated slag falling from hot duct into the ash conveyor or quench causing pressure build-up from blockage and/or steam pressure build-up.	**Preventative Measures:** 1) Periodic use of power shots and/or slag melts if condenser pressure 24HRA (24 Hourly Rolling Average)>-12 inH2O vacuum and it is determined that the low pressures are the result of slag build up. An attempt to remove slag accumulation will be completed within 7 days of the 24HRA reaching the limit. **Response Procedures:** 1) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

25) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Loss of service water. Includes loss of water flow to lower ring of quench and packed tower condenser	**Preventative Procedures:** 1) The quench and packed tower condenser are monitored and alarms sound when conditions are outside acceptable range. 2) Site has two independent sources of service water to maintain continuous supply **Response Procedures:** 1) Shut off waste feed at conditions more restrictive than AWFCO limits.
26) ESV Open or High High Pressure (Potential exceedance e.g. metals, particulate matter, HCl, D/F, CO, Cl_2, fugitive emissions, >ambient pressure)	Loss of Huron water. Includes loss of water to quench.	**Preventative Measures:** 1) Three sources of cooling water. 2) Primary source is Huron water (clean water supply). 3) Secondary source is a surge tank full of Huron water. 4) The third source is the service water supply. **Response Procedures:** 1) If Huron water is lost, switch to the surge tank which can supply water for approximately 5 minutes. 2) If the Huron water supply cannot be restored within the approximate 5 minutes, will switch to the service water supply. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

27) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Malfunction of speed controllers on the WWTP volumetric feeder could cause too much WWTP solids to be fed.	**Preventative Measures:** 1) Preventive maintenance and calibration performed periodically on speed controller. 2) The weigh cells on the feed hopper are used to calibrate the screw feed system during periods that the hopper is not being filled. **Response Procedures:** 1) WWTP solid waste feed ceases upon instrument malfunction of the speed controller. 2) Waste feed shut off at conditions more restrictive than AWFCO limits.
28) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Loss of weight transmitter signal in WWTP solids hopper could cause too much WWTP solids to be fed.	**Preventative Measures:** 1) Preventive maintenance and calibration performed periodically on weight scale/transmitter. **Response Procedures:** 1) WWTP solid waste feed will not cease upon this instrument malfunction since the screw will run using the last calibration value. 2) The weigh cells on this vessel will be fixed within 5 working days or this feed stream will be shut down until the repair is completed. 3) Waste feed shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

29) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Malfunction of weigh scale which could cause too much packed solids to be fed.	**Preventative Measures:** 1) Preventive maintenance and calibration performed periodically on weight scale/transmitter. 2) Waste characterization limits quantity of permitted materials (ex. metals) in each container to a level which limits total quantity of permitted materials fed. **Response Procedures:** 1) If the scale fails, maximum waste characterization allowed weight will be used for determining compliance with mass feed limits and/or 2) Waste feed shut off at conditions more restrictive than AWFCO limits.
30) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Malfunction of weigh scale in bulk solids transfer chute which causes too much bulk solids to be fed.	**Preventative Measures:** 1) Preventive maintenance and calibration performed periodically on weight scale/transmitter. **Response Procedures:** 1) Bulk solid waste feed ceases upon instrument malfunction. 2) Waste feed shut off at conditions more restrictive than AWFCO limits.
31) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Loss of conveyor speed controller could cause too much bulk solids to be fed.	**Preventative Measures:** 1) Preventive maintenance and calibration performed periodically on speed controller on conveyor belt. **Response Procedures:** 1) Bulk solid waste feed ceases upon instrument malfunction. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

32) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, Chlorine rate limits, feed instrument at positive full scale	Malfunction of air lock flop gates allows too much bulk solids to be fed to the kiln. Both sets of gates stay open	**Preventative Measures:** 1) Periodic inspection of system. 2) Switch show position of doors. 3) Programming that only opens 1 gate at a time. **Response Procedures:** 1) Bulk solid waste feed ceases upon both sets of doors being open. 2) Waste feed is shut off at conditions that are more restrictive than AWFCO limits. 3) This scenario may lead to positive pressure in the kiln, shutting off feeds due to positive pressure in the kiln.
33) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Waste/fuel flow problems (e.g. blip in gas/diesel flow, clearing/flushing/ purging lines, establishing flow – starting/stopping, erratic flow, flow meter problems)	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on flowmeters and flow transmitters. 2) Smart transmitter signals control system that instrument is malfunctioning. 3) Control valve is maintained at a lower than normal valve position until stable flow is measured during start up **Response Procedures:** 1) Liquid feed from the feed line with the malfunctioning instrument will cease and/or 2) In cases of start up and shut down of a direct burn waste, flowmeters will show error and/or erratic readings until two-phase material is purged from the line. Liquid feed will not be shutdown in these cases unless flowmeter one-minute average flow indicates full scale and/or 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

34) Total hazardous waste feed rate limit, Mercury, LVM, SVM, Ash, and/or Chlorine rate limits	Control valves to kiln or SCC fail and do not control or shut off waste	**Preventative Measures:** 1) Control valves are designed to fail closed. 2) Perform a monthly AWFCO system check. **Response Procedures:** 1) PCC will shut emergency block valve to lance on high flow and/or 2) PCC will shut emergency block valves to all waste feeds for waste feed shutdown and/or 3) Waste feed is shut off at conditions that are more restrictive than AWFCO limits.
35) Low pH which could result in emission limit deviations (e.g. Cl_2, PM emission limit)	Loss of caustic or caustic feed/addition problems around Cl_2 scrubber	**Preventative Measures:** 1) Dual pH meters installed. 2) Alarms indicating low pH. **Response Procedures:** 1) Shutdown waste feeds at conditions more restrictive than AWFCO limits.
36) Low pH which could result in emission limit deviations (e.g. Cl_2, PM emission limit)	Failure of pH meter	**Preventative Measures:** 1) Dual instruments installed. 2) The pH meters have Smart transmitters so the control system can sense which transmitter has failed. 3) Preventative maintenance and calibration is performed periodically on pH meters. **Response Procedures:** 1) Upon loss of single instrument control system will switch to valid instrument. 2) Upon failure of both instruments shutdown waste feed. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

37) Kiln/SCC low temp - hourly rolling average	Waste feed/fuel problems (e.g. switching from high BTU waste feed tank to low BTU waste feed tank causes temperature to decrease or waste feed tank has high BTU and low BTU phases (waste tank not homogenized), low air to fuel problems)	**Preventative Measures:** 1) Waste Characterization Process identifies and limits properties of waste streams 2) Temperature control system will add natural gas to maintain temperature. **Response Procedures:** 1) If the temperature cannot be maintained, low BTU fuels will be cut off or cut back and/or 2) Waste feed will be shut off at conditions more restrictive than the AWFCO limits.
38) Kiln/SCC low temp - hourly rolling average	Malfunction of thermocouples in combustion chamber	**Preventative Measures:** 1) Multiple thermocouples are located in the kiln combustion chamber. The control system uses the average reading from the thermocouples. 2) Preventative maintenance and calibration are performed periodically on thermocouples. 3) The thermocouples have Smart transmitters so the control system can sense which thermocouple has failed. **Response Procedures:** 1) If one thermocouple deviates from the other two or has failed, the other two valid thermocouples are used for the temperature reading. 2) Waste feed will be shut down if more than one thermocouple has failed. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

39) Kiln/SCC temperature problem	Failure of refractory lining which may cause the combustion chamber to leak.	**Preventative Measures:** 1) Periodic inspection looking for hotspots. 2) Periodic inspection of refractory. 3) Periodic observation of cameras in combustion chamber. 4) Infrared line scanner that monitors the kiln shell temperature. **Response Procedures:** 1) Orderly shutdown of incinerator to repair refractory when problem detected 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
40) CMS instrument at full scale/failure	CMS instrument at full scale/failure	**Preventative Measures:** 1) Routine preventative maintenance on critical instruments **Response Procedures:** 1) Waste feed is shut off at conditions more restrictive than AWFCO limits

Table 4-1, continued

41) Potential excursions (e.g. DRE, temperature, CO, Particulate matter, metals, HCl/ Cl_2, D/F emission limits)	Failure of refractory lining on kiln/SCC which may cause the combustion chamber to leak.	**Preventative Measures:** 1) Periodic inspection looking for hotspots. 2) Periodic inspection of refractory. 3) Periodic observation of cameras in combustion chamber. 4) Infrared line scanner that monitors the kiln shell temperature. **Response Procedures:** 1) Orderly shutdown of incinerator to repair refractory when problem detected 2) Waste feed is shut off at conditions more restrictive than AWFCO limits
42) Potential excursions (DRE, Operation of waste firing system, CO hourly rolling average)	Failure of flame detector. Loss of flame detection	**Preventative Measures:** 1) Redundant flame detectors (UV and IR) on each burner in kiln and SCC. 2) The unit will not warm up on natural gas if the flame detectors are non functional. **Response Procedures:** 1) Shut off waste and fuel feed to burner if both detectors indicated loss of flame and temperature is below autoignition set point. 2) Once above autoignition set point, waste will not shut off because the unit is operating at above the autoignition temperature of the waste being fed. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

43) Potential excursions (e.g. DRE, operation of waste firing system, CO hourly rolling average)	Loss of atomization fluid.	**Preventative Measures:** 1) Two atomization fluids - steam or air. 2) System would alarm if atomization pressure or flow is low. **Response Procedures:** 1) Waste liquid feed to lance is shut off until the atomization pressure and flow are back into the correct range and/or 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
44) Leak at quench	Failure of refractory lining which causes the quench to leak	**Preventative Measures:** 1) Periodic inspections looking for leaks. 2) Periodic inspection of refractory. **Response Procedures:** 1) Contain leak (if any) 2) Orderly shutdown of incinerator if necessary to repair refractory and/or vessel when problem detected.
45) Potential excursions (e.g. CO, Particulate matter, metals, HCl/ Cl_2, D/F, emission limits)	Failure of quench feed pressure device.	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on pressure transmitter. **Response Procedures:** 1) Waste feed will shut off in the event the instrument fails. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

46) Potential excursions (e.g. CO, Particulate matter, metals, HCl/ Cl_2, D/F, emission limits)	Failure of quench liquid feed rate flowmeter.	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on liquid flowmeter. **Response Procedures:** 1) Waste feed will shut off in the event the instrument fails. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
47) Potential excursions (e.g. CO, Particulate matter, metals, HCl/ Cl_2, D/F, emission limits)	Failure of refractory lining (NOx chamber) which causes device to leak.	**Preventative Measures:** 1) Periodic inspection looking for hotspots 2) Periodic inspection of refractory. **Response Procedures:** 1) Orderly shutdown of incinerator to repair refractory when problem detected. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits

Table 4-1, continued

48) Potential excursions (e.g. metals, PM, HCl emission limit)	Low water flow due to plugging heat exchanger (packed tower condenser)	**Preventative Measures:** 1) Flow transmitters and alarms on water flow. 2) Periodic maintenance on heat exchanger. 3) Back up service water **Response Procedures:** 1) Switch to back up service water and/or 2) Clean/repair heat exchanger and/or 3) Switch on second pump and/or 4) Waste feed shut off at conditions more restrictive than AWFCO limits.
49) Low differential pressure problem. Potential excursions (e.g. metals, PM, HCl emission limit)	Loss/failure of differential pressure transmitter (packed tower condenser)	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on pressure transmitter. 2) Individual pressure instruments at packed tower entrance and exit are used as backup instruments to the differential pressure transmitter. 3) Use of Smart pressure transmitters so control system can sense a failed pressure transmitter **Response Procedures:** 1) If differential pressure transmitter fails control system will switch to back up instrumentation. 2) If both systems fail waste feed will be shut off. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

50) Low flow to quench and condenser and/or low pressure condenser spray nozzles. Potential excursions (e.g. metals, PM, HCl emission limit)	Failure of pumps (packed tower condenser)	**Preventative Measures:** 1) Use of dual (spare) pumps on packed tower condenser. 2) Periodic inspection of pumps. **Response Procedures:** 1) If on line pump fails switch to installed spare pump. 2) Shutdown waste feed at conditions more restrictive than AWFCO limits.
51) Low flow to quench and condenser and/or low pressure condenser spray nozzles. Potential excursions (e.g. metals, PM, HCl emission limit)	Improper liquid distribution (nozzle plugging/mechanical failure) (packed tower condenser/quench)	**Preventative Measures:** 1) Preventative maintenance performed periodically on packed tower condenser/quench. 2) System will alarm if condenser/quench conditions outside acceptable range. 3) Multiple nozzles installed limiting the impact of a malfunction of a single nozzle. **Response Procedures:** 1) Identify and repair/unplug nozzle that has malfunctioned if needed and/or 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

52) Low flow to quench and condenser and/or low pressure condenser spray nozzles. Potential excursions (e.g. metals, PM, HCl emission limit)	Loss of level transmitters (packed tower condenser)	**Preventative Measures:** 1) Dual instruments installed. 2) The level devices have Smart transmitters so the control system can sense which transmitter has failed. 3) Preventative maintenance and calibration is performed periodically on level transmitters. **Response Procedures:** 1) Upon loss of single instrument control system will switch to valid instrument and/or 2) Upon failure of both instruments, the make-up water would go wide open preventing the pumps from going dry and/or 3) Excess water will overflow the vessel and/or 4) Shutdown waste feed at conditions more restrictive than AWFCO limits
53) Low differential pressure on packed tower. Could get high pressure in kiln. Potential excursions (e.g. metals, PM, HCl emission limit)	Failure of packing (packed tower condenser)	**Preventative Measures:** 1) Preventative maintenance performed periodically on packed tower condenser. **Response Procedures:** 1) Shutdown waste feed at conditions more restrictive than AWFCO limits.

Table 4-1, continued

54) Low dp in condenser tower and/or High kiln pressure. Potential excursions (e.g. metals, PM, kiln high pressure)	Failure of damper actuator causing loss of pressure drop (Venturi)	**Preventative Measures:** 1) Preventive maintenance performed periodically on venturi. **Response Procedures:** 1) Shutdown waste feed at conditions more restrictive than AWFCO limits.
55) Hi low/pressure drop in venturi. Potential excursions (e.g. metals, PM)	Failure of pressure drop transmitter (Venturi)	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on pressure transmitter. 2) Individual pressure instruments at venturi entrance and exit are used as backup instruments to the differential pressure transmitter. 3) Use of Smart pressure transmitters so control system can sense a failed pressure transmitter **Response Procedures:** 1) If differential pressure transmitter fails control system will switch to back up instrumentation. 2) If both systems fail waste feed will be shut off. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

56) Low flow to venturi and/or low dp on venturi and/or low flow to Cl_2 scrubber and/or low blowdown rate from Cl_2 scrubber. Potential excursions (e.g. metals, PM)	Failure of pumps on Cl^2 Scrubber	**Preventative Measures:** 1) Use of dual (spare) pumps on Scrubber 2) Periodic Inspections performed on pumps. **Response Procedures:** 1) If on line pump fails switch to installed spare pump. 2) Shutdown waste feed at conditions more restrictive than AWFCO limits.
57) Low flow to venturi and/or low dp on venturi and/or low flow to Cl_2 scrubber and/or low blowdown rate from Cl_2 scrubber Potential excursions (e.g. metals, PM)	Failure of liquid feed rate flowmeter (venturi)	**Preventative Measures:** 1) Smart transmitters will notify control system of instrument failure. 2) Preventive maintenance and calibration performed periodically on the flowmeter. **Response Procedures:** 1) Waste feed will be shut off in the event the instrument fails. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

58) Low pressure drop on Cl_2 scrubber and/or high kiln pressure. Potential excursion (e.g. Cl_2 emission limit)	Failure of packing (Cl_2 scrubber)	**Preventative Measures:** 1) Preventative maintenance performed periodically on Cl_2 scrubber. **Response Procedures:** 1) Shutdown waste feed at conditions more restrictive than AWFCO limits.
59) Low flow to venturi and/or low dp on venturi and/or low flow to Cl_2 scrubber and/or low blowdown rate from Cl_2 scrubber Potential excursions (e.g. PM)	Cl_2 scrubber - loss of level transmitter which regulates blowdown (solids buildup in water recirculating to venturi)	**Preventative Measures:** 1) Dual instruments installed. 2) The level devices have Smart transmitters so the control system can sense which transmitter has failed. 3) Preventative maintenance and calibration is performed periodically on level transmitters. **Response Procedures:** 1) Upon loss of single instrument control system will switch to valid instrument. 2) Upon failure of both instruments waste feed will be shut off. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

60) Low blowdown rate from Cl_2 scrubber and/or low flow to venturi and/or low dp on venturi and/or low flow to Cl_2 scrubber. Potential excursions (e.g. PM, Cl_2)	Cl_2 scrubber - loss of Huron water source	**Preventative Measures:** 1) Flowmeters and flow transmitters located on makeup water stream. 2) Alarms indicating flow is outside normal range. **Response Procedures:** 1) Shutdown waste feeds at conditions more restrictive than AWFCO limits.
61) Low dp Cl_2 scrubber, Potential excursions (e.g. PM, Cl_2)	Cl_2 scrubber- failure of differential pressure transmitter.	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on pressure transmitter. 2) Individual pressure instruments at Cl_2 scrubber entrance and exit are used as backup instruments to the differential pressure transmitter. 3) Use of Smart pressure transmitters so control system can sense a failed pressure transmitter **Response Procedures:** 1) If differential pressure transmitter fails control system will switch to back up instrumentation. 2) If both systems fail waste feed will be shut off. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.

Table 4-1, continued

62) Low flow to Cl_2 scrubber and/or low dp to Cl_2 scrubber. Potential excursions (e.g. PM, Cl_2)	Cl_2 scrubber - Failure of liquid feed rate flowmeter	**Preventative Measures:** 1) Alarms indicating flow is outside normal range. 2) Use of Smart transmitters so control system can sense a failed transmitter **Response Procedures:** 1) Shutdown waste feeds if instrument fails. 2) Waste feed is shut off at conditions more restrictive than AWFCO limits.
63) Low IWS recirculation flow rate and/or low blowdown rate and/or low kV, and/or more than 2 IWS units offline. Potential excursions (e.g. PM)	IWS – Pump failure	**Preventative Measures:** 1) Use of installed spare pumps on IWS. 5 pumps installed for 3 banks. 2) Periodic inspection of pumps. **Response Procedures:** 1) If on line pump fails operator switches to installed spare pump and/or 2) Shutdown waste feed at conditions more restrictive than AWFCO limits
64) Low kV, and/or more than 2 IWS units offline Potential excursions (e.g. PM)	IWS – system failure (e.g. broken wires, loose ionization potential , faulty transformer rectifier, faulty PLC controller, electrode misalignment, loss of purge air, instrument failure)	**Preventative Measures:** 1) Preventive maintenance performed periodically on IWS 2) Monitor voltage by instrument. 3) Failure may only impact 1 IWS unit. 4) By design only need 7 of 9 installed IWS unit operating to meet limits. **Response Procedures**: 1) Shutdown single IWS unit 2) Repair and restart failed IWS

Table 4-1, continued

65) Low blowdown from the IWS. Potential excursions (e.g. PM)	IWS - loss of purge and buildup of solids caused by (e.g. equipment failures,)	**Preventative Measures:** 1) Measure IWS basin level 2) Alarm on basin level outside acceptable range. **Response Procedures:** 1) Shut down waste feed at conditions more restrictive than AWFCO limits
66) Low blowdown from the IWS and/or low IWS plate water flow. Potential excursions (e.g. PM)	IWS - loss makeup water , flow meter problems.	**Preventative Measures:** 1) Monitor flow by instrument. 2) Alarm if flow is outside acceptable range. **Response Procedures:** 1) Shut off waste feed at conditions more restrictive than AWFCO limits.

Table 4-1, continued

67) High temp leaving condenser. Potential excursions (e.g. PM, metals)	Cooling tower - loss of heat exchanger cooling water for packed tower condenser. Cooling in packed tower condenser enhances venturi removal capability	**Preventative Measures:** 1) Redundant Level transmitters on basin 2) Use of Smart transmitters so control system can sense a failed transmitter 3) Cooling tower water is temperature controlled 4) Use of installed spare pumps on cooling tower. 5) Preventative maintenance performed periodically on pumps and cooling tower. 6) Once through water is available as back up to cooling tower. **Response Procedures:** 1) If level transmitter fails control system will switch to valid instrument and/or 2) If on line pump fails switch to installed spare pump and/or 3) If cooling tower fails switch to once through water back up and/or 4) Shutdown waste feed at conditions more restrictive than AWFCO limits.
68) Low flow to quench, and/or low flow to top of condenser and/or low blowdown rate from condenser and/or low blowdown from quench tower and/or high temp on quench and/or ESV opening and/or high kiln pressure. Potential excursions (e.g Fugitives due to loss of level in ash conveyor and eventually yielding to positive pressure in the kiln)	Loss of service water	**Preventative Procedures:** 1) The ash conveyor alarms on low level 2) Site has two independent sources of service water to maintain continuous supply **Response Procedures:** 1) The operator investigates and corrects problem and/or 2) Shut off waste feed at conditions more restrictive than AWFCO limits.

Table 4-1, continued

69) Loss of plant air Potential excursions (e.g D/F limit)	Loss of plant air	**Preventative Measures:** 1) Plant air system is run by outside firm. 2) They have back up compressors in case of failure. **Response Procedures:** 1) All block valves will go to fail safe position on loss of air. 2) The fuel supply will be lost if this event should happen.
70) Loss of Process Control Computer	Loss of verification that the unit did not exceed permit parameters	**Preventative Measures:** 1) Redundant computers. 2) One computer backs up the other. **Response Procedures:** 1) If both computers are lost, the system halts and must go into a fail safe mode.
71) IP21 problems and/or Loss of process information system	Loss of verification that the unit did not exceed permit parameters	**Preventative Measures:** 1) Process information data is backed up. **Response Procedures:** 1) Pack Line will be shutdown 2) Other waste feeds currently on line will continue using instantaneous value to trip AWFCO rather than rolling average value. 3) New waste streams will not be started. 4) If AWFCO should occur waste feed will not be restarted until PI system is online and all rolling averages calculations are in range.

Table 4-1, continued

72) IP21 problems and/or Loss of process information system	Loss of recorded data	**Preventative Measures:** 1) Process information data is backed up. **Response Procedures:** 1) Confirm data is being recorded. If current data is not being recorded, shut down all waste feed as soon as practicable until recording can be assured. Otherwise, do not interrupt operations. 2) If AWFCO should occur waste feed will not be restarted until PI system is online and all rolling averages calculations are in range. 3) If the missing data can still be recovered from another source, initiate and complete the necessary recovery action or make the request for a knowledgeable person to do so.
73) CEMS Failure. Low Oxygen.	Loss of Stack Oxygen. Needed for emissions calculations, minimum Oxygen limit	**Preventative Measures:** 1) Dual sample systems with dual instruments. 2) Preventative maintenance and calibration performed periodically on analyzer. **Response Procedures:** 1) If one analyzer fails control system will switch to valid analyzer. In this scenario there may be up to 20 minutes per day of analyzer downtime per day for calibration as allowed per the Subpart EEE Appendix. 2) If both units fail, all waste will be shut off from going into the incinerator. 3) Waste feed is shut off at conditions that are more restrictive than AWFCO limits.

Table 4-1, continued

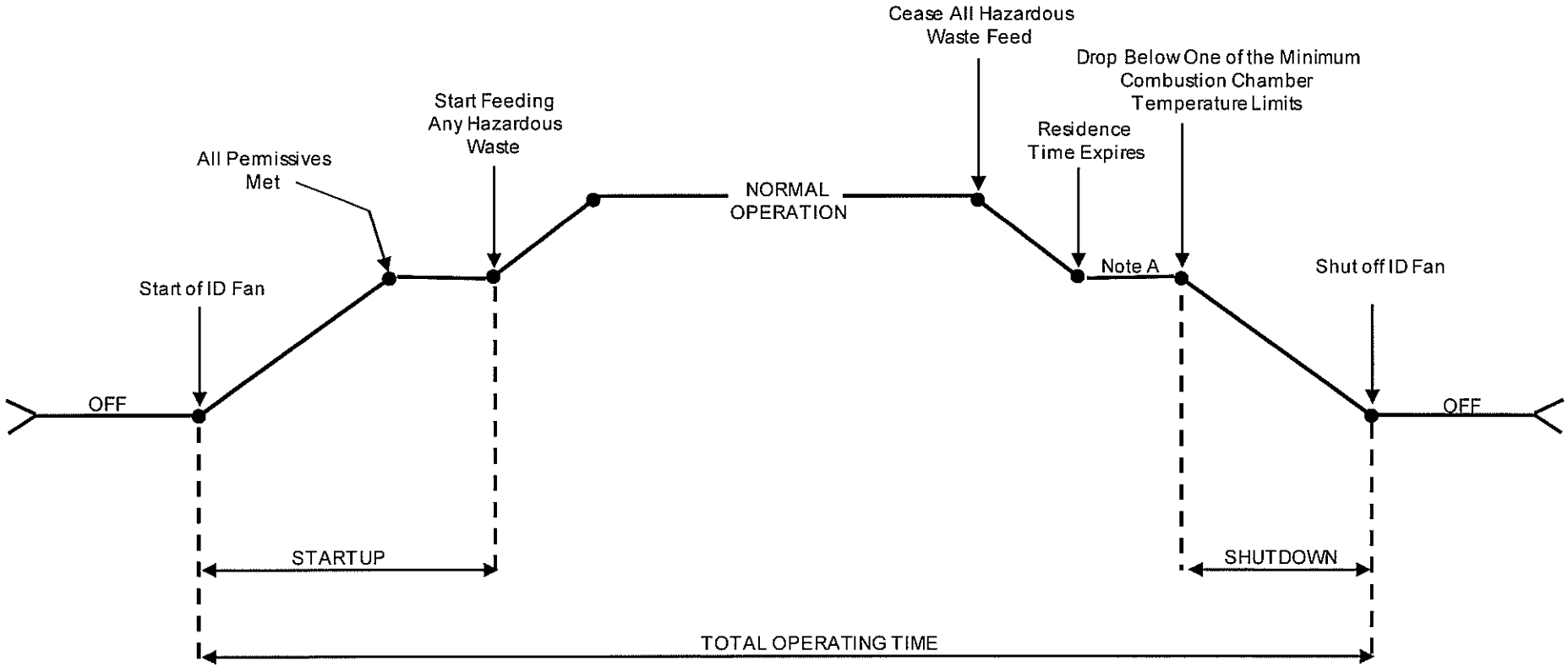
74) CEMS Failure. Loss of Stack Gas Flowmeter – maximum gas flowrate	Loss of Stack Gas Flowmeter – maximum gas flowrate	**Preventative Measures:** 1) Preventative maintenance and calibration performed periodically on pressure transmitter. 2) Use of Smart flow transmitters so control system can sense a failed transmitter **Response Procedures:** 1) If instrument fails control system will use last valid data in calculations for up to 4 hours while instrument repair is done. 2) If instrument cannot be repaired within 4 hours waste feed will be shut off. 3) Waste feed is shut off at conditions more restrictive than AWFCO limits.
75) Loss of NOx – NOx analyzer	Loss of NOx – NOx analyzer	**Preventative Measures:** 1) Dual sample systems with dual instruments. 2) Preventative maintenance and calibration performed periodically on analyzer. **Response Procedures:** 1) If one analyzer fails control system will switch to valid analyzer. In this scenario there may be up to 20 minutes per day of analyzer downtime per day for calibration as allowed per the Subpart EEE Appendix. 2) If both units fail, all waste will be shut off from going into the incinerator. 3) Waste feed is shut off at conditions that are more restrictive than AWFCO limits

Table 4-1, continued

76) Loss of SOx – SOx analyzer	Loss of SOx – SOx analyzer	**Preventative Measures:** 1) Dual sample systems with dual instruments. 2) Preventative maintenance and calibration performed periodically on analyzer. **Response Procedures:** 1) If one analyzer fails control system will switch to valid analyzer. In this scenario there may be up to 20 minutes per day of analyzer downtime per day for calibration as allowed per the Subpart EEE Appendix. 2) If both units fail, all waste will be shut off from going into the unit. 3) Waste feed is shut off at conditions that are more restrictive than AWFCO limits
77) Any other event not listed that results in potential exceedances from the incinerator vent	Any other event not listed that results in potential exceedances from the incinerator vent.	**Response Procedures** 1) Waste feed is shut off at conditions that are more restrictive than AWFCO limits

Table 4-1, continued

78) High Btu Output	Instrument failures, waste/fuel feed problem	**Preventative Measures:** 1) Preventative maintenance and calibration is performed periodically on instruments. **Response Procedures** 1) Waste feed is shut off at conditions that are more restrictive than AWFCO limits
79) Low blowdown from quench Potential excursion. (e.g.PM, Cl_2)	Pump/equipment failure, water supply problems, instrument failure, plugging in quench	**Preventative Measures:** 1) Dual feed pumps 2) Preventative maintenance and calibration is performed periodically on instruments. **Response Procedures** 1) Waste feed is shut off at conditions that are more restrictive than AWFCO limits



NOTES

A. IF HAZARDOUS WASTE FEED RESUMES DURING THIS TIME PERIOD THE SYSTEM IS STILL CONSIDERED IN "NORMAL OPERATIONS"

Figure 4-1. Startup and Shutdown Periods for the Rotary Kiln Incineration System

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