STANDARD OPERATING PROCEDURE
STAN MAYFIELD BIOREFINERY PILOT PLANT

TITLE: Waste Water System

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A. Scope

This SOP describes the procedure to operate the Waste Water System in order to collect waste water from the process and CIP sumps. The waste water is decontaminated by heating in the Waste Water Pick Heater before delivering to the Buckeye Waste Water Plant.

B. Safety and Training Requirements

Refer to UF lab safety policies regarding equipment listed in section D below before starting any process work.

Refer to UF Biosafety guidelines and the NIH Guidelines (Physical Containment for Large Scale Uses of Organisms Containing Recombinant DNA Molecules) whenever biological cultures/genetically modified organisms are handled or present in the equipment.

Review the location of fire extinguishers, fire blankets, safety showers, spill cleanup equipment and protective gear before beginning any process work.

During operations in the plant, the following safety gear will be utilized at all times:

- Safety Goggles or Face Shield
- Protective Gloves
- Hard Hat

C. Related Documents and SOPs

1. Waste Water Self Priming Pump 1 manual XXXX
2. Waste Water Sump Pump 2 manual XXXX
3. Waste Water Pump manual XXXX
4. Waste Water Pick Heater manual XXXX
5. Bleach Scrubber Operation System SOP-7221
6. CIP System SOP-8205
7. Steam Supply System Operation SOP-9305
8. Sampling SOP-0511
9. Thermal Inactivation by Heat Exchanger SOP-5000
10. NIH Guidelines Appendix K

D. Preparation/Materials/Equipment

1. Waste Water Self Priming Pump 1 (PC-9504)

TITLE: Waste Water System

2. Waste Water Sump Pump 2 (PC-9505)
3. Waste Water Tank (TS-9502)
4. Waste Water Pump (PC-9502)
5. Waste Water Pick Heater (HS-9502)
6. Sample Containers

E. Detailed Procedure

1. Initial valve positions settings are given in the table below.

Waste Water System				
Line	Line Number	Valve	Position	Check
Bleach Scrubber to Waste Water Tank	RCW-7202-03-SS10	9502-V-13	~~Close~~	
Sump Pumps to Waste Water Tank	WSW-9502-05-CS51	9502-V-04	~~Close~~	
		9502-V-12	~~Close~~	
	Pressure Indicator	9502-V-03	Open	
	WSW-9502-01-CS51	9502-V-08	~~Close~~	
		9502-V-11	~~Close~~	
	Pressure Indicator	9502-V-07	Open	
Hose connection	WSW-9502-09-CS51	9502-V-14	Close	
		9502-V-28	Close	
Waste Water Tank to Waste Water Pump	WSW-9502-03-CS51	9502-V-16	~~Close~~	
	Drain	9502-V-17	Close	
Waste Water Pump to Pick Heater	WSW-9502-04-CS51	9502-V-20	~~Close~~	
		9502-V-22	~~Close~~	
	Pressure Indicator	9502-V-21	Open	
	Drain	9502-V-19	Close	
Pick Heater to Buckeye Waste Water Plant	WSW-9502-08-CS51	9502-V-25	~~Close~~	
	Drain	~~9502-V-24~~	~~Close~~	
150 PSI Steam to Pick Heater	SL-9301-05-CS72	9502-V-23	~~Close~~	
		9301-V-17	~~Close~~	
Waste Water Tank Drain		9502-V-09	Close	
Waste Water Tank Level Indicator		9502-V-10	Open	
Sump Pump Service Line		9502-V-01	Close	
		9502-V-06	Close	

TITLE: Waste Water System

2. ~~Open valve 9502-V-13 to let the Waste Water Tank (TS-9502) collect the waste water from the Bleach Scrubber (SC-7203).~~
3. ~~Open valves 9502-V-04, -08, -11, -12 to prepare filling the Waste Water Tank (TS-9502) with waste water from CIP and waste water sumps.~~
4. Turn on the Waste Water Self Priming Pump 1 (PC-9504) and Waste Water Sump Pump 2 (PC-9505). The pumps will come on based on float sensors.
    a. When the Waste Water Self Priming Pump 1 needs service, close valve 9502-11 and open valves 9502-V-06, -08 to drain line WSW-9502-01-CS51.
    b. When the Waste Water Sump Pump 2 needs service, close valve 9502-12 and open valves 9502-V-01, -04 to drain line WSW-9502-05-CS51.
5. When using a hose to transfer waste water to the Waste Water Tank (TS-9502), connect the hose to HC-9502-01 and open valve 9502-V-14, -28.
6. At HMI, monitor the Waste Water Tank (TS-9502) level in LI-9502-01.
    a. LIT-9502-01 triggers a Low-Low alarm at 10%, High alarm 90% and High-High alarm at 95%.
7. When the level reaches ~~80%~~ full, begin discharging wastewater.
    a. Assure the 150 PSI steam supply is ready according to the Steam Supply System Operation SOP-9305.
    b. At HMI, set the temperature to 200 °F in TIC-9502-08.
        i. TIC-9502-08 regulates TV-9502-08 to control the steam flow to the Waste Water Pick Heater (HS-9502), maintaining the waste water discharging to the Buckeye Waste Water Plant at the set temperature.
    ~~c. Open valve 9502-V-25 to open the discharge the line.~~
    ~~d. Open valves 9301-V-17, 9502-V-23 to supply the 150 PSI steam to the Waste Water Pick Heater.~~

    CAUTION: High steam pressure and temperature

        ~~i. Locally monitor the steam pressure in PI-9502-09.~~
    e. ~~Open valves 9502-V-16, -20, -22 to open the line to the Waste Water Pick Heater (HS-9502).~~
    f. At HMI, set the flow rate to XX in FIC-9502-04.
        i. FIC-9502-04 regulates FV-9502-04 to control the waste water flow to the Waste Water Pick Heater at set point.
    g. At HMI, turn on the Waste Water Pump (PC-9502) to start pumping the waste water to the Waste Water Pick Heater (HS-9502).
    h. Locally monitor the pressure downstream of the Waste Water Pump using PI-9502-03.

TITLE: Waste Water System

8. When needed (as determined by the experimental plan), a sample port is provided in the discharge line to Buckeye Waste Water in order to measure the presence of viable production microorganisms.
    a. Place sample container under sample port at 9502-V-24.
    b. Verify the pressure in the line is less than 3 PSI in PI-9502-03.
    c. Open sample valve 9502-V-24 to fill container.
    d. Close sample valve 9502-V-24.
    e. The sample should be handled according to Sampling SOP-0511.
9. When needed, the effectiveness of the steam treatment should be tested according to the Thermal Inactivation by Heat Exchanger SOP-5000.
    a. For samples before the heat exchanger;
        i. Place sample container under sample port at 9502-V-19.
        ii. Verify the pressure in the line is less than 3 PSI in PI-9502-03.
        iii. Open sample valve 9502-V-19 to fill container.
        iv. Close sample valve 9502-V-19.
    b. For samples after the heat exchanger;
        i. Place sample container under sample port at 9502-V-24.
        ii. Verify the pressure in the line is less than 3 PSI in PI-9502-03.
        iii. Open sample valve 9502-V-24 to fill container.
        iv. Close sample valve 9502-V-24.
10. When the Waste Water Tank (TS-9502) level is below 10%, turn off the Waste Water Pump (PC-9502) to avoid running the pump dry.
11. After the tank has been drained, flushing is performed for the line downstream of the Waste Water Tank to remove debris and microorganisms that may have accumulated inside.
    a. Close valve 9502-V-16.
    b. Connect a hose to valve 9502-V-17.
    c. Open valves 9502-V-17, -20, -22, -25.
    d. Start supplying process water to valve 9502-V-17 through the hose.
    e. At HMI, turn on the Waste Water Pump (PC-9502) to start flushing.
        i. After the water out of the line is clear, flush for an additional 5 min.
    f. When finished, reset valve positions according to the initial valve configuration.

~~12. For short term shut down;~~
    ~~a. at the HMI, turn off the Waste Water Pump (PC-9502), and~~
    ~~b. close valves 9502-V-23 and 9301-V-17 to close 150 PSI steam supply.~~

13. For ~~long term~~ shut down;
    a. at the HMI, turn off the Waste Water Pump (PC-9502), and
    b. restore all valves to the initial positions according to the initial valve configuration table.