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# PERMIT ATTACHMENT

## APPENDIX XXII

### STARTUP, SHUTDOWN, MALFUNCTION PLAN

This document was not altered from the April 2016 Application

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## APPENDIX XXII

### STARTUP, SHUTDOWN, MALFUNCTION PLAN

EVOQUA WATER TECHNOLOGIES

PARKER REACTIVATION FACILITY

PARKER, ARIZONA

Revision 1  
June 2014

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# **STARTUP, SHUTDOWN, AND MALFUNCTION PLAN**

**EVOQUA WATER TECHNOLOGIES  
2523 MUTAHAR STREET  
PARKER, ARIZONA 85344**

JUNE, 2014  
REVISION: 1

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### **List of Acronyms**

acfh	Actual cubic feet per hour
acfm	Actual cubic feet per minute
APC	Air pollution control
AWFCO	Automatic waste feed cutoff
Btu	British thermal unit
CAA	Clean Air Act
CEM or CEMS	Continuous emission monitor or Continuous emission monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CRIT	Colorado River Indian Tribes
cu. ft.	Cubic foot
DC	Direct current
DRE	Destruction and removal efficiency
dscf	Dry standard cubic foot
dscfm	Dry standard cubic feet per minute
EPA	United States Environmental Protection Agency
ESV	Emergency Stack Vent
ft	Feet
gpm	U.S. Gallons per minute
gr	Grain (equals 1/7000 pound)
HAP	Hazardous air pollutant
HCl	Hydrogen chloride
hr	Hour
ID	Induced draft
in	Inch
in w.c.	Inches of water column (pressure measurement)
L	Liter
lb	Pound
mg	Milligram
ml	Milliliter
MTEC	Maximum theoretical emission concentration
NDIR	Non-dispersive infrared
ng	Nanogram
P&ID	Piping and instrumentation diagram

PCDD/PCDF	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans
PDT	Performance Demonstration Test
PDTP	Performance Demonstration Test Plan
PFD	Process flow diagram
PLC	Programmable logic controller
POTW	Publicly Owned Treatment Works
ppm	Parts per million
ppmv	Parts per million by volume
ppmvd	Parts per million by volume, dry basis
RCRA	Resource Conservation and Recovery Act
rpm	Revolution per minute
scfm	Standard cubic feet per minute
EWT	Evoqua Water Technologies
SOP	Standard Operating Procedure
sq. ft.	Square feet
SSMP	Startup, Shutdown, and Malfunction Plan
TCDD	Tetrachloro dibenzo-p-dioxin
TEQ	Toxicity equivalent (related to 2,3,7,8-TCDD)
TSCA	Toxic Substances Control Act
ug	Microgram
USEPA	United States Environmental Protection Agency
WESP	Wet electrostatic precipitator

## 1.0 INTRODUCTION

Evoqua Water Technologies (EWT) operates a carbon reactivation facility located in the Colorado River Indian Tribes (CRIT) Industrial Park near Parker, Arizona. The facility treats spent activated carbon that has been used by industry, state and federal government agencies, and municipalities for the removal of organic compounds from liquid and vapor phase process waste streams. Once the carbon has been used and is spent, it must be either disposed of or reactivated at a facility such as EWT. A Carbon Reactivation Furnace (RF-2) is used by EWT to reactivate the spent carbon. Some of the carbon received at the Parker facility is designated as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) regulations. Much of the spent activated carbon received at the facility is not a RCRA hazardous waste, as it is neither a characteristic nor a listed waste as defined by 40 CFR 261. The carbon reactivation facility is operating under the RCRA Interim Status standards of 40 CFR 265 and is currently in the process of obtaining a RCRA permit.

The carbon reactivation process thermally treats spent activated carbon in a multiple hearth furnace consisting of five hearths. The spent carbon is introduced into the top hearth and flows downward through the remaining four hearths. Reactivated carbon exits the bottom hearth through a cooling screw. Natural gas burners are provided to ensure adequate heat input to the reactivation unit for all of the spent carbons that are reactivated at the facility. The hot gases generated in the reactivation furnace are routed to an afterburner to ensure the thermal oxidation of any organic matter that is not oxidized in the reactivation unit. The afterburner is equipped with two burners that utilize natural gas as the fuel source. From the afterburner, the gases are quenched by direct water contact and routed through a variable throat venturi scrubber for particulate matter control. From the venturi scrubber, the gases are routed to a packed bed scrubber for acid gas control. From the packed bed scrubber, the gases flow through a wet electrostatic precipitator, used for fine particulate matter and metals control. From the wet electrostatic precipitator, the gases are routed through a stack to the atmosphere. The motive force for moving the gases through the air pollution control system is supplied by an induced draft fan. The air pollution control equipment uses a closed loop recycle water system. Scrubber blowdown from reactivation furnace air pollution control equipment is treated in an exempt wastewater treatment unit, or discharged directly to a Publicly Owned Treatment Works (POTW).

RF-2 is not a hazardous waste incinerator. "Incinerator" is defined in 40 CFR 260.10 as "any enclosed device that: (1) Uses controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer or carbon regeneration unit, nor is listed as an industrial furnace; or (2) Meets the definition of infrared incinerator or plasma arc incinerator." The multiple hearth furnace is designated by Subpart X of the RCRA regulations as a Miscellaneous Unit.



EPA Region 9 has requested that EWT prepare a Startup, Shutdown and Malfunction Plan (SSMP) as part of the permitting process for the reactivation furnace. The purpose of the SSMP, which will take effect once the final Part B permit is approved, is to do the following:

- To ensure that the reactivation furnace unit, including emission control equipment is operated and maintained in fulfillment of EWT's general duty to minimize emissions to the greatest extent in a manner consistent with good air pollution control practices
- To ensure that owners and operators are prepared to correct malfunctions as soon as practicable
- To minimize the reporting burden associated with excess emissions. The SSMP should address startup, shutdown, and malfunction events of the thermal treatment process that could result in an emission or operating limit exceedance

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

- Procedures for operating and maintaining the source during periods of startup, shutdown, and malfunction
- The corrective action program for responding to malfunctioning process, air pollution control, and related monitoring equipment used to comply with the SSMP standard
- Potential causes of the identified malfunctions that may result in excess emissions of hazardous air pollutants (HAPs), and actions to be taken to minimize the frequency and severity of those malfunctions

Emission standards and operating limits do not apply during periods of startup, shutdown, and malfunction. Facilities are exempted from emission standard and operating limit violations during startup, shutdown, and malfunction events, provided the SSMP procedures are followed and compliance with the SSMP is properly documented. The specific procedures that address startup, shutdown, and response to possible malfunctions of the thermal treatment process, and how facility personnel must document compliance with these procedures, are described in this plan.

In order to ensure that the plan comprehensively identifies potential malfunctions, the plant's reaction to those malfunctions, and the measures in place to prevent them, a EWT cross-functional team reviewed the process and its operational factors via the following:

- independent consideration of the malfunction potential and impact of each relevant piece in the APC system
- planned actions to be taken in response to malfunctions, and
- a determination of the scope and adequacy (with adjustment as needed) of the measures in place to prevent malfunctions from occurring

The cross-functional team consisted of and obtained input from staff in the operations, maintenance, and environmental departments of the Parker facility. In addition, consultative support on this effort was provided via internal corporate and external resources.

## **2.0 PLAN ORGANIZATION AND OBJECTIVES**

This SSMP has been developed to provide guidance for operating and maintaining the spent carbon thermal treatment process during startup, shutdown, and occurrence of malfunctions in a manner consistent with safety and good air pollution control practices for minimizing emissions. Preventative measures as well as corrective measures associated with the malfunctions are also key aspects of this Plan. The SSMP is organized as follows:

- Section 3.0 provides a description of EWT's spent carbon reactivation process
- Section 4.0 defines startup, shutdown, and malfunction as they apply to this Plan, and provides details for complying with the plan. Instructions for preparing new Plan procedures and revising existing procedures are also discussed.
- Section 5.0 describes the decisions, actions and required records associated with the occurrence of startups, shutdowns, or potential malfunction events
- Section 6.0 describes procedures to be followed during startup and shutdown of the thermal treatment process.
- Section 7.0 addresses features of the thermal treatment process intended to prevent system malfunctions, and corrective measures to be taken in the event of malfunctions.
- Section 8.0 describes the SSMP record keeping requirements
- Section 9.0 describes the SSMP reporting requirements.

### **3.0 CARBON REACTIVATION PROCESS DESCRIPTION**

Provided in this section is a general process description of the carbon reactivation process. Included are functional descriptions of each system component as they apply to achieving compliance with the emission limits and operating parameter limits. A block flow diagram of EWT's carbon reactivation system is provided as Figure 3-1. This section also includes a discussion of hazardous waste residence time, which is a critical parameter associated with implementation of this plan.

#### **3.1 CARBON REACTIVATION SYSTEM**

The carbon reactivation system is a multiple hearth furnace, consisting of five hearths followed by an afterburner. Spent carbon in an aqueous slurry form is introduced into the top hearth of the reactivation unit by a dewatering screw and flows downward through the remaining four hearths. The top two hearths are unfired hearths. Hot combustion gases generated in the bottom three hearths flow upward through the top hearths and are used to complete the dewatering of the spent carbon. The bottom three hearths are fired hearths where the reactivation process occurs. Rabble arms, with teeth, each connected to a rotating center shaft, are located above each hearth. The rabble arms plow the carbon material across the hearth surface and towards drop holes. The carbon falls through the drop holes to the next lower hearth, and eventually to the outlet of the reactivation unit. Reactivated carbon exits the bottom hearth through a cooling screw. The reactivation furnace is equipped with a primary combustion air fan, and two center shaft cooling fans. Natural gas burners are provided to ensure adequate heat input to the reactivation unit for all carbons that are reactivated at the facility. A Performance Demonstration Test was conducted at the reactivation furnace unit, and demonstrated compliance with all of the performance and emissions standards in 40 CFR 60, Subpart EEE, while processing 3,049 pounds per hour of wet spent carbon feed.

##### **3.1.1 Multiple Hearth Furnace**

Following dewatering the spent granular carbon is fed to the top section of the multiple-hearth furnace. In the pre-drying and drying zones (the top hearths), the water retained in the pores and the surface of the carbon is evaporated by the counter-current flow of hot combustion gases coming from the lower hearths. The temperature of the carbon in the top hearths is raised to approximately 210°F. Upon application of heat, water will evaporate freely when the particle temperature goes over 200°F. The adsorbed water is freed at temperatures of approximately 212°F to 230°F. After the water is evaporated from the carbon, the carbon starts to increase in temperature.

At temperatures over 600°F, high molecular weight organic impurities in the carbon will crack to produce gaseous hydrocarbons, hydrogen and water vapor which escape the pores of the granular carbon. Some fixed carbon is formed by pyrolytic (low oxygen) cracking of the organic and is retained in the pores of the granules. In these pre-heating and decomposition zones (middle hearths) the temperature of the carbon

is increased to about 750°F in a virtually oxygen-free atmosphere. Under these conditions the adsorbed organic impurities in the pores of the carbon are pyrolyzed and all volatile materials are driven off.

### **3.1.2 Afterburner**

The afterburner is a self supporting vertical cylindrical chamber approximately 33 feet high with an inside diameter of approximately 5 feet. The design incorporates a mixing zone, choke ring and a minimum residence time, at temperature, of greater than one second. The afterburner shell is constructed of steel plate and is internally lined with firebrick and castable insulation. The afterburner is equipped with two low NO<sub>x</sub> burners, which utilize heated combustion air. The afterburner chamber is fitted with a total of six air injection nozzles which are placed to provide combustion air and turbulence to promote the oxidation of organic materials in the flue gas from the multiple hearth furnace. The afterburner is designed to thermally oxidize greater than 99.99 percent of all organic matter entering the afterburner in the furnace off gas. A cross section of the afterburner and the afterburner specification can be found in Appendix X of the RCRA Part B Permit Application.

### **3.1.3 Residence Time Determination**

The hazardous waste residence time for the carbon reactivation process following waste feed cutoff, based on calculations of the time for spent activated carbon to exit the bottom hearth and emitted gases to be treated in the afterburner, is 38 minutes at a rabble arm shaft speed of approximately 1 revolution per minute (rpm).

The hazardous waste residence time is a critical parameter for establishing, following automatic or manual shutoff of the spent carbon, whether exceedances from permit limits are or could be counted as permit violations. Additional discussion of the significance of hazardous waste residence time as it applies to this SSMP is provided in Section 4.0.

## **3.2 BURNER AND FEED SYSTEMS**

Six natural gas burners are installed in the reactivation furnace, two per hearth on hearths 3, 4, and 5. Two natural gas burners are installed in the afterburner. Depending on temperature requirements in the unit, not all burners will be required to be operated at any one time.

### **3.2.1 Burner Description**

The six burners installed in the reactivation furnace are North American Manufacturing Company burners (NA 6422-6) or equivalent. The two burners installed in the afterburner are North American Manufacturing Company burners (NA 6514-8B) or equivalent. Literature describing these burners can be found in Appendix X of the RCRA Part B Permit Application.

### **3.2.2 Spent Activated Carbon Feed System**

The spent activated carbon feed system to the reactivation furnace consists of a feed tank, a dewatering screw, and a weigh belt conveyor. The spent carbon/recycle water slurry is discharged from the feed tank to the dewatering screw via a control valve. The dewatered spent carbon is discharged from the dewatering screw on to the weigh belt conveyor, which is used to measure the feed rate to the reactivation furnace.

### **3.2.3 Auxiliary Fuel System**

The six burners in the reactivation furnace and the two burners in the afterburner are fired with natural gas, supplied by the local utility company via pipeline.

### **3.2.4 Combustion Air**

Combustion air is supplied to the six reactivation furnace burners and two afterburner burners by a combustion air blower. The blower is designed to supply approximately 351,600 actual cubic feet per hour (acfh) of preheated combustion air. Fan specifications are located in Appendix X of the RCRA Part B Permit Application.

## **3.3 REACTIVATED CARBON HANDLING SYSTEM**

The reactivated carbon exiting from the reactivation furnace is a product and hence not regulated under RCRA. No solid residues are produced by the reactivation furnace. The reactivated carbon is discharged from the reactivation furnace into a screw cooler and from the screw cooler into one of three reactivated carbon product storage tanks. From the reactivated carbon storage tanks, the reactivated carbon product is transported through an enclosed conveyor to a product packaging facility. At the product packaging facility, the reactivated carbon is removed from the storage tanks and placed in appropriate containers for shipment to customers.

Scrubber blowdown from the reactivation furnace air pollution control equipment is treated in a RCRA-exempt wastewater treatment unit, or discharged directly to the POTW. The discharge to the POTW is continuously monitored for pH, total dissolved solids, flow and temperature to ensure compliance with the discharge limitations found in the facility's industrial wastewater discharge permit.

## **3.4 AIR POLLUTION CONTROL (APC) SYSTEM**

The APC system for the reactivation furnace includes a quench/venturi scrubber, a packed bed scrubber and a wet electrostatic precipitator. The APC system does not include an Emergency Stack Vent (ESV). Exhaust gases from the carbon reactivation system are continuously routed through the APC equipment, and cannot by-pass the APC equipment under any circumstances. The individual components of the APC equipment are described in the following sections.

### **3.4.1 Quench/Venturi Scrubber**

The Quench/Venturi Scrubber is a dual-purpose device used to rapidly quench the hot combustion gases exiting the afterburner and to remove particulate matter. The quench section uses water sprays to cool the afterburner exit gas to the point of adiabatic saturation (approximately 170 to 190°F). The venturi scrubber has an adjustable throat, and is a low energy, vertical down flow type. The throat area is adjusted by a pneumatic cylinder actuator and an electro/pneumatic positioner. The remotely adjustable throat is automatically controlled to maintain a constant pressure differential. The venturi scrubber is located directly below the quench section and is connected by a flooded elbow to the packed bed scrubber. The elbow incorporates a water-filled gas impact section directly beneath the throat to prevent erosion of the shell. The water supply for venturi irrigation is recirculated scrubber water at a total flow of approximately 7.5 gpm/1000 acfm.

The design data and equipment descriptions for the Quench/Venturi Scrubber as well as a description of the physical dimensions of the venturi scrubber section can be found in Appendix X of the RCRA Part B Permit Application.

### **3.4.2 Packed Bed Scrubber**

The packed bed scrubber consists of a vertical up flow and cylindrical disengaging section followed by a packed bed section and mist eliminator. The bottom portion of the scrubber is used to separate entrained water droplets from the gas prior to entering the packed section of the scrubber. The packed bed scrubber is designed to remove a minimum of 99 percent of the incoming hydrogen chloride.

The design data and equipment description for the packed bed scrubber as well as a description of the physical dimensions of the packed bed scrubber can be found in Appendix X of the RCRA Part B Permit Application.

### **3.4.3 Wet Electrostatic Precipitator**

The wet electrostatic precipitator (WESP) is a vertical tubular design with self irrigating tubes. The WESP consists of inlet gas distribution to promote even distribution of the process gas flow entering the WESP, inlet and outlet plenums and a collecting electrode tube bundle. The WESP is equipped with outboard high voltage insulator compartments which include a purge air system, high voltage distribution-support grids, high intensity rigid tube type charging/precipitating discharge electrodes, high voltage power supply (transformer/rectifier and controller) system, ground sticks, safety key interlocks, warning labels, and electronic control logic equipment and valving.

The WESP, in conjunction with the venturi scrubber, is designed to achieve a maximum outlet particulate matter grain loading of 0.015 grains/dscf adjusted to 7 percent oxygen. The design data and equipment

description for the WESP as well as a description of the physical dimensions of the WESP can be found in Appendix X of the RCRA Part B Permit Application.

#### **3.4.4 ID Fan**

A variable speed induced draft fan is provided to exhaust combustion gases from the furnace and afterburner and through the air pollution control system. Design specifications for the fan can be found in Appendix X of the RCRA Part B Permit Application.

#### **3.4.5 Stack**

The cleaned gas stream is exhausted to the atmosphere via a 110 foot high stack with an inside diameter of two feet and a gas outlet that is 19.75 inches in diameter. A stack drawing is provided in Appendix X of the RCRA Part B Permit Application.

### **3.5 PROCESS MONITORING, CONTROL, AND OPERATION**

The facility is equipped with a programmable logic control (PLC) system which monitors and/or controls process variables to ensure proper facility operation. The reactivation furnace system is equipped with instrumentation to monitor and control process flows, temperatures, and pressures, and to transmit signals to the main control system. The automation system has the capabilities of controlling valves, motors, pumps, and fans as well as alarming and initiating waste feed cutoff interlocks if process conditions deviate from established limits.

Figure 3-2 shows the location of pertinent instrumentation related to permit compliance. Complete Piping and Instrumentation Diagrams (P&IDs) are included in Appendix VI of the RCRA Part B Permit Application. It is important to note that these drawings include many components of the facility that are exempt from permitting under various provisions of RCRA. These components are provided for informational purposes and ease of review only, and they are not intended to become regulated components of the facility. Information concerning major process instruments associated with regulatory compliance is presented in Table 3-1. Calibration schedules are based on manufacturer's recommendations and EWT operating experience.

Process monitoring and emissions monitoring performed for regulatory compliance is conducted on a continuous basis in accordance with USEPA definitions of continuous monitors.

A "Continuous Monitor" is a device (or series of devices) which continuously samples the regulated parameter without interruption, evaluates the detector response at least once every 15 seconds, and computes and records the average value at least every 60 seconds, except during periods of calibration or as otherwise allowed by the applicable regulations or guidelines. For many parameters, rolling averages are calculated. A "Rolling Average" is defined as the arithmetic mean of a defined number of



the most recent one-minute average values calculated by the continuous monitor. For example, an hourly rolling average would incorporate the 60 most recent one-minute average values. As each new one-minute average value is computed, the least recent of the 60 values is discarded and a new hourly rolling average is calculated and recorded. Twelve hour rolling averages use 720 one-minute average values rather than 60.

Two subsets of continuous monitoring systems are employed on the reactivation furnace: process continuous monitoring systems (CMS) and continuous emissions monitoring systems (CEMS). The following is a discussion of each type of continuous monitoring system.

### **3.5.1 Process Continuous Monitoring System (CMS)**

The carbon reactivation process utilizes a continuous monitoring system (CMS) to monitor regulated stack gas emissions and operating parameters. The CMS consists of a combination of continuous emissions monitoring systems (CEMS) and instruments (parameter CMSs) that monitor and record parameter data from the operations of the process.

Parameter CMSs are process instruments that continuously monitor and record parameter data from the operation of the carbon reactivation process. The instruments consist of weigh belts, flowmeters, pressure transducers, thermocouples and other devices that collect process information on key regulatory parameters. The parameter CMSs sample each regulated parameter without interruption, evaluate the detector response at least once every 15 seconds, and compute and record the average values at least once every 60 seconds. The specified operating parameter limits are shown in Table 3-2. The parameter CMSs that will be used to continuously demonstrate compliance with the operating parameter limits are shown in Table 3-1.

Figure 3-2 shows the general location and function of the parameter CMSs that monitor temperature, pressure, and flow indicating and control devices for the system. The specifications for these devices are shown in Table 3-1. The following is a discussion of each type of process monitoring and control to be performed in the reactivation furnace system for regulatory compliance purposes.

#### **Spent Activated Carbon Feed Rate**

The flow rate of the spent activated carbon is monitored and controlled using a weigh belt conveyor and carbon slurry feed valve. When the feed valve is open, carbon slurry drops into the dewatering screw and is then discharged onto the weight belt conveyor, which feeds the carbon to the reactivation furnace. The feed rate control system consists of a weigh cell, weight transmitting element, weight indicating controller, variable timed open/closed carbon slurry feed valve, and continuous weight feed rate recorder. The desired spent activated carbon feed rate is achieved by the control system adjusting the time that the carbon slurry feed valve is open and closed. Automatic waste feed cutoff interlocks stop the weigh belt

conveyor and hold the carbon slurry valve closed which stops the feed of carbon to the reactivation furnace.

### **Regulated Constituent Feed Rates**

The total feed rate of mercury, semivolatile metals (the combination of cadmium plus lead), and low volatility metals (the combination of arsenic, beryllium and chromium) is continuously monitored and recorded. This is accomplished by the process computer which continuously monitors the flow rate of spent activated carbon, and multiplies that flow rate by the constituent concentration, which is input to the computer whenever the feedstream characterization is updated as described in the facility Waste Analysis Plan.

### **Afterburner Temperature**

The reactivation furnace afterburner combustion temperature is continuously measured by a thermocouple located in the bottom of the afterburner chamber. The automatic waste feed cutoff interlock is activated during low temperature conditions. The automatic temperature controller accepts the signal from the thermocouple and manipulates the auxiliary fuel feed rate.

### **Venturi Pressure Differential**

Venturi scrubber pressure differential is measured and controlled as an indicator of the energy supplied for particulate matter removal. A minimum pressure differential is necessary for proper control efficiency. The pressure differential is continuously measured by a pressure differential indicator with pressure taps located at the inlet and outlet of the venturi. The pressure differential is controlled by changing the position of the venturi throat control valve elements.

### **Quench/Venturi Scrubber Liquid Flow Rate**

The recycle flow rate is continuously monitored using magnetic flow meters in the recycle water lines. A minimum recycle water flow rate is maintained in order to provide sufficient cooling and scrubbing water for particle removal. A low total recycle flow rate will initiate an automatic waste feed cutoff.

### **Packed Bed Scrubber pH and Flow Rate**

The packed bed scrubber recycle pH and the flow rate of recycled liquid to the packed bed scrubber influence the effectiveness of acid gas removal. The pH is measured continuously by an in-line pH probe installed in the recycle liquid piping. The recycle flow rate is continuously monitored using a magnetic flow meter in the recycle water line. Either low pH or low packed bed scrubber recycle flow rate will initiate an automatic waste feed cutoff.

### **Packed Bed Scrubber Pressure Differential**

The differential pressure across the packed bed is measured as an indicator of proper liquid and gas distribution in the tower. The pressure differential is continuously measured by a differential pressure element with taps located at the inlet and outlet of the packed bed scrubber.

#### **WESP Secondary Voltage**

EWT monitors the secondary voltage as an indicator of proper collection of fine particles and metals. A minimum secondary voltage has been established based upon the operating conditions during the Performance Demonstration Test.

#### **Scrubber Blowdown Flowrate**

In order to conserve water, EWT recycles most of the liquid from the air pollution control system. In order to prevent the buildup of dissolved solids, EWT bleeds water from the system. As water is bled, fresh makeup water is added. The APC system blowdown flow rate is continuously monitored using a magnetic flowmeter, and a low flow rate will trigger an automatic waste feed cutoff.

#### **Stack Gas Flow Rate**

The flow rate of stack gases is used as the indicator of combustion gas velocity prescribed by the applicable regulations. A flow sensor located in the stack provides the direct flow measurement. High stack gas flow rate will initiate an automatic waste feed cutoff.

### **3.5.2 Continuous Emissions Monitoring System (CEMS)**

The exhaust gases are continuously monitored for carbon monoxide and oxygen content as an indicator of proper operation of the combustion process.

The oxygen analyzer is a paramagnetic analyzer. The carbon monoxide analyzer is a non-dispersive infrared monitor having a dual range of 0-100 ppm and 0-1000 ppm. Performance specifications for the CEMS, as well as a drawing of the sampling system can be found in Appendix X of the RCRA Part B Permit Application.

### **3.5.3 Process Control System**

The carbon reactivation facility is equipped with a programmable logic control (PLC) system which monitors and/or controls process variables to ensure proper facility operation. The reactivation furnace system is equipped with instrumentation to monitor and control process flows, temperatures, and pressures, and to transmit signals to the main control system. The automation system has the capabilities of controlling valves, motors, pumps and fans as well as alarming and initiating waste feed cutoff interlocks if process conditions deviate from established limits.

The process control system maintains the operations within desired operating conditions, and manages continuously monitored process data required for compliance demonstration and specific operational

purposes. Regulatory and safety interlocks as well as shutdown features are important aspects of the process control system. Safety 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.

### **3.5.4 Safety and Automatic Waste Feed Cutoffs**

The control system includes automatic waste feed cutoff (AWFCO) system that stops the feed of spent activated carbon when operating conditions are at or near limits necessary to comply with specific permit conditions. A listing of the AWFCO parameters is provided in Table 3-2. When any of these parameters deviates from the established limit, an electronic signal from the control system will stop the carbon weigh belt feeder.

The parameter CMSs and CEMS described in this plan are integrated with the AWFCO system. The AWFCO system also incorporates safety related parameters that are not regulated by the facility's operating limits that are tied into the burner management and combustion control systems. The safety shutdown responses are relayed to various equipment and instruments when process limits are not met so that the equipment will enter a fail-safe mode. An AWFCO will occur following any of the below conditions:

- When the measured emission level of a regulated compound reaches or exceeds the AWFCO setpoint
- When the monitoring input of a regulated operating parameter reaches or exceeds its AWFCO setpoint
- 

On a monthly basis, during reactivation furnace operations, the AWFCO system will be tested by running a software routine to check PLC logic functions associated with the AWFCO subsystem. Each of the regulatory AWFCOs will be tested by using a control system console to input a software value which corresponds to an exceedance of the permit limit. The AWFCO test will be documented, via the Monthly RCRA Inspection Checklist. It should be noted that during the brief period of time when the AWFCO parameters are being tested, regulatory AWFCOs will be precluded. Non-regulatory AWFCOs will not be affected by the test.

## **3.6 PROCEDURES TO RAPIDLY STOP SPENT ACTIVATED CARBON FEEDS AND CONTROL EMISSIONS**

### **3.6.1 Rapidly Stopping Spent Activated Carbon Feeds**

The reactivation furnace is controlled by a process control computer. EWT has included alarms and waste feed cutoff interlock setpoints which will automatically stop the feed of spent activated carbon. In the event any of these preprogrammed operating setpoints are reached, the computer will take automatic

action to stop the carbon weigh belt conveyer to immediately stop spent activated carbon feed to the system. The same action to cease spent activated carbon feed can be activated from the control room by operating personnel. These actions do not necessarily constitute a shutdown of the reactivation furnace; only a stoppage of spent activated carbon feed. The reactivation furnace will normally operate on auxiliary fuel after spent activated carbon feed is ceased to maintain operating temperature.

### **3.6.2 Shutting Down the System**

Reactivation furnace system shutdowns may occur for three reasons:

- A loss or malfunction of systems or controllers critical to maintaining performance standards and operating requirements.
- Plant-wide electrical power or natural gas outage or loss of external water service.
- A scheduled shutdown for normal maintenance or other operational purposes.

In the event of a system failure, the reactivation furnace system is equipped with spent activated carbon feed and fuel shutoff valves which fail to the “safe” (closed or off) position. Operations personnel have the ability to initiate an emergency system shutdown manually from the control room, although a controlled shutdown is preferred. Complete shutdown of the reactivation furnace system can be undertaken as required in an orderly fashion to allow for a proper rate of cooling.

### **3.6.3 Controlling Emissions During Equipment Malfunctions**

Equipment shells and interconnecting ductwork are free from openings or gaps. Emissions from the spent activated carbon feed point are prevented through the use of a rotary air lock on the multiple hearth furnace feed port. Emissions from the rotating parts in the multiple hearth are prevented by a sand seal. Daily inspections are conducted in accordance with the inspection procedures of the RCRA permit application. Process gases are always directed through the emissions control equipment, and there are no provisions to bypass the air pollution control system. In addition, the emissions control equipment is among the last equipment to be taken off-line under any circumstance. In the event of an equipment malfunction affecting reactivation furnace system performance, spent activated carbon feed is automatically discontinued. Stopping the spent activated carbon feed immediately eliminates the flow of untreated spent activated carbon into the reactivation furnace system, however since the spent activated carbon takes 38 minutes to travel through the reactivation furnace hearths, a slight potential for emissions remains during this time. To the greatest extent possible, the afterburner and emissions control equipment will continue to operate while the malfunction is corrected. Spent activated carbon feed may be resumed once operating conditions have been returned within the permit limits. If the malfunction can not be corrected in a reasonable time frame or requires the unit to be taken off line, the reactivation

furnace, afterburner, and APC systems will be shut down in an orderly fashion according to standard operating procedures. Spent activated carbon feed will not resume until the malfunction has been corrected and the entire reactivation furnace system has been returned to operating conditions within the permitted limits.

#### **3.6.4 Emergency Safety Vent Operations**

The EWT reactivation furnace design does not require or utilize an emergency safety vent. Process gases are always directed through the emissions control equipment, and there are no provisions to bypass the air pollution control system.

## **4.0 SSMP IMPLEMENTATION**

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 carbon reactivation system's sophisticated process monitoring and control system is configured to shutoff spent activated carbon upon a malfunction, potential operating limit exceedances could occur during the spent activated carbon residence time in the multiple hearth and gaseous residence time in the afterburners (after the spent activated carbon has been shutoff). This section defines the periods of startup, shutdown and malfunctions as it applies to the SSMP, and describes activities and responsibilities for following and documenting compliance with the SSMP procedures.

### **4.1 APPLICABILITY**

#### **4.1.1 Startup**

For the purposes of this SSMP, startup will begin when the system begins firing natural gas in any of the bottom three hearths or the afterburner during a "cold startup". Startup ends when spent activated carbon feed to the multiple hearth is initiated.

#### **4.1.2 Shutdown**

For the EWT carbon reactivation system, shutdown includes the period when natural gas feed is being ramped down and the spent activated carbon reactivation system is being cooled. Shutdown will begin when spent activated carbon feed is discontinued to the multiple hearth furnace and the hazardous waste residence time of 38 minutes has expired. Permit limits are not applicable when spent carbon is not in the furnace.

#### **4.1.3 Malfunction**

A malfunction is defined as any sudden, infrequent, and not reasonably preventable failure of air pollution control, monitoring equipment, process equipment, or a process to operate in a normal or usual manner which causes, or has the potential to cause, the emission limitations in an applicable standard to be exceeded. The emission limitations refer to the CO standard and various parameter operating limits.

### **4.2 FOLLOWING THE STARTUP, SHUTDOWN, AND MALFUNCTION PLAN**

One purpose of the SSMP is to ensure that EWT fulfills its general duty to operate and maintain the unit, including emission control equipment, in a manner consistent with safety and good air pollution control practices during periods of startup and shutdown, and in responding to potential malfunctions. The instructions in this SSMP must be followed during all startups, shutdowns, and malfunctions. Also, documentation of whether the SSMP steps were followed during startups, shutdowns, and malfunctions

must be maintained, as well as numerous specific details associated with these startup, shutdowns and malfunctions. For the purposes of documenting the duration of an exceedance as a result of a malfunction, the exceedance will begin once an emission standard or operating limit is exceeded while spent carbon is in the multiple hearth. The exceedance will end once the spent activated carbon has cleared the multiple hearth furnace or once the emissions and operating parameters are reestablished within their respective permit limits, whichever occurs sooner. Additional detailed discussions for operating the activated carbon reactivation process during startups and shutdowns, responding to known or potential malfunctions, and abiding by all required recordkeeping and reporting requirements, are addressed in the remainder of this SSMP.

#### **4.3 METHODOLOGY FOR IDENTIFICATION OF MALFUNCTIONS**

This SSMP was developed to be both proactive and reactive to malfunctions. Malfunctions involving process equipment, instrumentation/CMS, and the process control system were included in the malfunction evaluation. After identifying these potential malfunctions, proactive measures were identified that would be expected to prevent these malfunctions from occurring as well as the reactive procedures that provide instructions for operating and controlling the system in the event that the malfunctions actually occurred. The primary work product of this team consists of a spreadsheet entitled "Potential Malfunctions From the Spent Activated Carbon Reactivation Furnace That May Result in Emission Exceedances". This spreadsheet is attached and incorporated into this plan by reference as Table 3-3. Additional discussions on procedures to respond to malfunctions are included in Section 7.0 of this plan.

In addition to the potential malfunctions identified in Table 3-3, future unexpected malfunctions could occur that might require compliance documentation, and that could possibly require revision of this SSMP to include the unexpected malfunctions. As such, operational personnel should be prepared to recognize incidents that may qualify as malfunctions that have not been previously identified. Indication that a potential malfunction is occurring or has occurred may be signaled by:

- Exceedance of an emission standard or operating limit
- Alarm
- Automatic waste feed cutoff
- Inspection or general observation of operational data

For the purposes of this plan, equipment problems that do not or could not cause an exceedance will not be considered a malfunction. Determining whether an equipment problem is a malfunction may require additional review of the process data and circumstances surrounding the event.



#### **4.4 DOCUMENTATION OF COMPLIANCE WITH THE SSMP**

During operational periods when the SSMP is applicable, process control operators will use the information contained in it to make regulatory compliance related decisions about the operation of the system, and to document what is needed to ensure compliance. It includes determining whether a potential malfunction event qualifies as a malfunction according to the Plan and how personnel document actions taken that are consistent or not consistent with the Plan. EWT has taken measures to train the control room operators and other key personnel on the importance of maintaining a thorough SSMP and following the procedures referenced in the plan. EWT has also provided extensive training on the procedures referenced in this plan. Exceedances of emission limits or operating parameters that occur when actions taken are consistent with the plan are not considered violations, even if hazardous waste is present in the combustion chamber.

EWT will use a checklist similar to the ones identified in the Appendix of this plan to document compliance with the SSMP during startup, shutdown, and malfunction events.

#### **4.5 PROCEDURE DEVELOPMENT AND MAINTENANCE**

This plan includes information on potential malfunctions and the reactive and proactive nature of EWT malfunction activities. In the event that any part of this plan or the referenced attachments requires revisions, new or modified procedures are needed, or changes are made to the review and approval process. Two basic circumstances may prompt these changes:

- Periodic changes in equipment or procedures that are addressed by the SSMP, and
- Revisions to the SSMP if the plan fails to address an event that occurs and that meets the characteristics of a malfunction.

If the SSMP fails to address or inadequately addresses an event that meets the characteristics of a malfunction, EWT will revise the SSMP within 45 days after the event to include detailed procedures for operating and maintaining the spent activated carbon reactivation process during similar malfunction events and a program of corrective action.

#### **4.6 AUTOMATIC WASTE FEED CUTOFF SYSTEM REQUIREMENTS DURING MALFUNCTIONS**

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 cutoff spent activated carbon feeds. If the malfunction itself prevents immediate and automatic cutoff of spent activated carbon feed, EWT will cease feeding spent activated carbon as quickly as possible.

Although AWFCO requirements continue to apply during malfunctions, an exceedance of an emission standard or operating limit is not a violation if corrective measures taken during the malfunction are consistent with procedures prescribed in the SSMP.

#### **4.7 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 the stack gas CO concentration to develop a CO concentration, corrected 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<sub>2</sub> = 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. The CO values during the startup, shutdown and when spent carbon feed is not in the furnace will not be valid or considered a permit violation.

## **5.0 DECISIONS, ACTIONS, AND RECORDS ASSOCIATED WITH STARTUPS, SHUTDOWNS, OR MALFUNCTIONS**

When a startup, shutdown or malfunction occurs, whether actions taken were consistent or not consistent with the SSMP will be documented in the facility operating record. Also, if it is a malfunction that occurs, the duration and a brief description of the malfunction must be included in the operating record. A determination must then be made as to whether an emission standard or operating limit exceedance occurred while spent activated carbon was in the multiple hearth during the startup, shutdown, or malfunction. If an exceedance did occur while spent activated carbon was in the multiple hearth, the occurrence and duration of the exceedance will be recorded in the operating record. The duration of the exceedance will be determined from the time the exceedance occurred until spent activated carbon is no longer in the multiple hearth (i.e. the hazardous waste residence time has expired) or once the emissions and operating parameters are reestablished within their respective permit limits, whichever occurs sooner.

If an exceedance did not occur while spent activated carbon was in the multiple hearth, determine whether the SSMP adequately addressed the SSM event. If the SSMP adequately addressed the event, no further action is required. If the SSMP did not adequately address the event, the SSMP will be revised.

A determination must then be made as to whether the exceedance was a result of a malfunction. In order to qualify as a malfunction, the event must be sudden, infrequent, and not reasonably preventable.

If the event was caused by a malfunction, investigate whether the malfunction was adequately addressed in the SSMP and whether actions taken in response to the event were consistent with the SSMP.

## **6.0 STARTUP AND SHUTDOWN PROCEDURES**

The procedures for operating the carbon reactivation process during startup and shutdown are delineated in the facility's operating manuals for the operation of the reactivation process. Conceptual startup and shutdown procedures are provided below.

### **6.1 STARTUP PROCEDURES**

The sequence below is a general summary of the procedures used for startup of the spent activated carbon reactivation system:

- Verification of power supply to all motors and process equipment/instrumentation
- Verification of utility supplies to all process equipment and instrumentation
- Startup of the afterburner forced draft fans
- Startup of the process induced draft fan
- Startup of the multiple hearth furnace shaft cooling fan
- Startup of the afterburner pilot
- Startup of multiple hearth furnace burner pilot
- Bring spent activated carbon reactivation system to operating temperature
- Startup of multiple hearth furnace air motor
- Startup of the multiple hearth furnace rabble arm drive
- Startup of multiple hearth furnace carbon product discharge system
- Startup of spent activated carbon feed.

Once the power and utility supply to all motors and process equipment/instrumentation is verified, the startup of the carbon reactivation system is initiated. This includes the startup of the afterburner forced draft fans, ID Fan, multiple hearth furnace cooler forced draft fans, quench/venturi scrubber, packed bed scrubber and the WESP. The afterburner system natural gas burners are lighted followed by the multiple hearth furnace natural gas burners. The multiple hearth furnace activated carbon product discharge system is activated prior to initiating waste feed. Additionally, all automatic waste feed cutoffs (AWFCOs) must be satisfied in order to initiate a feed start.

### **6.2 SHUTDOWN PROCEDURES**

In general, normal shutdown procedures are in reverse to the sequence used for startup. In the case of any interruptions, either AWFCOs or mechanical of short duration, the APCS continues to operate at permitted levels ensuring no excess particulate, metals and hydrogen chloride (HCl) emissions from the combustion system.

Emergency shutdown procedures occur either automatically via automatic shutdown control loops or by manual control. Conditions of unsafe operations for either the equipment or personnel (as defined by the safety interlock system) can result in emergency shutdown. In the event any emergency shutdown occurs, the reason for the condition occurring and the corrective action taken must be documented according to the SSMP requirements found in this plan.

## **7.0 PROCEDURES TO RESPOND TO MALFUNCTIONS**

Section 4.3 described the methodology that EWT utilized to identify possible malfunctions of the carbon reactivation process that, if they occurred, could possibly lead to an exceedance of an emission limit or operating parameter. This section provides information on the procedures for responding to these identified malfunctions. The procedures listed in Table 3-3 are a combination of procedures that provide proactive measures to prevent malfunctions and procedures that provide responses to such malfunctions. For potential malfunctions, the following is provided as referenced above:

- 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

Proactive measures included in EWT carbon reactivation process control system and in routine inspection procedures are briefly described in the following subsections.

### **7.1 CARBON REACTIVATION PROCESS CONTROL SYSTEM**

The carbon reactivation process is operated by a sophisticated control system. The control system is programmed to adjust the unit when operating conditions warrant and respond to certain malfunctions. The control system notifies the operators via alarms when operating conditions are outside optimal ranges.

### **7.2 INSPECTIONS**

EWT performs many proactive measures to identify potential problems with the system before they result in malfunctions. Such measures include daily inspections in which EWT visually inspects the reactivation furnace and associated equipment. The inspection includes a walk through around the carbon reactivation equipment and associated air pollution control system for leaks, spills, and fugitive emissions.

## **8.0 RECORDKEEPING REQUIREMENTS**

EWT will keep records for events of startup, shutdown, or corrective measures resulting from a malfunction which document that the procedures referenced in this Plan were followed. Records will also be maintained for events that occur where the procedures were not followed, and for malfunction events that occur where no corresponding response to malfunction procedures exist in the SSMP. The occurrence and duration of all startups, shutdowns, and malfunctions must be maintained in the operating record.

- Complete an investigation of the cause of each exceedance
- Evaluate approaches to minimize the frequency, duration, and severity of each exceedance
- Revise the SSMP as warranted by the investigation
- The results of the investigation and evaluation will be recorded in the operating record.
- A summary of the investigation and evaluation, and any changes to the SSMP

## **9.0 REPORTING REQUIREMENTS**

Details on the SSMP reports are provided below:

### **9.1 PERIODIC STARTUP, SHUTDOWN, AND MALFUNCTION REPORTS**

These reports will be kept in the facility's operating record and will contain the following:

- If action taken during a startup, shutdown, or malfunction event are consistent with the procedures specified in EWT's SSMP,
- The identification of each instance if actions taken during a startup, shutdown, or malfunction event are not consistent with the SSMP, but no exceedance occurs.
- Number, duration and a brief description of each malfunction.
- Summary of any changes to the SSMP during the last review period

### **9.2 IMMEDIATE STARTUP, SHUTDOWN, AND MALFUNCTION DOCUMENTATION**

- Any time an action taken during a startup, shutdown, or malfunction event is inconsistent with the procedures specified in the EWT SSMP and an exceedance of an emission standard or operating limit occurs while spent activated carbon is in the multiple hearth, EWT will document the details in the facility operating record.

### **9.3 INVESTIGATION AND EVALUATION SUMMARY REPORT**

This investigation and evaluation must include the following:

- Investigation of the cause of each exceedance
- Evaluation of approaches to minimize the frequency, duration, and severity of each exceedance
- Revision of the SSMP as warranted by the investigation

The results of the investigation and evaluation will be recorded in the operating record.



**Table 3-1 - Summary of Key Regulatory CMS Instrumentation**

Parameter	Identification Number of Sensor/Transmitter (a)	Instrument Type	Units	Range	Expected Operating Point or Range	Calibration frequency	Averaging	AWFCO (Y/N)
Feed rate of spent activated carbon	WE/WT-427	Weigh cell	lb/h	0-6000	< 3049	Semi-annually	1-hr Block	Y
Total feed rate of mercury	Computer	Calculated	lb/h	NA	0 – 1.9E-03	NA	12-hr RA	N
Total feed rate of SVM	Computer	Calculated	lb/h	NA	0 – 1.0	NA	12-hr RA	N
Total feed rate of LVM	Computer	Calculated	lb/h	NA	0 – 1.2	NA	12-hr RA	N
Afterburner gas temperature	TE-464A/B	T/C	F	0-2400	>1750	Annually	1-hr RA	Y
Venturi scrubber pressure differential	PDIT-556	Pressure sensor	in w.c.	0-50	>15	Annually	1-hr RA	Y
Venturi/Quench scrubber recycle liquid flow rate (Total Flow)	FI-562 (Total of FE/FIT-553, 554, & 555)	Sum of Magnetic flow meters (Dynac Function)	gpm	0-656	>75	Annually	1-hr RA	Y
Packed bed scrubber pH	AE/AIT-590	pH probe	pH	0-14	5	Quarterly	1-hr RA	Y
Packed bed scrubber recycle liquid flow rate	FE/FIT-552	Magnetic flow meter	gpm	0-200	>60	Annually	1-hr RA	Y
Packed bed scrubber pressure differential	PDIT-560	Pressure sensors	in w.c.	0-10	>0.1	Annually	1-hr RA	N
Scrubber blowdown flow rate	FE/FIT-605	Magnetic flow meter	gpm	0-691	>30	Annually	1-hr RA	Y
WESP secondary DC voltage	EI-558	Voltmeter	kVDC	0-80	14-22	NA	1-hr RA	Y
Stack gas flow rate	FE/FIT-700	Ultrasonic meter	acfm	Not available	<10,000	Annually	1-hr RA	Y
Stack gas carbon monoxide (b)	AE-575	Nondispersive infrared CEMS	ppmvd @7% O <sub>2</sub>	0-100 0-1000	< 100	Daily/ Quarterly/	1-hr RA	Y
Stack gas oxygen (b)	AE-576	Paramagnetic CEMS	vol%, dry	0-25	7	Daily/ Quarterly/	None	N

RA = Rolling average.

(a) Instrument identification from P&IDs.

(b) CEMS calibrations include daily zero and span check and quarterly cylinder gas audit,.

**Table 3-2. Evoqua Operating Parameter Limits**

<b>Control Parameters<sup>a</sup></b>	<b>Operating Limit</b>	<b>Comments<sup>b</sup></b>
<b>GROUP A1 PARAMETERS</b>		
Maximum spent carbon feed rate (lb/hr)	3049	Block hour AWFCO
Minimum afterburner temperature (°F)	1760	Hourly rolling average AWFCO
Minimum hearth #5 temperature (°F)	1350	Hourly rolling average AWFCO
Minimum venturi scrubber pressure differential (in. w.c.)	18	Hourly rolling average AWFCO
Minimum quench/venturi scrubber total liquid flow rate (gpm)	75	Hourly rolling average AWFCO
Minimum packed bed scrubber pH	4.4	Hourly rolling average AWFCO
Minimum packed bed scrubber liquid flow rate (gpm)	63	Hourly rolling average AWFCO
Minimum wet scrubber blowdown flow rate (gpm)	58	Hourly rolling average AWFCO
Minimum WESP secondary voltage (kVDC)	22	Hourly rolling average AWFCO
Maximum stack gas flow rate acfm	9,550	Hourly rolling average AWFCO
<b>GROUP A2 PARAMETERS</b>		
Maximum stack gas carbon monoxide (ppmvd, @7% oxygen) <sup>c</sup>	100	Hourly rolling average AWFCO
<b>GROUP B PARAMETERS</b>		
Allowable hazardous constituents	All except dioxin wastes and TSCA PCBs	Class 1 POHC demonstrated
Maximum total chlorine and chloride feed rate (lb/hr)	60	12-hour rolling average
Maximum mercury feed rate (lb/hr)	1.8E-03	12-hour rolling average
Maximum semivolatile metal (Cd + Pb) feed rate (lb/hr)	1.0E-01	12-hour rolling average
Maximum low volatility metal (As + Be + Cr) feed rate (lb/hr)	1.5E+00	12-hour rolling average
<b>GROUP C PARAMETERS</b>		
Minimum packed bed scrubber pressure differential (in. w.c.)	0.1	Hourly rolling average

- (a) Group A1 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. The values for the Group A1 parameters are based on the performance demonstration test operating conditions. Group A2 parameters are continuously monitored and recorded, and are interlocked with the automatic waste feed cutoff system. The values for the Group A2 parameters are based on regulatory standards or good operating practice rather than performance demonstration test operating conditions.

Group B parameters are continuously monitored and recorded, but are not interlocked with the automatic waste feed cutoff system. Values for the group B parameters are based on the performance demonstration test operating conditions.

Group C parameters are continuously monitoring and recording, but are not interlocked with the automatic waste feed cutoff system. The values for the Group C parameters are based on manufacturer's specifications and/or operational and safety considerations rather than performance demonstration test operating conditions.

- (b) AWFCO = Automatic waste feed cutoff.
- (c) AWFCO interlock will not be active during the daily CEM calibration period.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
<b>1</b>	<b>SPENT CARBON FEED SYSTEM</b>	Control system failure on weigh scale (Weigh cell, controller, encoder, recorder, etc.) allowing too much waste to enter combustion chamber.	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Interlocks are set to stop spent activated carbon feed before reaching permitted parameter limit based on weigh belt. (2) Weigh belt is routinely checked as per inspection schedule. (3) inspection by operators.	If the automated preventative measures do not detect and stop spent activated carbon feed, an operator will manually stop spent activated carbon feed upon identification of the malfunction.
<b>2</b>		Conveyor weigh belt continues to feed spent carbon during an AWFCO.	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Weigh belt motor shut off is routinely tested during AWFCO testing. Operator will make sure that rotary airlock valve (RV-1) is closed.	Operator will manually shut the weigh belt off to prevent waste from entering the multiple hearth.
<b>3</b>		Rotary Air Lock Fails	Fugitive emissions.	(1) Rotary air lock is periodically checked during the an inspection schedule. (2) Inspections by operators. (3) Operator will make sure that rotary airlock valve (RV-1) is functioning properly.	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
<b>4</b>		Sand Seal Fails	Fugitive emissions.	(1) Sand seal is periodically checked during the plant inspections. (2) Inspections by operators.	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
<b>5</b>		Drop Chute Fails	Fugitive emissions.	(1) Drop chute is periodically checked during the plant inspections. (2) Inspections by operators.	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
<b>6</b>	<b>MULTIPLE HEARTH FURNACE (RF-2)</b>	Shaft cooling air starts leaking into RF and may cause emissions from RF seals.	Fugitive emissions.	(1) Interlocks are set to stop spent activated carbon feed. (2) Cooling air shaft is periodically checked during plant inspections. (3) Inspections by operators.	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
<b>7</b>		Loss of ID Fan because coupling breaks causing pressure increase in RF that results in seal leaks.	Fugitive emissions.	(1) ID fan is periodically checked during plant inspections. (2) Inspections by operators	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
<b>8</b>		ID Fan shuts down because of vibration causing pressure increase in RF that results in seal leaks.	Fugitive emissions.	(1) ID fan is periodically checked during plant inspections. (2) Inspections by operators	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
<b>9</b>		Loss of ID Fan because of variable frequency drive (VFD) malfunction or controller tripped requiring reset	Fugitive emissions.	(1) ID fan is periodically checked during plant inspections. (2) Inspections by operators	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
10		Loss of ID Fan because of impeller failure	Fugitive emissions.	(1) ID fan is periodically checked during the plant outages. (2) Inspections by operators	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
11		Loss of ID Fan due to moisture buildup in fan housing from condensation.	Fugitive emissions.	(1) ID fan is periodically checked during plant inspections. (2) Inspections by operators	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
12		Draft Sensor plugged up	Fugitive emissions.	(1) Sensor port periodically checked during plant inspections. (2) Inspections by operators	If preventative measures fail to manage problem, spent activated carbon feed will manually be stopped by the operator upon identification of malfunction.
13		Malfunction of thermocouples in furnace	DRE, dioxins, CO	Thermocouple elements are located in the Reactivation Furnace (RF-2). (1) Failure of thermocouples causes burner system to shut down (2) Thermocouples are periodically checked during plant inspections and thermowells are visually inspected during shutdowns. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
14		Furnace roof arch fails	Fugitive emissions.	(1) Roof checked inspected during plant outages (2) Inspections by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
15		Furnace hearth door fails.	Fugitive emissions.	(1) Doors periodically checked during plant outages. (2) Inspections by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
16		Furnace hearth brickwork	Fugitive emissions possible.	(1) Brickwork periodically checked during plant outages. (2) Inspections by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
17		Furnace Discharge Chute Fails	Fugitive emissions possible.	(1) Outlet chute periodically checked during plant outages. (2) Inspections by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
18	<b>AFTERBURNER (AB-2)</b>	Slag buildup on burner in Afterburner causes low Afterburner temperature while spent activated carbon is in the multiple hearth.	DRE, dioxins, CO	(1) Interlocks are set to stop spent activated carbon feed before reaching permitted parameter limit and to increase natural gas feed rate to increase temperature. (2) Inspection of burners by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
19		Slag buildup on burner in multiple hearth causes low temperature of combustion gas entering afterburner. Afterburner burners not able to maintain minimum afterburner temperature while spent activated carbon is in the multiple hearth.	DRE, dioxins, CO	(1) Interlocks are set to stop spent activated carbon feed before reaching permitted parameter limit and to increase natural gas feed rate to increase temperature. (2) Inspection of burners by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
20		Slag buildup in Afterburner causes restrictions in flow which, in turn, causes the loss of the water seal	DRE, dioxins, CO	(1) Water Seal level is routinely checked measured each shift by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
21		Malfunction of thermocouples in combustion chamber	DRE, dioxins, CO	A thermocouple element is located in the Afterburner (AB-2). (1) Failure of thermocouples causes burner system to shut down (2) Thermocouples are periodically checked and thermowells are visually inspected during shutdowns. (3) Inspections by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
22		Failure of flame to be present due to flame detector failure.	DRE, dioxins, CO	(1) Flame detectors are present, a failure will not shut the system down. Two failures will cause an AWWCO and burner shutdown. (2) UV flame detectors are periodically inspected. (3) Inspection by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
23		Loss of natural gas because of failure of NG pressure regulator. (APC continues running)	DRE, dioxins, CO	(1) Interlocks are set to stop spent activated carbon feed on loss of gas pressure. (2) Loss of gas will cause low Afterburner combustion zone temperature and stop of spent activated carbon feed.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
24		Loss of natural gas because of failure of supplier to supply required amount (APC continues running)	DRE, dioxins, CO	(1) Interlocks are set to stop spent activated carbon feed on loss of gas pressure. (2) Loss of gas will cause immediate shut down of the feed system.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
25		Loss of combustion air fan	DRE, dioxins, CO	Burners will shut down and spent activated carbon feed to multiple hearth will be stopped. Air Pollution Control (APC) equipment will continue running.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
26		Loss or Inadequate levels of secondary combustion air	DRE, dioxins, CO	Burners will shut down and spent activated carbon feed to multiple hearth will be stopped. Air Pollution Control (APC) equipment will continue running.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
27	<b>QUENCH VENTURI SYSTEM (SC-11)</b>	Low Quench/Venturi pressure differential because of failure of DP instrumentation.	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed upon reaching permitted parameter limit. (2) The instruments are on a calibration and inspection schedule. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
28		Low Quench/Venturi pressure differential because of dampers hung up	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed upon reaching permitted parameter limit. (2) The instruments are on a Preventive Maintenance Program. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
29		Water Seal Fails	Particulate, dioxins, metals, chlorides.	Monitor water seal at least twice per day to determine the level. Low level may be caused by lack of water flow or a restriction in the off-gas system.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
30		Pump failure causes low total water flow to Quench/Venturi (temperature out of Q/V does not exceed high-high setting for TSHH-557 and Afterburner burners stay on).	Particulate, dioxins, metals, chlorides.	(1) There are two sources of make-up water. The first is from the city water booster pumps (P 17A/B). The second is from the city water supply. (2) Interlocks are set to stop spent activated carbon feed and increase the city water flow upon reaching permitted parameter limit. (3) The instruments are on the routine inspection schedule. (4) If leakage in the waste lines after the flow meters are present, they will be detected during routine walkthroughs of the area.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
31		Pump failure causes low total water flow to Quench/Venturi (temperature out of Q/V does exceed high-high setting for TSHH-557 and Afterburner burners shut off).	DRE, particulate, dioxins, metals, chlorides, CO.	(1) There are two sources of make-up water. The first is from the city water booster pumps (P 17A/B). The second is from the city water supply. (2) Interlocks are set to stop spent activated carbon feed and increase the city water flow before reaching permitted parameter limit. (3) The instruments are on a calibration and inspection schedule.. (4) If leakage in the waste lines after the flow meters are present, they will be detected during routine walkthroughs of the area.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
32		TDS instrument failure causes low Quench/Venturi blowdown rate	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed upon reaching permitted parameter limit. (2) The instruments are on Preventive Maintenance Program. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
33		Flow control instrument failure causes low Quench/Venturi blowdown rate	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed before reaching permitted parameter limit. (2) The instruments are on calibration and inspection checklist. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
34		Pump, impeller, sprays/strainer plugged	Particulate, metals, chlorides.	Packing, strainer and impeller will be inspected routinely during selected shutdowns.	Packing will be adjusted (if needed), based on routine inspections during select shutdowns.
35		Motor-pump coupling failure causes loss of pump (P-22) to provide recycle water to Quench/Venturi	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed. (2) When temperature out the Q/V exceeds the High-High limit, the city water will flow to the Q/V. (3) The recycle water pump P-22 is on a inspection schedule. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
36		Motor failure or overload causes loss of pump (P-22) to provide recycle water to Quench/Venturi	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed. (2) When flowrate is below to the permit limit the feed is stopped. (3) The recycle water pump (P-22) is on a routine inspection schedule. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
37		Low flow caused by sprays in quench/venturi plugging up	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed. (2) When temperature out the Q/V exceeds the High-High limit, the city water will flow to the Q/V. (3) The recycle water pump P-22 is on a inspection schedule. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
38		Failure of level control instrument causes low level in PBS Tank shuts down PBS recycle water pump (P-22)	Particulate, metals, chlorides.	(1) Low PBS recycle water flow from P-22 initiates interlock to stop spent activated carbon feed. (2) The scrubber water equalization tank (SC-12) level gages are on a inspection checklist. (3) Inspection by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
39		Low flow caused by impeller malfunction or plugging.	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed. (2) The recycle water pump (P-22) is on a Preventive Maintenance Program. (3) Inspections by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
40		High cross-over temperature due to low quench/venturi flow creating ID fan shutdown	Fugitive emissions.	(1) Sprays are periodically checked as part of an inspection schedule (2) Inspections by operators	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
41	<b>PACKED BED SCRUBBER (SC-12)</b>	Flow control instrument failure causes low total water flow to packed bed scrubber (PBS) (temperature out of PBS does not exceed high-high setting for TSHH-557 and Afterburner burners stay on).	Particulate, metals, chlorides.	(1) There are two sources of make-up water. The first is from the city water booster pumps (P 17A/B). The second is from the city water supply. (2) Interlocks are set to stop spent activated carbon feed and increase the city water flow before reaching permitted parameter limit. (3) The instruments are on a calibration and inspection checklist. (4) If leakage in the waste lines after the flow meters are present, they will be detected during routine walkthroughs of the area.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
42		Flow control instrument failure causes low total water flow to PBS (temperature out of PBS does exceed high-high setting for TSHH-557 and Afterburner burners shut off).	DRE, particulate, dioxins, metals, chlorides, CO.	(1) There are two sources of make-up water. The first is from the city water booster pumps (P-17A/B). The second is from the city water supply. (2) Interlocks are set to stop spent activated carbon feed and increase the city water flow before reaching permitted parameter limit. (3) The instruments are on the Preventive Maintenance Program. (4) If leakage in the waste lines after the flow meters are present, they will be detected during routine walkthroughs of the area.	If the automated preventative measures do not detect and stop spent activated carbon feed, an operator will manually stop waste flow upon identification of the malfunction.
43		Loss of pH meter control instrument in pump (P-27) recycle water line.	Chlorides	(1) Interlocks are set to stop waste feed on the permitted parameter limit. (2) The pH control instruments are on a plant inspection checklist (3) inspection by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
44		Failure of caustic addition system (pump P-28 and/or P-29, pH meter, flow meter, low ambient temperatures causing caustic to congeal and therefore be unpumpable, etc.)	Chlorides	(1) Interlocks are set to stop spent activated carbon feed. (2) The pH control instruments are on a calibration and inspection checklist. (3) inspection by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
45		Failure of DP instrument causes low packed bed differential pressure drop.	Chlorides	(1) A low packed bed differential pressure will cause an alarm. (2) The instrument is on a calibration and inspection program. (3) Inspection by operators and/or maintenance personnel.	After hearing the alarm, the operator will shut feed off to the furnace.
46		Poor water distribution through the packing due to plugging in the packed bed scrubber.	Particulate, metals, chlorides.	Packing will be inspected routinely during select shutdowns.	Packing will be adjusted (if needed), based on routine inspections during select shutdowns.
47		Pump, impeller, sprays/strainer plugged	Particulate, metals, chlorides.	Packing and impeller will be inspected routinely during select shutdowns.	Packing will be adjusted (if needed), based on routine inspections during select shutdowns.
48		Failure or overload of pump motor causes loss of pump (P-27) to provide recycle water to PBS	Particulate, dioxins, metals, chlorides.	(1) Interlocks are set to stop spent activated carbon feed. (2) The PBS recycle water pump (P-27) is routinely inspected. (3) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
49		Failure of level control instrument causes low level in Scrubber Water Equalization Tank (T-19) shuts down PBS recycle water pump (P-27)	Particulate, metals, chlorides.	(1) Low PBS recycle water flow from P-27 initiates interlock to stop spent activated carbon feed. (2) The scrubber water equalization tank (T-19) level gages are on a plant inspection checklist. (3) Inspection by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.



**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
50		Failure of makeup water addition (city water) which could be caused by outside utility or failure of an air compressor that feeds air actuated valve.	Particulate, metals, chlorides.	(1) Low PBS recycle water flow from P-27 initiates interlock to stop spent activated carbon feed. (2) The air compressors are on a plant inspection checklist. (3) Inspection by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
51	<b>WESP (W-11)</b>	Failure of secondary voltage instrument causes low WESP secondary voltage	Particulate, metals	(1) Interlocks are set to stop spent activated carbon feed before reaching permitted parameter limit. (2) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
52		WESP failure due to arcs and sparks causing low secondary voltage.	Particulate, metals	(1) The WESP is on a inspected during plant outages. (2) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
53		WESP failure due to wet insulators causing excessive arcs and sparks which in turn causes low secondary voltage.	Particulate, metals	(1) The WESP is on a routine inspection schedule during plant maintenance outages. (2) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
54		Breakage of WESP electrode causes low secondary voltage.	Particulate, metals	(1) The WESP is on a routine inspection schedule during plant maintenance outages. (2) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
55	<b>ID FAN (B-15)</b>	Failure of ID Fan motor causes process shutdown.	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Interlocks are set to stop spent activated carbon feed. (2) The ID fan is on a Preventive Maintenance Program. (3) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
56		Failure or malfunction of VFD	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Interlocks are set to stop spent activated carbon feed. (2) The ID fan is on an inspection checklist. (3) Inspections by operators and/or maintenance personnel..	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
57		Failure of Damper, VFD instrumentation	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Interlocks are set to stop spent activated carbon feed. (2) The ID fan is on a inspection checklist (3) Inspection by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
58		Over amp or over volt DC bus link on ID Fan	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Interlocks are set to stop spent activated carbon feed. (2) The ID fan is on an inspection checklist. (3) Inspection by operators.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.

**Table 3-3. Potential Malfunctions from EWT Spent Activated Carbon Reactivation Furnace that may Result Permit Exceedances**

	Area	Malfunction	Potential Exceedance	Preventative Measures	Reactive Response
59	<b>STACK</b>	Failure of flow control instrument causes high stack gas flowrate (high combustion gas velocity)	DRE, dioxins, CO.	(1) Interlocks are set to stop spent activated carbon feed at the permitted parameter limit. (2) The stack flowmeter is on a calibration and inspection checklist. (3) Inspection by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
60	<b>CEMS STACK MONITORS</b>	Failure of CEMS oxygen monitor	DRE, dioxins, CO	(1) Interlocks are set to stop spent activated carbon feed at the permitted parameter limit. (2) The CEMS units are on a calibration and inspection schedule. (3) Inspection by operators and/or maintenance personnel.	If preventative measures fail to manage the problem, spent activated carbon feed will be manually stopped by the operator after malfunction is identified.
61	<b>PROGRAMMABLE LOGIC CONTROLLER (PLC)</b>	Failure of electronic component in PLC causes loss of Programmable Logic Controller (PLC) system	DRE, particulate, dioxins, metals, chlorides, CO.	(1) The PLC is inspected by maintenance personnel for proper operation.	Operators will shutdown RF and APC if PLC fails.
62	<b>ALPHA SERVER/WORK STATIONS</b>	Failure of Alpha server operator interface	DRE, particulate, dioxins, metals, chlorides, CO.	(1) The Alpha Server is routinely checked for operation regularly. (3) Inspection by maintenance personnel.	Operators will shutdown RF and APC if Server fails.
63	<b>UTILITIES</b>	Failure of air compressor causes loss of instrument air.	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Loss of instrument air will cause interlocks to stop spent activated carbon feed. (2) The instrument air supply equipment is on a (1) The compressors are on a routine inspection schedule (2) Inspections by operators and/or maintenance personnel..	Operators will shutdown RF and APC because of instrument air failure.
64		Failure of flow control instrument causes loss of natural gas.	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Loss of natural gas supply will cause interlocks to stop spent activated carbon feed. (2) Inspection by operators.	Operators will shutdown RF and APC because of natural gas failure.
65		Failure of Duplex Pump Controller causes loss of city water booster pumps (P-17A/B).	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Loss of city water will cause interlocks to stop spent activated carbon feed. (2) The city water supply equipment is routinely inspected. (3) Inspection by operators and/or maintenance personnel.	Operators will shutdown RF and APC because of loss of water supply.
66		Power Outage caused by trip of Main Breaker (GFI or overload)	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Loss of electrical power will shut the whole plant down immediately.	Operators will shutdown RF and APC because of loss of electrical power.
67		Storm or other unforeseen occurrence causes loss of power to facility	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Loss of electrical power will shut the whole plant down immediately.	Operators will shutdown RF and APC because of loss of power .
68		Storm or other unforeseen occurrence causes loss of power to facility (City water not available to APC)	DRE, particulate, dioxins, metals, chlorides, CO.	(1) Loss of electrical power will shut the whole plant down immediately.	Operators will shutdown RF and APC because of loss of power .

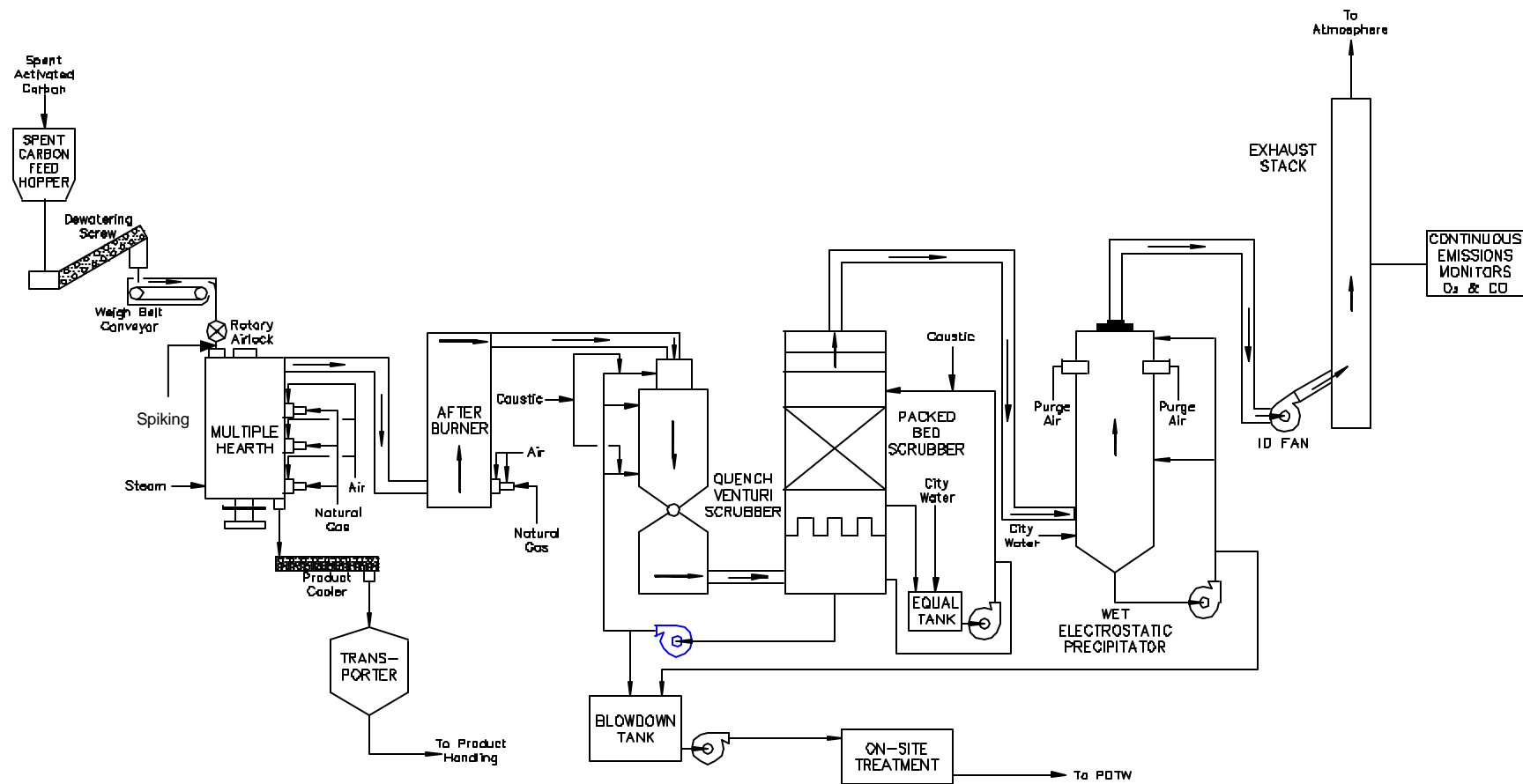


Figure 3-1. Carbon Reactivation Furnace System Block Flow Diagram

- |  |  |
|--|--|
| (F1) Spent Activated Carbon Feed Rate                  | (P2) Packed Bed Scrubber Pressure Differential |
| (F2) Quench/Venturi Scrubber Recycle Flow Rate (Total) | (A1) Packed Bed Scrubber pH                    |
| (F3) Packed Bed Scrubber Recycle Flow Rate             | (A2) Stack Gas Carbon Monoxide                 |
| (F4) Scrubber Blowdown Flow Rate                       | (A3) Stack Gas Oxygen                          |
| (F5) Stack Gas Flow Rate                               | (E1) WESP Secondary Voltage                    |
| (P1) Venturi Scrubber Pressure Differential            | (T1) Afterburner Temperature                   |

See Table 3-1 And P&IDs For Additional Details

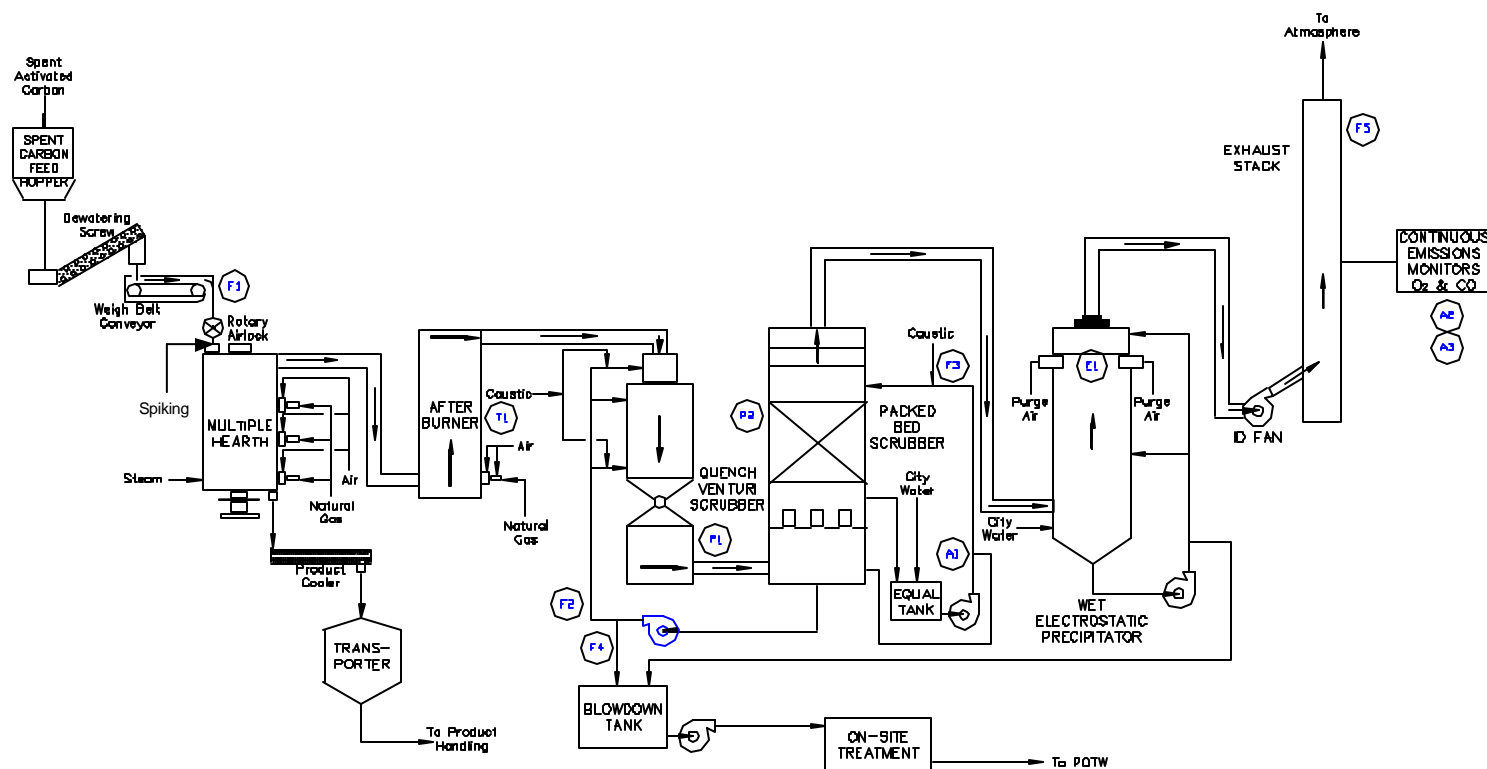


Figure 3-2. Location of Critical Process Instruments

## Exhibit A-1: Documentation of Startup, Shutdown, or Malfunction

### SECTION 1

Event was a: ☐ Startup ☐ Shutdown ☐ Malfunction (known or potential)  
☐ Power Outage

Brief description of event: \_\_\_\_\_

Date/time SSM commenced: \_\_\_\_\_ Date/time SSM ended: \_\_\_\_\_

Is the SSM addressed in the SSMP? ☐ Yes ☐ No

Check all that apply associated with SSM:

- 1) \_\_\_\_\_ Actions taken were consistent with SSMP/ SOP
- 2) \_\_\_\_\_ Actions taken were not consistent with SSMP/ SOP
- 3) \_\_\_\_\_ Permit Limit exceedance did not occur
- 4) \_\_\_\_\_ Permit Limit exceedance did occur.

### SECTION 2

Description of startup, shutdown, or malfunction: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Response/corrective action taken: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reason(s) for not following the SSMP (complete if 2 above is checked) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Suggested measures to prevent reoccurrence of malfunction: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Suggested SSMP revisions or improvements \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

OPERATOR

Print name: \_\_\_\_\_  
Signature \_\_\_\_\_  
Date: \_\_\_\_\_

ENVIRONMENTAL HEALTH AND SAFETY  
MANAGER

Print name: \_\_\_\_\_  
Signature \_\_\_\_\_  
Date: \_\_\_\_\_

Summary of All Malfunction Events and,  
Any instances during a startup, shutdown, or malfunction where the SSMP was not followed and no exceedance occurred

Event Occurrence				Event Duration	Event Description	Exceedance occurred during event? (Yes/ No) <sup>2</sup>	SSMP/ Procedures Followed? (Yes/ No) <sup>3</sup>	Comments
Begin		End						
Date	Time	Date	Time	(Hrs) <sup>1</sup>				

<sup>1</sup> Duration for a malfunction defined as time exceedance occurring due to malfunction and hazardous waste is in the combustion chamber  
<sup>2</sup> If “yes” to exceedance occurred during event?, provide description of exceedance(s) in Comments column  
<sup>3</sup> If “no” to SSMP/ procedures followed?, and “no” to exceedance occurred, explain in Comments column. If “no” to SSMP/ procedure followed, and “Yes” to exceedance occurred, event is not required to be included in this report, but is required in the Immediate Startup Shutdown and Malfunction Report per 63.10(d)(5)(ii)