

Log Book
Campaign 18

2015-07-13

08:01 Steam, UV, Process, and Potable Water Pumps ON
08:10 Flipping CIP header to UV Water
08:12 WW Pump ON in Recirc @ 45.9% Level
08:33 Flushing Prop 2A,2B, and 3B with UV Water
09:03 AAP#2 ON@ 30%
09:04 AAP#2 →90%
09:05 AAP#2 OFF
09:06 Prep Tank Ag ON (filled with UV Water)
09:21 Ferm A Pump ON
09:23 Prep Tank AG OFF
09:25 Began UV Rinse of Prop 2A through sprayballs for 25 minutes
09:33 Prop 2A SV→50% and CLOSED. PAMP#1 ON
09:34 Popping Prop 2A's Acid and Base lines
09:48 WW pH=12.13; Cond=13.9 mS/cm; Level=64.8%
10:00 Finished UV Rinse of Prop 2A
10:03 Ferm A Pump OFF
10:16 Heating up WW pick heater. Sending out WW @ 83.7% Level
Flow~29-30 GPM
10:18 Began UV Rinse of Prop 2B through sprayballs for 25 minutes
Ferm A Pump ON
10:32 Ferm A Pump OFF
10:33 Ferm A Pump and Prep Tank AG ON
10:36 Popping Prop 2B's Acid and Base lines
10:43 Resumed Prop 2B with Sprayball#1
10:47 Both Prop 2B sprayballs open now
11:11 Prep Tank AG OFF
11:14 Finished UV Rinse of Prop 2B. Ferm A Pump OFF
11:20 Ferm A Pump ON
11:28 Began SIP Procedures on Prop 2B.
Steam ON
11:34 Chiller ON
11:35 Cooling Water Pump ON
11:37 Prep Tank AG ON
11:40 Prop @ +5 psi, Steam OFF, VacPump ON
11:41 Prop @ -10 psi, VacPump OFF, Steam ON
12:09 Popped Steam, Acid, and Base of 3B
12:10 2B @ 250°F, opening transfer lines
12:29 Ferm A Pump OFF
12:44 Prep Tank AG OFF
13:18 Prop 2B @ 250°F. Began 90-minute timer
13:24 Hot Water Pump ON
13:41 Prep Tank Numbers: Additions Total
40 gallons of Hydrolyzate; 333.6lbs; 333.6lbs
30 gallons of UV Water; +250.2lbs; 583.8lbs

5 gallons more of UV Water to flush lines; +41.7lbs; 625.5lbs

14:07 RevScr and ScPr ON, rinsing out

14:14 RevScr→Liquefaction Tank, rinsing down into Liq Tank now

14:26 ScPr and RevScr OFF

14:51 Finished SIP Hold for Prop 2B. Steam OFF

15:12 Prop 2B TC→"NORMAL" in Auto

16:19 Prep Tank Pump ON @ 30→50→70%

Adding Hydrolyzate to Prep Tank

16:21 Prep Tank Pump→100%

16:45 Prep Tank Pump→30% and OFF.

Prep Tank @ 334lbs

16:47 Prep Tank AG ON

16:41 Began adding UV Water to Prep Tank

17:03 AAP#2 ON @ 30%, Conditioning Prep Tank→pH=8

Finished UV Water Add→Prep Tank.

W=589lbs

4lbs of Antifoam added as well

17:19 AAP#2→20%, pH=7.78

17:22 Prep Tank pH=8.00, AAP#2 OFF.

W=594lbs

I guess this means we now can know exactly how much base we're using for pH adjustment now for this initial step now.

17:23 PAMP#1 OFF

17:28 Prep Tank Pump ON @80→90%

Prep Tank→Prop 2B

17:32 Flow→Prop 2B confirmed @ W=555lbs (~roughly 40lbs to fill the line)

17:55 Prop 2B AG ON @ 30%

17:57 Prop 2B AG→100%

18:09 Prep Tank AG OFF

18:16 Prep Tank Pump OFF. W=0lbs Prop 2B @ 79.9%

18:18 WW Pump OFF and flushed out

18:25 Adding 42lbs of UV Water to the Prep Tank for flushing out the lines

18:32 Prep Tank Pump ON @ 90%, flushing line→Prop 2B with ~5 gallons

18:35 Prep Tank Pump→50%

18:36 Prep Tank Pump OFF. Line flushed

18:37 Prep Tank Pump ON @ 50%

18:38 Prep Tank Pump OFF

18:43 Began UV Rinse of pHAT through sprayballs for 25 minutes

18:48 Prep Tank AG ON

18:55 pHAT SV→50% and CLOSED. Popping pHAT Base line

19:05 Prep Tank AG OFF

19:18 Ferm A Pump ON

19:35 Began UV Rinse of Preop 3A through sprayballs for 30 minutes.

Prop 3A SV→50% and CLOSED

19:36 PAMP#1 ON

19:37 Popping Prop 3A's Acid and Base lines. PAMP#1 OFF

Shift Change

21:09 WW pH=11.40 Cond=2.00 mS/cm

2015-07-14

03:03 Started pumping WW. Level @ 95%
05:05 Start Pretreatment→High pressure pump and acid agitator
05:13 Start screws all the way to the HSMC
05:27 Nutrients added to Prop 2B.
(L) 83.3%; pH=6.86; (T) 98.1°F
05:28 Blow Back Dampener was adjusted
05:40 Changed trip point to 120% PSB Level for CV#2 override/interlock
05:45 Started feed system
05:47 Closed steam valve in T-pipe
Reached Temp in Liq Tank (for SIP)
05:48 Sampled 10L Bioflow, get ready for inoculation of 2B
05:52 Turned off interlock override for reversing conveyor
05:55 Changed alarm for PSB level to 100% for High and High-High levels
06:00 Changed trip point to 120% PSB Level for level alarm and turned off High and High-High alarms
06:03 Closed all vents for Metso
06:04 Start scrubbers. Bleach Scrubber Level=27.6%
06:06 Added solution to Bleach scrubber→53%
06:09 Started Inoculation of 2B; 0.05 ACFM
(L) 83.5%; pH=6.85; (T) 98.3°F; 0.07 psi
06:12 Reset sump pump
06:09 Finished 1st Inoculation of 2B; 0.05 ACFM
(L) 86.3%; pH=6.84; (T) 98.6°F; 0.10 psi
06:27 Reached 100 psi in pretreatment
06:30 Start feeding Biomass.
FBLBs @ 70% (M)
PSBLB @ 80% (M)
PSB Temp set @ 125°F (A)
PSF→88% (CAS)
Pressure→150 psi (A)
Acid Flow @ 8.00 GPH (CAS); Cond=18.7 mS/cm; Level=65.1%
Hydrolyzer @ 100% (A)
Screw Press @ 100% (A)
06:33 Start 2nd Inoculation into 2B
Total Inoculation volume=15 L (5%); Total Volume=80 gallons
06:40 PSBLBs→90%
PSF→99% in CAS
Prop 2B Inoculation finished
06:42 t=0hr Sample 2B Taken; 0.10 ACFM
(L) 90.2%; pH=6.81; (T) 98.6°F; 0.27 psi
06:44 Turned off FBLBs. Can't see clearly through camera
06:47 Reached Temp and Pressure in pretreatment
06:50 PSBLBs→100%
PSF→MAN @ 110%, Acid→10.00 GPH
07:04 FBLBs ON @ 50→100%
07:08 FBLBs→80%
07:11 FBLBs→90%

07:14 PSF→115%
07:15 PSF→125%
07:19 PSF→130%
07:21 PSBLBs→80%, PSF→110%
07:25 Transfer conveyor clogged. Shut down pretreatment
Shift Change
07:46 PSF ON @ 100%, clearing out
08:07 PSBTC ON and OFF
08:13 Metso Steam ON, T-pipe Vent CLOSED
Other Vents CLOSED as well
08:28 PSBTC ON at 51.2 psi
08:38 PSBLBs ON @ 70%, Acid→7.00 GPH, FBLBs ON @ 50%
08:41 PSF→110%, PSBTC spiking already
08:42 PSBLBs→60%, Acid→6.00 GPH, FBLBs→60%
08:44 Began SIP Procedures on Prop pHAT
Steam ON
08:45 FBLBs→80%, PSF→115%
08:47 PSBLBs→50%
Acid→5.00 GPH
08:48 PSF→110%; Acid→4.00 GPH
PSBLBs→40%
08:49 PSF→120%
08:50 PSBTC clogged! PSBLBs to PSF, FBLBs, and Steam OFF
pHAT @ +5 psi, Steam OFF, VacPump ON
08:52 Prop @ -10 psi, VacPump OFF, Steam ON
08:55 Did not switch off PSF and Metso Steam like I [Chris] thought I had.
Plug blew out as a result while working on other things just now.
09:18 Depressurizing Metso to Atmospheric now. Dump Chamber OPEN
09:22 pHAT transfer lines opened to steam
09:29 WW Pump OFF. PSF ON @ 100%
09:30 PSBTC ON, Ferm A Pump ON, Rinsing out Prop 3B again
PSBTC OFF
09:34 PSF OFF
09:35 PSF OFF; PSF and PSBTC ON
09:46 Metso Steam ON
09:48 Metso Vents CLOSED, restarting Dump Cycle
Ferm A Pump OFF
09:49 FBLBs ON @ 30%, going to start slowly just to be on safe side of things with CVs after that blown
plug
09:52 PSB SV OPEN @ 30%
10:00 Liq Tank TC→"NORMAL" in Auto
10:02 PSB SV--?40%
10:07 PSB SV→CAS
10:09 PSBLBs ON @ 60%
Acid→6.00 GPH @ 100 psi
10:10 Plug near-immediately blew again.
PSBLBs to PSF, FBLBs, and Steam OFF
10:14 Dump Chamber OPEN just to be safe.

10:19 Began adding UV Water to Liq Tank @ 2.0 GPM
145-minute timer started
Should have been 225 minutes in retrospect.

10:33 LT pH probe in tank now

10:40 PSF (@100%) and PSBTC ON

10:47 Metso Steam ON, Dump Cycle restarted, T-pipe vent CLOSED
PSF and PSBTC OFF

10:58 pHAT @ 250°F.
Began 90-minute timer

10:59 Noticed steam in PSB despite SV being closed.
Worried that Metso steam is leaking into it somehow

11:03 Noticed steam is coming out of the Metso emergency vent through the window in the control room.

11:04 Metso vents CLOSED. This might help?

11:10 Metso Steam OFF. Need it off to figure out what is wrong.

11:16 PSF ON @ 100%, checking BBD

11:24 Metso Steam ON. Trying again. BBD fully sealed this time.

11:28 No leaks spotted so far in Metso

11:32 Metso vents CLOSED

11:41 PSBTC ON @ 50 psi in Metso

11:52 FBLBs ON @ 30%, PSB SV→CAS

11:53 PSBLBs ON @ 60%
Acid→6.00 GPH, PSF→90%

11:55 PSF→85%
PSBLBs→65%

11:56 PSF→95→105%
PSBLBs→60%
Spiking in PSBTC again.

11:57 PSF→120%

11:58 PSBLBs to PSF, FBLBs, and Metso Steam OFF
Was initially worried about feeding issues, then field reported hearing some squealing sounds, and finally the PSBTC load went straight to hell in no time at all.

12:28 Finished SIP Hold for pHAT. Steam OFF

12:35 Began SIP Procedures on Prop 3B. Steam ON
Will NOT be pulling a vacuum on the tank

12:43 Prop 3B @ 250°F. Began 90-minute timer

12:44 Dump Chamber OPEN. Depressurizing Metso fully

12:45 Finished adding 450 gallons to Liq Tank. Level=17.2%
Was actually wrong about this due to a math error.

13:02 PSF ON @ 100%

13:07 WW Pump ON in Recirc @ 52.0% Level

13:08 PSF OFF

13:28 PSF ON @ 100% and OFF

13:43 PSF ON @ 100%; PSBTC ON and OFF

13:44 PSBTC ON. Amps look alright

14:04 Changed setting for PSBLBs to now trip if Liq Level > 120%

14:05 Metso Steam ON

14:06 Dump Chamber Cycle restarted

14:11 T-pipe vent CLOSED
14:15 Metso vents CLOSED
14:16 Finished SIP Hold for Prop 3B. Steam OFF
14:37 t=8hr Prop 2B Sample Taken; 0.1 ACFM
(L) 82.4%; pH=6.37; (T) 98.1°F; 0.13 psi
PSBLBs ON @ 50%
Acid→5.00 GPH, FBLBs ON @ 30%
14:38 PSF→110%
14:39 Prop 2B pH ON. BBP#5 set @ 10%
14:41 FBLBs→25%
14:43 PSF→108%
14:45 FBLBs→30%, stormy weather outside
14:49 FBLBs→35%
14:52 FBLBs→40%
14:53 FBLBs→50%
14:55 Metso @ Temp and Pressure
14:58 WW pH=8.45 Cond=1.24 mS/cm; Level=69.3%
15:01 PSBLBs→55%
15:04 t=8hr [Ethol]=1.72 g/L
15:06 PSBLBs→60%, Acid→6.00 GPH
15:10 Heating up WW pick heater. Sending out WW @ 70.0% Level
Flow~28-30 GPM
15:16 PSBLBs→65%
Acid→6.50 GPH
15:24 PSBLBs→70%
Acid→7.00 GPH
15:25 FBLBs→60%
15:32 PSBLBs→75%
Acid→7.50 GPH
15:40 PSBLBs→80%
Acid→8.00 GPH
15:41 FBLBs→60%
15:53 PSBLBs→85%
Acid→8.50 GPH
16:03 FBLBs→65%
16:06 PSBLBs→90%
Acid→9.00 GPH, PSF→112%
16:12 FBLBs→70%
16:18 PSBLBs→95%
Acid→9.50 GPH, FBLBs→95%
16:29 PSBLBs→100%
Acid→10.00 GPH, PSF→115%
16:32 PSF→118%
16:39 FBLBs→80%
16:42 Had an issue with CV's dumper valve not closing.
Field checked it, and it seems to be fine now
16:50 Adding another 160 gallons to Liq Tank. Initial math was off. Just a mental error.
Timer set for 80 minutes.

Began Metso Flowrate Test now.

17:34 BBP#5→20%. Prop 2B pH=6.26 currently while set @ 6.37.

17:44 GP ON @ 50%, cleaning with hydrogen peroxide

17:49 GP OFF

17:50 GP ON @ 50% and OFF

17:59 DW=39.53% at 252lbs/hr of DW biomass.

18:02 LTAG ON @ 100%

18:04 GP ON @ 50%, priming line with Enzyme.

18:05 Liquefaction Settings:

Initial Volume=450 gallons

UV flow during fill with biomass=0.79 GPM

UV Flow after reaching Level=2.04 GPM

Enzyme flow rate= 0.02498 GPM

GP speed=24.87%

6hr retention time

Fill Volume=1200 gallons

18:08 GP OFF

18:10 Now Feeding Liquefaction Tank

RevScr OFF, direction→"FORWARD"

Knifegate to Liq Tank OPEN

RevScr→"RUN FORWARD"

18:17 LTAG→75%

18:21 Current Metso Settings:

Temp=185°C=366°F; Pressure=150 psi (A)

FBLBs @ 80% (M); PSF @ 118% (M)

CV#1&2 @ 100% (M); ScPr @ 9.0 RPMs (A)

PAMP#2 CAS; Acid Cond=18.7 mS/cm (2%); Acid Flow @ 10.00 GPH (CAS)

PSBLBs @ 100% (M); PSB Level-Camera; Temp=125°F (A)

18:39 LTAG→100%, Liq Tank level is all over the place.

19:13 FBLBs→85%

19:20 FBLBs→90%

19:49 GP ON @ 24.86%

19:52 GP→49.72% for next 100 minutes

19:54 FBLBs→95%

Shift Change

20:03 FBLBs→105%

20:05 Sample Taken from Liq Tank for Lab pH readings

pH in LT has SLOWLY dropped. Have not even turned-on AAP#1 yet.

20:08 Lab pH=6.07 for Liq Tank. Reasonably close to current 5.86 in LT.

Will squeeze some treated biomass to get pH reading from there and get a sample from PA Hold Tank.

20:10 PAMP#2→80% (from 66%) for 30 seconds to pop line.

20:11 Field is fairly confident that we have good acid flow into Metso

Might be that 2% Acid Solution is too dilute for 250lbs/hr, 39.5% DW biomass going through the system.

20:14 Phosphoric Acid pH=1.42

20:16 CO₂ Scrubber's Process Water Flow set to 1.50 GPM

When and was it changed to 2.00 GPM?

Pump was beginning to fall behind and the level was consistently rising.

20:26 Checking squeezed biomass sample's pH now in Lab
20:27 Squeezed biomass pH=5.56
There is something wrong for certain now.
20:37 PAMP#2→MAN @ 80% (from 65%)
Will sample Blow Tank ~30 minutes to check pH. See if it's lower than 5.
20:44 PSF→120%
20:45 PSF→118%
20:46 PSBLBs→90%
20:47 PSBLBs→75%
20:48 PSBLBs to PSF, FBLBs, and Metso Steam OFF.
PSBTC clogged.
20:50 RevScr→Dumpster now. GP→24.86% for 40 minutes.
21:04 t=0hr Liq Tank Sample Taken
(L) 39.7%; pH=5.84; (T) 113.8°F; 2.71 psi
Campaign was called off because of another clog in pretreatment. In addition, the amount of acid was lower than usual, and the biomass was NOT pretreated properly. The pH of the Liquefaction never got below 5.8 after over two hours of adding biomass.
22:00 CO₂ Scrubber OFF
22:11 Phosphoric Acid pump and agitator OFF
22:22 Complete shutdown of pretreatment. Seal Water OFF

2015-07-15

00:00 t=17.5hr Prop 2B Sample Taken; 0.1 ACFM
(L) 88.9%; pH=6.31; (T) 99.1°F; 0.15 psi
03:30 Liq Sample taken for Lab pH reading (pH=6.2)
Been having issues with 2B AG overloading and tripping breaker
06:30 t=24hr Prop 2B Sample Taken; 0.1 ACFM
(L) 84.5%; pH=6.41; (T) 99.8°F; 0.12 psi
Lab pH=6.30
06:31 Kill started 2B because agitator has been off for so long and no additional base has been used in 3 hours.
07:15 140°F reached in 2B
Shift Change
07:52 Prop 2B pH OFF
08:34 CIP Systems ON, heating up tanks.
08:36 UV Water→Liq Tank was left going ALL NIGHT
Now off.
09:37 Having difficulty removing PSBTC to inspect it.
Will be cutting off the bearing (apparently, it's a commonly found/replaced part)
10:06 LT sample port BADLY clogged. No sample yet
10:13 Finished heat-kill of Prop 2B
10:17 Heat-kill Prop 2B Sample Taken
(L) 84.7%; pH=6.33; (T) 142.7°F; 0.09 psi
10:23 Prop 2B TC OFF (leaving LT TC on for the time being to see if biomass will degrade further and make cleaning easier)
10:58 POWER OUTAGE, leaving scrubbers OFF
11:01 Storming really bad outside. Another minor trip.
11:04 t=13.5hr Liq Tank Sample Taken

(L) 64.3%; pH=6.49; (T) 121.8°F; 2.84 psi

12:00 Ferm A Pump ON, Prop 2B→Beer Well
12:09 Ferm A Pump OFF, Prop 2B clogging really badly
12:10 Ferm A Pump ON
12:11 Ferm A Pump OFF, draining Prop 2B to the floor.
12:26 Prop 2B empty now
12:33 Began draining Liq Tank to the floor. Clogged immediately
14:17 2nd Attempt at draining Liq Tank
14:48 Prop 2B AG ON and OFF. Seems to be running fine.
Won't know for sure until there's something in the tank to agitate.
15:05 LT TC OFF
15:06 Cooling and Hot Water Pumps OFF
15:14 Chiller OFF
15:21 LT AG OFF. Field confirmed that bottom impeller was just barely touching the surface.
16:05 WW Pump ON in Recirc @ 54.1% Level
16:52 WW pH=6.72 @ 65.4% Level
16:53 Began 3-minute addition of Caustic→WW Sump
16:56 Finished Caustic addition→WW Sump.
17:07 Adding UV Water through sprayballs to Liq Tank
17:32 WW pH=8.11; Cond=1.06 mS/cm; Level=66.9%
17:39 Heating up WW pick heater. Sending out WW @ ~26 GPM
19:07 RevScr and ScPr ON→Liquefaction
19:09 Flipping CIP Header to Rinse Water.
19:21 Rinse Pump→70→55%

2015-07-16 Post-Campaign Notes

PSBTC was pulled out and found to be somewhat bent.
Straightened out and put back in.

Log Book Keys

Color Coding

blue text

green text

purple text

red text

yellow highlight

tank refill log (i.e., bleach, caustic acid)

notes from field

problems

sampling/inoculation-related information

process notes, major issues

Abbreviations

AAP	Aqueous Ammonia Pump
AG	Agitator
BT	Blow Tank
BW	Beerwell
BWP	Beerwell Pump
C5 Discharger	Hydrolyzer Discharge Screw
CIP	Clean in Place
CV	CableVey-Cable conVeyors
DFP	Decanter Feed Pump
FBLBs	Feed Bin Live Bottoms
FBTC/FBCC	Feed Bin Transfer/Collection Conveyor
GP	Gluconase Pump
HPSWP	High Pressure Seal Water Pump
HSMC	High Shear Mixing Conveyor
LIQ	Liquefaction Tank
LP/LIQP	Liquefaction Tank Pump
PA	Phosphoric Acid
PAHT	Phosphoric Acid Holding Tank
PAMP	Phosphoric Acid Metering Pump
PAMT	Phosphoric Acid Mix Tank
pAP	pH Adjustment Tank Pump
PATP	Phosphoric Acid Tote Pump
pHA	pH Adjustment Tank
Prop	Propagator
PSBLBs	Pre-Steam Bin Live Bottoms
PSF	Plug Screw Feeder
RevSc	Reversing Screw
ScPr	Screw Press
SIP	Sterilize in Place
SV	Steam Valve
WW	Waste Water