Appendix F

Approved RTO Work Plan

I. Controls

- A Regenerative Thermal Oxidizer ("RTO") system with a guaranteed destruction rate efficiency of 95% or greater
- Compressed air drying system treating air discharged from the compressors
- 6,000 gallon surge tank with dewatering valve installed to control air before entering the RTO
- Control air lines
- Heat Exchanger

II. Description of process stream/flows vented to the New RTO

VOC emissions from the following emission units, and any emission units permitted by Ohio EPA or Ohio EPA rules following the Effective Date of the Consent Decree, will be captured by a closed-vent system. The closed-vent system is maintained under sufficient negative pressure to capture these emissions and vent them to the RTO.

- P004: Centrifuge 1
- P006: SWECO-01 (vibratory screen)
- P007: SWECO-02 (vibratory screen)
- P035: Hazardous Waste Drum Bulking
- P041: Dissolved Air Filtration System (DAF) for wastewater treatment (consisting of oil/water separator, flash tank, floc tank, DAF clarifier, DAF effluent tank) vented through closed-vent system to a demister to RTO.
- P042: Centrifuge 2
- P043: Centrifuge 3
- P045: Decanter Centrifuge
- T063: OR-1 (wastewater storage tank, 72,000 gallon)
- T064: T-002 (OR-1 oil phase receiving tank)
- T065: T-001 (oil/water separator oil phase receiving tank)
- T066: OR-2 (wastewater 72,000 gallon storage tank)
- T067: Surge tank (T-206; UF permeate surge tank, 1,500 gallon)
- T068: T-1 (T-601; wastewater chemical conditioning tank, 4,000 gallon)
- T069: T-2 (T-506; wastewater sludge settling tank, 3,500 gallon)
- T070: TW-1 (T-605; treated process waters storage tank, 16,000 gallon)
- T075: G-1 (T-801A; G-cone high solids process vessel, 14,080 gallon)
- T076: G-2 (T-801B; G-cone high solids process vessel, 14,080 gallon)
- T077: G-3 (T-801C; G-cone high solids process vessel, 14,080 gallon)
- T079: B-1 (process oils storage tank, 30,000 gallon)

- T080: B-2 (process oils storage tank, 17,500 gallon)
- T081: B-3 (process oils storage tank, 30,000 gallon)
- T082: B-4 (process oils storage tank, 30,000 gallon)
- T083: C-2 (wastewater storage tank, 15,000 gallon)
- T084: C-3 (raw oils solids storage tank, 15,000 gallon)
- T085: C-4 (raw oil storage tank, 15,000 gallon)
- T086: P-1 (process oils storage tank, 18,500 gallon)
- T087: P-2 (process oils storage tank, 18,500 gallon)
- T088: R-1 (raw oils storage tank, 20,000 gallon)
- T089: R-2 (raw oils storage tank, 20,000 gallon)
- T090: S-9 (storage tank, 30,000 gallon)
- T091: S-10 (raw oils storage tank, 30,000 gallon)
- T092: S-11 (raw oils storage tank, 30,000 gallon)
- T093: S-12 (raw oils storage tank, 30,000 gallon)
- T094: S-25 (crank case oils storage tank, 15,000 gallon)
- T095: S-26 (crank case oils storage tank, 16,700 gallon)
- T096: S-27 (crank case oils storage tank, 23,400 gallon)
- T097: W-1 (raw oils storage tank, 30,000 gallon)
- T098: W-2 (raw oils storage tank, 18,000 gallon)
- T099: W-5 (wastewaters storage tank, 23,000 gallon)
- T100: W-6 (wastewaters storage tank, 23,000 gallon)
- T101: Tricanter oil receiving tank (T-006)
- T102: Centrifuge oil phase receiving tank (T-003)
- T103: Centrifuge water phase receiving tank (T-004)
- T104: Sweco-02 oil receiving tank (T-005)
- T105: Sweco-01 oil receiving tank (T-007)
- T106: SBR (T-705; high COD wastewaters, 125,000 gallon)
- T107: VDR (T-703; high COD wastewaters 425,000 gallon)
- T117: G-4 (T-801D; G-cone high solids process vessel, 14,920 gallon)
- T118: Sludge Press Discharge Tank, Bldg G (6,012 gallon)

III. Vent stream characteristics

- Process stream flow rate: 10,000 SCFM
- Estimated VOC load: 23 lbs/hour as methane
- Expected Heat Exchanger inlet temperature (based on normal operations): 90 degrees Fahrenheit
- Expected Heat Exchanger outlet temperature (based on RTO outlet temperature): 150 degrees Fahrenheit (measured at thermocouple located between the Heat Exchanger and RTO during performance testing)
- Expected Heat Exchanger inlet relative humidity: 100%
- Expected Heat Exchanger outlet relative humidity: 18%

IV. Manufacturer Performance Guarantee

Destruction removal efficiency of 95% or greater of non-methane hydrocarbons or less than or equal to 20 ppmv for volatile organic compounds based on 40 C.F.R. Part 60, Appendix A, Method 25A.

V. Expected performance criteria

Performance criteria will be determined based on an emission and compliance demonstration test of the closed vent-system and the RTO. Emission and compliance demonstration test will be conducted to demonstrate compliance with the required overall control efficiency of 95% or greater. The following test methods as specified in 40 CFR Subpart DD will be employed to measure the mass emission rates before and after the RTO to demonstrate compliance with the 95% or greater destruction requirement: USEPA Test Methods 1 through 4 and 25 or 25A of 40 CFR Part 60, Appendix A.

VI. Preventive maintenance and operations

Clean Water Limited will perform maintenance of the RTO in accordance with the PMO Plan.

VII. Calculations used to develop the predicted design and control efficiencies

The RTO is being engineered and designed to meet a destruction removal efficiency of at least 95% based on the process flow and retention time of the unit. The unit is designed for a flow rate of up to 10,000 SCFM, the Combustion chamber's interior combustion zone is 882 Ft^3. After the Heat Exchanger, the process flow rate is 192 feet/sec, which results in a combustion temperature residence time of 4.59 seconds. The RTO operating temperature variable will be adjusted at the time of testing, but will operate within the 1400 degrees Fahrenheit to 1575 degrees Fahrenheit temperature range to reduce any carbon monoxide or NOx emissions.

VIII. Detailed description of equipment relating to RTO

Detailed descriptions of the primary components and equipment relating to the RTO are provided below.

System Process Fan

The system process fan is sized and supplied for pulling the exhaust emissions through the collection duct work and continue through the oxidizer system. The fan allows for negative suction pressure at the system inlet during normal operation.

The process fan is complete with a premium efficient motor. The fan housing is fabricated of welded heavy gauge metal. The fan shall be supplied with heavy-duty roller bearings and grease fittings, OSHA-approved bearing and shaft guards, and shaft seals.

Volume control of the exhaust stream shall be achieved through the use of a pressure transmitter and variable frequency drive (VFD) that will be supplied with the oxidizer equipment. The pressure transmitter is used for sensing the negative pressure in the collection duct work. The negative dynamic pressure in the duct work is a direct correlation to the volume of air being moved through the duct.

As the volume of air being exhausted from the process increases and decreases through the duct, the negative pressure varies also. By sensing the negative pressure and controlling the inlet process gases to a predetermined negative pressure, the fan speed also varies and is increased or decreased to maintain the constant negative pressure. Maintaining a constant pressure in the duct provides assurance that the oxidizer system will have no effect on the plant operations. Upon start-up, the air volume for the system will be measured and the duct work balanced to assure seamless interface between the processes and the oxidizer system. The oxidizer system will be controlled from one (1) pressure transmitter located in the main inlet duct line.

Inlet Duct

The inlet duct has two (2) drop leg drains located before the RTO takeoff to the unit. The drop legs are designed to remove liquid within the process duct lines prior to entering the RTO unit. The RTO take off is on top of the primary or main trunk line, which reduces the potential for liquids to enter the RTO.

Heat Exchanger and Other Energy Recovery Features

The Heat Exchanger is located on the discharge of the primary blower. The Heat Exchanger offers two benefits: (1) preheating the process gases to 150 degrees Fahrenheit, reducing potential for condensation; and (2) increasing the efficiency of the RTO unit, reducing the amount of fuel needed to maintain the RTO operating temperature, as well as fuel usage emissions. The approximate fuel savings is 1 MMBTU/hr. Thermal oxidizer systems are completely insulated with 8-lb density ceramic fiber block materials designed for higher operating temperatures. This insures the outer oxidizer skin temperature stays between 70°F and 80°F degrees above ambient conditions based upon an outdoor installation and a 5 mph wind speed.

The outside walls shall be made from sheet metal with grating material and support structure used for the heat recovery media rack system on regenerative thermal oxidizer systems. The rack system shall be made from 1” grating material to insure structural stability of the towers during high temperature operation.

Ceramic Heat Exchange Media Used On Regenerative Thermal Oxidizers

The Heat Exchanger media will consist of approximately 3’ of chemically resistant structured refractory block media and 3” to 8” protective chemically resistant random packing material. The quantity of media and bed configuration will be such to reach an approximate 95% thermal heat recovery efficiency at the maximum design flow conditions.

Combustion Chamber Used On Thermal Oxidation Systems

The combustion chamber serves two purposes within the system. First is to input the required heat energy to bring the pre-heated air exiting the energy recovery system up to the required operating temperature with the burner firing into the combustion chamber.

Second is to retain the process stream at the operating temperature for the required elevated temperature in order to achieve the desired destruction efficiency – this is typically called the oxidation residence time. It is important that the correct ceramic fiber material density is selected for the proper operating temperatures. This selected ceramic fiber is also used to protect the combustion chambers outer shell from thinning, bulging and warping under extreme temperatures.

Access Ladder and Platform

On larger operating systems the upper areas of the system will be supplied with an access ladder and platform. The assembly shall be designed per OSHA standards and applicable codes. The platform assembly shall give access to the various instruments and equipment.

The access ladder and platform will be manufactured from ASTM A36 material, 1” galvanized welded steel grating and ASTM 529-50 2” X 2” angle iron for hand rails. The ladder and platform are finished in a combination of painted and galvanized materials.

Burner & Controlled Combustion Air on Thermal Oxidizer Systems

The purpose of the burner on the thermal oxidizer system is to input the heat energy required to raise the process gas stream to the required combustion chamber operating temperature. A combustion fan with high static pressure blower will be used on the application for the combustion chamber burner. The higher pressure assures that the combustion pressure is great enough to offset the pressure within the combustion chamber on forced draft systems.

The combustion air blower will feed the required stoichiometric air volume to the fuel burner to maintain and control the stoichiometric volume of air to the burner. The system will include one inlet protective screen, flexible joints, carbon steel piping to the burner, and a manual adjustment damper to control pressure of air volume to each burner. The operating temperature will be set at a temperature that will achieve compliance with the minimum temperature measured during performance testing.

The burner is initially fired with natural gas. When the set operating temperature is reached, the burner automatically switches to low fire mode and vent gases begin injection into the combustion zone. If the temperature cannot be reached or maintained after firing of vent gases begins, additional natural gas is added to bring the temperature up to the necessary oxidizing temperature.

Automated Inlet, Exhaust & Valve System on Thermal Oxidizers

The purpose of the flow control valves is to balance and direct the process stream movement into and out of the energy heat recovery chambers for the process of heat regeneration.

The exhaust dampers will be designed to handle the maximum designed exhaust temperatures experienced during high temperature operation. The seals will be a tadpole refractory fiber gasket for minimal leakage across the valves. The inlet and outlet manifolds will be a bolt on flanged 2" connection.

Process Isolation Damper / Fresh Air Damper

The purpose of the process isolation damper is to isolate the oxidizer system from the process stream. The fresh air damper is to allow ambient air to purge the oxidizer system during a system start-up and to reduce the process streams BTU content while in operation should spike conditions occur. The RTO will include an automatic process isolation damper.

System Controls / Safety Equipment

The system will be a fully automated, single push button operation for the entire sequence of operation for the oxidizer system. The single button start/stop design has been utilized for ease of use and to eliminate the possibility of operator error. The system has been designed to provide a self-checking safety control and monitoring system that is user-friendly during all periods of system operation.

The system will incorporate a display and graphics for operational status and fault / trouble shooting messages. The fault indicator shall display messages defining the reason for any system or control faults. The messages minimize any time needed to correct operation of a faulty condition; minimizing time spent troubleshooting faults and maximizing the process run time. The system is fully DCS/SCADA compatible through a network connection and has a static IP address.

Exhaust Stack

The exhaust stack will be 40' in height and have a diameter of 20." The stack will be constructed out of 3/16" ASTM A36 Steel with ASTM 529 2" flanges. Two (2) ASTM A53 Type F Grade A 3" diameter test ports shall also be provided for testing purposes.

Control Air Lines

Control air lines will be supplied to the new RTO to prevent valves from freezing during extremely cold weather.

Compressed Air Drying System

Normally the air off of the compressors goes to an air dryer. As a backup, there is a 1,000 gallon back-up tank that holds compressed air to ensure that the system has enough air to switch the beds. The system will provide dried air to all controls and is designed to treat all air immediately discharged from the compressors. The location of the Compressed Air Drying System is shown in the attached drawing.

Drop Legs and Surge Tank

A 6,000 gallon surge tank with a dewatering valve will be installed prior to the inlet of the RTO. 3" drop legs are located prior to the inlet of the RTO which will drain to the blow down tank. This will help reduce moisture from getting into the RTO.