1. Procedure summary

This procedure outlines the method to start up and shut down the Saturation Tank Pressurization Loop.

1.1. Related Procedures

DAF Operations	CB-02-004-004

1.2. Procedure impacts and concerns

Safety	Compressed air valves should be opened slowly to prevent rapid outgassing of pressurized air. Do not override or block any pressure relief valves.	<Additional notes>
Quality	The dissolved air quality in the DAF determines if the flocculated algae will float or not. Loss of algae due to settling and lack of quality dissolved air in the DAF is something we want to avoid. Water must be in the Recycle loop (from the DAF) for the saturation tank to operate correctly	<Additional notes>
Delivery	Water must be overflowing the DAF weir or valve PF-V100 must be open with a full DAF to allow the Saturation tank to prime (or partially fill with water). All pumps need to be operated wet to prevent any damage	
Environmental	Any spills need to be cleaned as soon as possible or avoided	<Additional notes>
Cost	Failure to produce quality dissolved air in the DAF will result in the loss of material.	<Additional notes>
Compliance	All applicable regulations for operating compressed air and dissolved air saturation tank equipment need to be observed and followed at all times.	

1.3. Responsibilities and owners

Document Owner	Manage content and distribution	Jose Perez
Process Owner	Responsible for content and process validation	Rebecca White
Plant Manager	Responsible for implementation and conformance	Rebecca White

2. Process

2.1. Process description

There are 3 parts to this procedure: <Additional notes>

Saturation Tank start up
Saturation tank operations
Saturation Tank shutdown

2.2. Process diagram

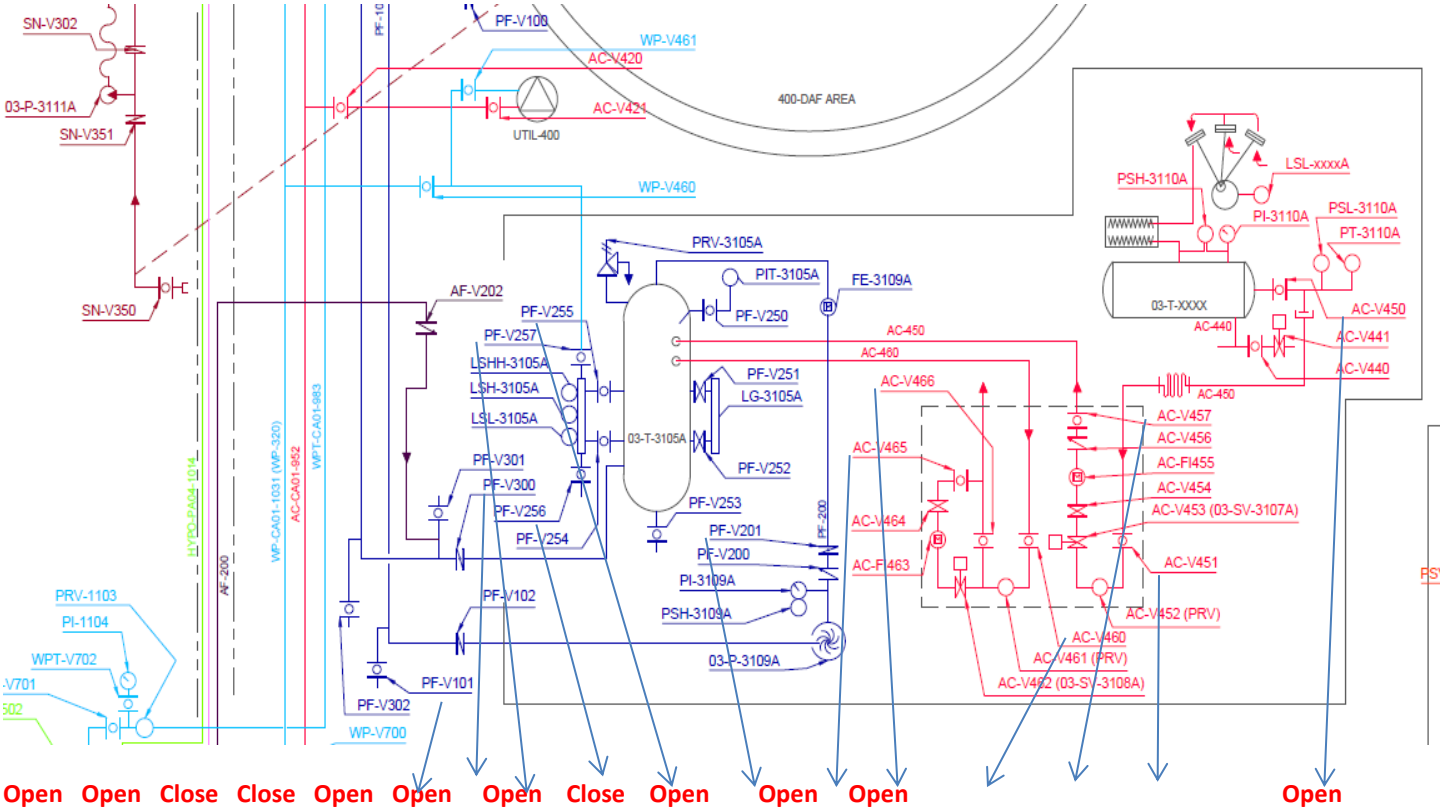

Figure 1 Saturation tank piping layout

Figure 1
Figure 1 depicts the Saturation Tank used to charge the recycle loop from the DAF with air. This is the system that creates the dissolved air in the DAF and facilitates the floating of algae in the DAF.

Figure 2 – Air Flow Control panel.

Figure 2
Figure 2 depicts the air flow control panel that controls the amount of air to the Saturation Tank.

Figure 3 – DAF pressurization skid.

Figure 3
Figure 3 Shows the Saturation Tank that is used to charge the recycle loop from the DAF with air. This is the system that creates the dissolved air in the DAF and facilitates the floating of algae in the DAF. Saturation Tank is located on the south end of the DAF.

2.3. Normal Saturation Tank Operations

2.3.1 Saturation tank start up

This method outlines the startup of the Saturation tank and the DAF recycle loop.

Record the Saturation Tank parameters on the Harvest Record Hourly Data sheet.
Verify that the air compressor oil level is sufficient for regular operations.
Verify valves are in the following positions: See figure 1 also.
Open PF-V101
Open PF-V201
Open PF-V255
Close PF-V257
Open AC-V450
Close PF-V256

During start up it is possible to get a quick blast of air that can damage the rotameter. The rotameter should be bypassed during normal operations

Open PF-V106
Open PF-V300
Verify back pressure valve is set and in position for normal operations.
Open PF-V100 (Open on start-up until the DAF is full above the weir height, then close valve. PF-V100 can be opened again during DAF shutdown).
Verify that there is sufficient oil in the recycle pump.
Verify that the site air compressor is online and the following air supply valves are in their correct positions:
Open AC-V451
Open AC-V457
Open AC-V460
Close AC-V466
Open AC-V465
In the airflow control panel, close the air inlet needle valve for the flow control, close the bypass valves for the solenoid valve and open the solenoid valve flow piping.
Close the rotameter flow piping and then open the bypass valves.
Check that the compressor is set at a minimum of 100 psi.
Adjust the filter/regulator in the airflow control panel to 80psi.
Check that the back pressure control valve is set at the correct position (marked on the valve).
Verify that the DAF main tank is full to the weir height.
Open Valve PF-V100. This allows water to flow into the DAF recycle loop during start-up.
Verify that the saturation tank liquid level control valves are open and operating correctly.
Turn on the recycle pump. Verify that the pump is flowing normally and not cavitating or vibrating excessively. The Saturation tank will fill with water.
Open the airflow control valve. Slowly open the air inlet needle valve in the air flow control panel, careful not to damage the rotameter. The valve may need to be opened all of the way to equalize the saturation tank.
Check the back pressure control valve and set the initial pressure between 55 and 65 psi.
Pressure at the Recycle pump should be at 75 psi. Pressure on the Saturation Tank should be at 60 psi. To equalize the saturation tank, close the air inlet needle valve to minimize the amount of air that is bled off the saturation tank.
The stabilization process may take several hours. The water on the surface of the DAF tank should look “milky white”.
The DAF feed pump can be controlled in Program/Automatic Mode from the HMI (see DAF Operations procedure CB-02-004-004).

unless the operator is checking airflow.

The pressure on the air filter should always be 10 to 15 psi greater than the pressure in the saturation tank.

2.3.2 Saturation Tank Operations

Based on the saturation tank level and the air compressor pressure set point the quality of the dissolved air in the DAF can change. Small adjustments can be made during the process to improve dissolved air flotation of algae.

Record Saturation Tank operating parameters in the Harvest Record Hourly Data sheet.

The back pressure control valve allows for system optimization by changing the recycle flow rate and the pressure of the pressurization system. The higher the flow rate the more air is required in the system, the higher the pressure the more air that will dissolve. This ratio should be customized to specific particle sizes and air-to-solids ratios. The highest air-to-solids ratio is best for the floatation of algae.

2.3.3 Saturation Tank Shutdown

This method will transfer process water from the HRP back to the DFP.

Shut off the DFP feed pump.
Shut off the Recycle pump on the DAF pressurization skid. The Recycle pump should be shut off after all remaining solids are skimmed off the top of the DAF and into the DAF float box.
See DAF Operations procedure CB-02-004-004 for complete DAF system shutdown.

3. Required documents

3.1. Input documents

Harvest Record <Input document number>

3.2. Output documents

Harvest Record <Output document number>

4. Document control

4.1. Revision history

R0 – Initial Release – Timothy Langer	March 27, 2012
R1 – Updated procedure – Marcos Delgado	September 5, 2012
R2 – Updated Procedure- Jose Perez	February 25, 2015

Document approval
<Name> <Approval date>

Document reviewers
<Name> <Last reviewed date>
<Name> <Last reviewed date>

Risk analysis

<Risk name>	<Mitigation plan>	<Owner>	<RPN>