STANDARD OPERATING PROCEDURE
STAN MAYFIELD BIOREFINERY PILOT PLANT

TITLE: Hot Water System

AUTHOR: Troy Tian **DATE: December 5th, 2011**

APPROVALS: Process Change Committee **DATE: March 3rd, 2012**

A. Scope

This SOP describes the procedure to operate the Hot Water System in order to provide hot water for the process vessels.

B. Safety and Training Requirements

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

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. Hot Water Pump manual XXXX
2. Biomass Liquefaction SOP-2325
3. Hydrolysate pH Adjustment SOP-2320
4. Process Water System Operation SOP-9505
5. Steam Supply System Operation SOP-9305
6. Fermentation Tank A SOP-3230
7. Fermentation Tank B SOP-3235
8. Fermentation Tank C SOP-3240
9. Primary Propagator 1 SOP-3210
10. Primary Propagator 2 SOP-3215
11. Secondary Propagator 1 SOP-3220
12. Secondary Propagator 2 SOP-3225

D. Preparation/Materials/Equipment

1. Hot Water Tank (TS-9601)
2. Hot Water Pump (PC-9601)
3. Hot Water Heater (HP-9601)

TITLE: Hot Water System

E. Detailed Procedure

E.1 Startup Procedure

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

Hot Water System				
Line	Line Number	Valve	Position	Check
Process Water Pump to Hot Water Tank	RCW-9501-50-SS10	9501-V-33	~~Close~~	
Hot Water Tank to Hot Water Pump	HW-9601-17-CS51	9601-V-19	~~Close~~	
	Drain	9601-V-20	Close	
Hot Water Pump to Hot Water Heater	HW-9601-22-CS51	~~9601-V-22~~	~~Close~~	
		9601-V-23	~~Close~~	
	Pressure Indicator	9601-V-21	Open	
	Drain	9561-V-24	Close	
Hot Water Heater to Downstream Process	HW-9601-19-CS51	9601-V-32	Close	
	Spare Valves	9601-V-35	Close	
		9601-V-36	Close	
		9601-V-40	Close	
to Liquefaction Tank	HW-9601-16-CS51	9601-V-28	~~Close~~	
to Hydrolysate pH Adjustment Tank	HW-9601-14-CS51	9601-V-29	~~Close~~	
to Propagator 1A	HW-9601-13-CS51	9601-V-30	~~Close~~	
to Propagator 1B	HW-9601-12-CS51	9601-V-31	~~Close~~	
to Propagator 2A	HW-9601-11-CS51	9601-V-33	~~Close~~	
to Propagator 2B	HW-9601-10-CS51	9601-V-34	~~Close~~	
to Fermenter A	HW-9601-07-CS51	9601-V-37	~~Close~~	
to Fermenter B	HW-9601-06-CS51	9601-V-38	~~Close~~	
to Fermenter C	HW-9601-05-CS51	9601-V-39	~~Close~~	

TITLE: Hot Water System

Hot Water System				
Line	Line Number	Valve	Position	Check
Hot Water Return to Hot Water Tank	HW-9601-01-CS51	9601-V-01	Close	
	Spare Valves	9601-V-05	Close	
		9601-V-09	Close	
		9601-V-12	Close	
to Fermenter C	HW-3207-17-CS51	9601-V-02	~~Close~~	
to Fermenter B	HW-3206-17-CS51	9601-V-03	~~Close~~	
to Fermenter A	HW-3205-17-CS51	9601-V-04	~~Close~~	
to Propagator 3B	HW-3204-31-CS51	9601-V-06	~~Close~~	
		9601-V-07	~~Close~~	
to Propagator 3A	HW-3203-31-CS51	9601-V-08	~~Close~~	
to Propagator 2B	HW-3210-26-CS51	9601-V-10	~~Close~~	
to Propagator 2A	HW-3202-26-CS51	9601-V-11	~~Close~~	
~~to Propagator 1B~~	~~HW-3209-23-CS51~~	~~9601-V-13~~	~~Close~~	
~~to Propagator 1A~~	~~HW-3201-24-CS51~~	~~9601-V-14~~	~~Close~~	
To Hydrolysate pH Adjustment Tank	HW-2303-19-CS51	9601-V-15	~~Close~~	
to Liquefaction Tank	HW-2301-16-CS51	9601-V-16	~~Close~~	
Intermediate Steam to Hot Water Heater	SL-9302-50-CS72	9302-V-30	~~Close~~	
Condensate to Steam Condensate Tank	CL-9601-18-CS72	9302-V-22	~~Close~~	
	Drain	~~9302-V-21~~	~~Close~~	
		9601-V-27	Close	
Level Indicator		9601-V-~~18~~	Open	
Drain		9601-V-~~17~~	Close	

2. Assure the process water is ready according to the Process Water System Operation SOP-9501.
3. At HMI, set the Hot Water Tank (TS-9601) level at 80% full in LIC-9601-01.
   a. ~~LIC-9601-01 modulates the level valve LV-9601-01 which controls the flow rate of process water, maintaining the Hot Water Tank at the set level.~~
4. Assure valve 9601-V-18 is closed.
5. ~~Open valve 9501-V-33 to supply the process water to the Hot Water Tank.~~
6. Assure the intermediate steam supply (60 PSI) is ready according to the Steam Supply System Operation SOP-9305.
7. Assure valves ~~9302-V-21 and~~ 9601-V-27 are closed.

CAUTION: High steam temperature and pressure

8. ~~Open valves 9302-V-30,~~ 9601-V-26 to supply the intermediate steam (60 PSI) to the Hot Water Heater (HP-9601).
9. ~~Open valve 9302-V-22 to~~ ~~ate return to the Steam Condensate Flash Tank (VS-9302).~~
10. Assure valve 9601-V-20, -24, -25 are closed.
11. Open valve 9601-V-19, -23, to open the hot water supply ~~line~~ loop.
12. At HMI, set the temperature at XX °F in TIC-9601-03.
    a. ~~TIC-9601-03 modulates the temperature valve TV-9601-03 to adjust the steam flow into the Hot Water Heater, controlling the hot water temperature.~~
13. Assure that PRV-9601-02 is set to 30 PSI.
14. Once the Hot Water Tank level has reached 30%, turn on the Hot Water Pump (PC-9601) at HMI ~~to start the loop and heating the process water stored in the tank.~~
15. The hot water supplies the Hydrolysate pH adjustment Tank, Liquefaction Tank, Fermenters and Propagators. Refer to the respective SOP for the corresponding valve operation.

Move step 8 after step 14

E.2 Shutdown Procedure

~~E.2.a Short Term~~

1. ~~At the HMI, turn off theHot Water Pump (PC-9601).~~
2. ~~Close valves 9302-V-30 and 9601-V-26 to close the intermediate steam supply.~~
3. ~~Refer to the Steam Supply System Operation SOP-9305 if the steam system needs to be shut down.~~

~~E.2.b Long Term~~

1. At the HMI, turn off the Hot Water Pump (PC-9601).
2. Restore all valves to the initial positions according to the initial valve configuration table.
3. ~~Refer to the Steam Supply System Operation SOP-9305 if the steam system needs to be shut down.~~