SmartSkim® CF Series System

Installation and Operations Manual

(Updated April 1, 2019)

SmartSkim® CF Series Separation System

SmartSkim® CrossFlow and CF20 Systems mounted on optional stands

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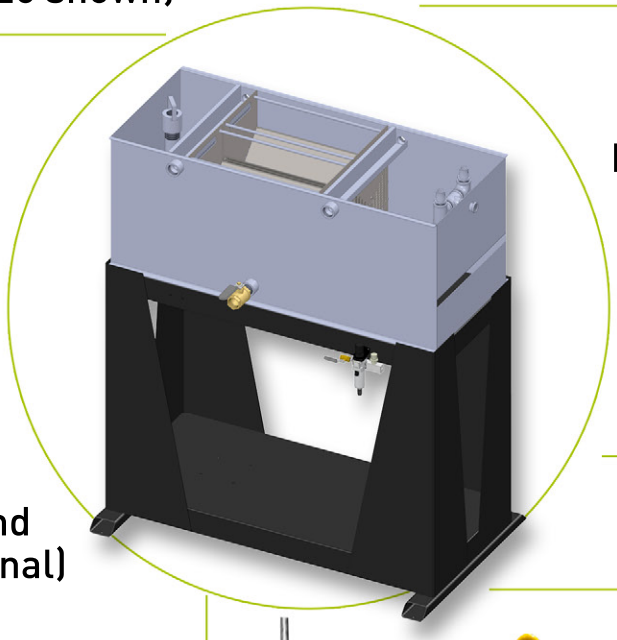
1. Components

CF Series Tank
(CF20 shown)



Platepack for CrossFlow

Platepack for CF20

Air Operated Diaphragm
(AOD) Pump

Stand
(Optional)

Air Service
Assembly

Standard 7"
Skimmer

Connection Kit (Optional)

Skimmer to Pump Kit

Pump to Separator Kit

Piping by End User

1. 1/2" shop air connection to air service assembly
2. 1-1/2"NPT oil discharge piping
3. 1-1/2" NPT solids discharge piping
4. 1-1/2" NPT return piping
5. 3/4" NPT connection between skimmer and pump inlet (if connection kit is not purchased.)
6. Connection between 3/4" NPT pump discharge and 1-1/2" NPT CrossFlow tank (if stand or connection kit is not purchased.)

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2- Start-up

1. Locate and Install Suction Skimmer — It should be located in a position that sees floating oils. Look at the source tank for a place where the natural flow of the tank causes oils to sit on the top surface and locate the skimmer in this location.
2. Locate and Level the CF Series tank — Level the CF Series tank. The unit needs to be level side to side and front to back. A tank that is not level may inhibit the removal of oil from the system. The CF Series tank needs to be installed high enough to gravity flow back into the source tank.
3. Install the platepack — Place the platepacks into the tank. Each platepack should be placed into the tank so that the coalescing plates form a "V" pointing to the bottom of the tank.
4. Install pump — Locate the pump as to be accessible for suction and discharge piping. A CF Series unit with a stand will already have this step completed.
5. Install Pump Suction piping — This piping needs to go from the skimmer to the suction side (bottom ports) of the pump. The piping connections are 1" NPT. Optional connection kit #2198 available for this step.
6. Install CF Series tank inlet piping — Inlet piping needs to have a 1" NPT connection to the pump discharge (top ports) and an 1" NPT connection to the CF Series tank (See section #7). Optional connection kit #2197 available for this step. A CF Series unit with a stand will already have this step completed.
7. Install CF Series tank discharge / treated fluid return piping — The piping connection from the CF Series tank is a 1-1/2" NPT. The discharge into the source tank should be located at a point in the source tank away from the skimmer location. It is not recommended to reduce this pipe size. Install Tramp Oil Discharge pipe (By owner or with kit). Unit required 2x Tramp Oil Discharge Kit #2040
8. Install Air Service Assembly — The Air Service Assembly will need to have a 1/2" shop air line connected to the pump. The air service should be located in an accessible location to enable the ball valve to be turned off, to monitor air pressure and to adjust airflow with the needle valve of the air service assembly (See Section #6). A CF Series unit with a stand will already have this step completed.
9. Fill CF Series tank — with the platepack installed in the tank, fill the tank with clean solution. This will accomplish a preferential wetting of the platepack surface. This preferential wetting of the surface allows oils to release from the coalescing plates.
10. Start pump — connect shop air to air service assembly, open ball valve, set air regulator to 30psi, open up the needle valve. See Air Supply (Section #6)
11. Adjust Skimhead — See Skimhead Adjustment (Section #4)
12. Adjust pump speed — See Air Supply (Section #6)
13. Check / re-adjust skimhead (Section #4)
14. Adjust overflow weir height (Section #8)

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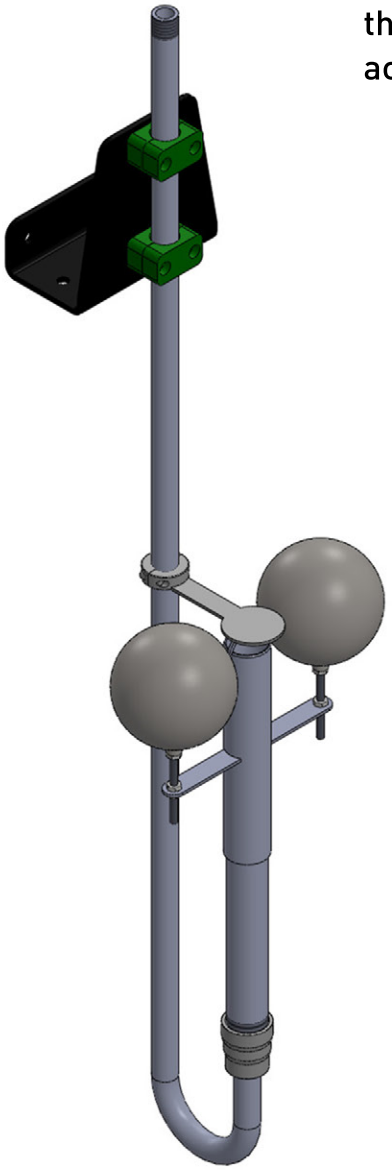
3. Suction Skimmer Options

J-Tube Style



The 17" J-Tube is the standard skimmer for a CF Series unit.

This option comes in a 17" and 36" size. These represent the vertical fluid level changes that each skimmer can accommodate.

Sidewall Style

SmartSkim® Suction Skimmer can be installed through the sidewall of your washer by welding in a full coupling below surface.

This can be done as a 7", 17" or 36"size

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4. Skimhead Adjustment

GOOD SKIMHEAD HEIGHT

— A good skim height will locate the skim head slightly below the surface and create a vortex which will pull the surface oil to the skimmer.

SKIMHEAD TOO HIGH

— The skimhead set too high will prevent oil from being collected by the skimmer and will cause air to be pumped into the CF Series Tank. This can create foaming in the CF Series Tank.

The ideal position for the floating sleeve (skimmer inlet) is one which aggressively skims the surface without drawing in excess air.

The position of inlet relative to surface will result from a combination of the position of the float balls and the pumping rate.

To raise the position of the suction skimmer inlet relative to the surface:

A. Loosen the jam nuts above and below the float brackets.

B. Rotate the float balls clockwise, toward the brackets.

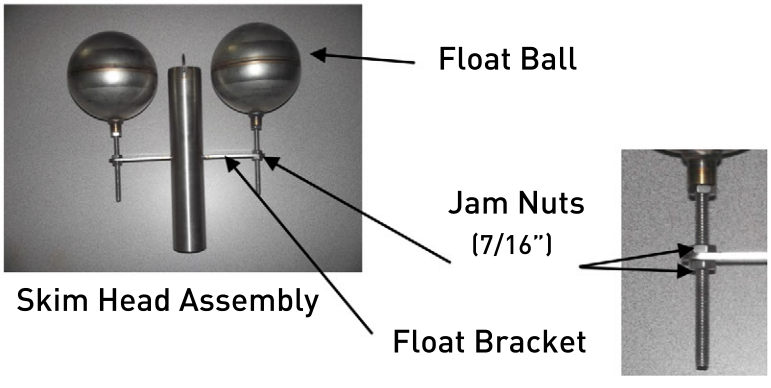
C. This action has the effect of increasing the total buoyancy beneath the surface, driving the float position of the skim head up and closer to the surface.

To lower the position of the suction skimmer inlet relative to the surface:

A. Loosen the jam nuts above and below the float brackets.

B. Rotate the float balls counter-clockwise, away from the brackets.

C. This action has the effect of decreasing the total buoyancy beneath the surface, driving the float position of the skim head deeper & increasing its relative distance from the surface.



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5. Transfer Pump

NOTE: This pump is a positive displacement (PD) pump. It is used because PD pumps do not "shear" or mechanically emulsify oil molecules in transit.

Parts and other materials of construction for the pump are application specific.

1. For a complete discussion of the Air Operated Diaphragm (AOD) pump please refer to the manual that was included with the pump.
2. **INLET/SUCTION** – 1"NPT inlet is located at the bottom of the manifold.
3. **OUTLET/DISCHARGE** – 1"NPT outlet/discharge is located at the top of the manifold.

   NOTE: Pump manifold can be rearranged easily to change the position of the inlet and outlet connections. (See pump manual)
4. **MUFFLER** – Air muffler is supplied with pump. This muffler can be vented remotely if there are decibel restrictions in the area of operations. (see pump manual)
5. **PUMP REPAIR KIT** – It is recommended that customers keep a repair kit on hand to avoid any downtime.

NOTE: The normal recommended flow of a CF Series model CF20 is between 7-20 GPM based on fluid make-up & constant levers. At this rate SCFM will be 5-15.

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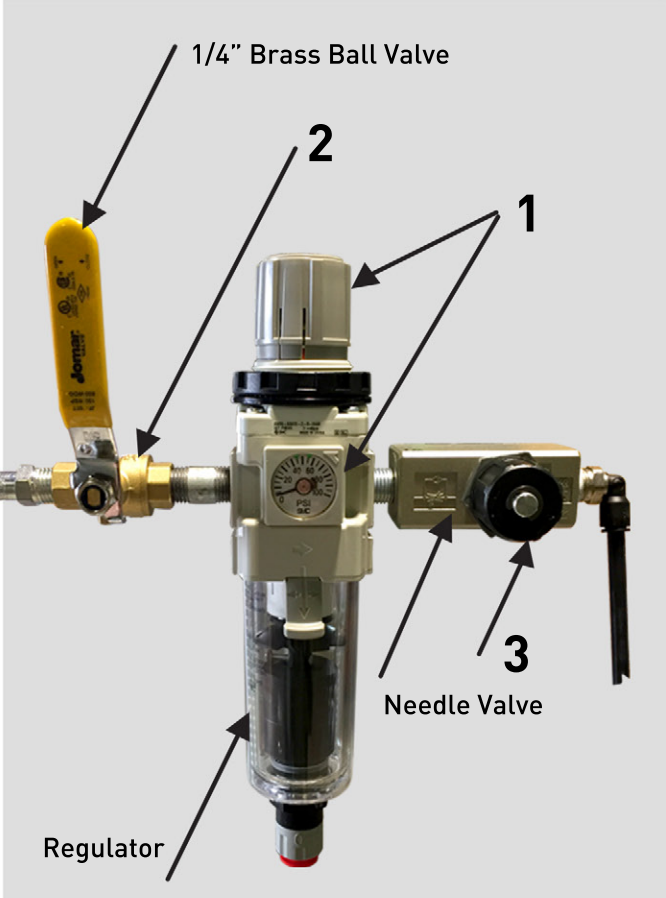
6. Air Supply



The air service assembly consists of a ball valve, combination air filter / regulator and a needle valve.

1. The combination air regulator / filter includes an automatic drain, mounting bracket, and embedded 0-60 PSI gauge. This assembly has ¼" NPT connections and a 5 micron filtration level (see photo at left).
2. The ball valve allows you to quickly start and stop the pump without changing any of the air flow settings on the regulator. (Shop air connection is required at this valve).
3. The needle valve allows fine adjustments of the flow rate of the pump without needing to adjust the regulator at all.
4. Change fillers as needed.

TO START THE PUMP

1. Open the 1/4" ball valve.
2. Using the knob on the top of the regulator, set the regulator serving the pump air supply to 30 PSI on the regulator gauge.
3. Open the needle valve, this is done by turning the knob on the needle valve counter-clockwise to increase flow.
4. Adjust the flow rate of air to the pump by turning the needle valve clockwise to decrease airflow / pump speed and counter-clockwise to increase flow / speed

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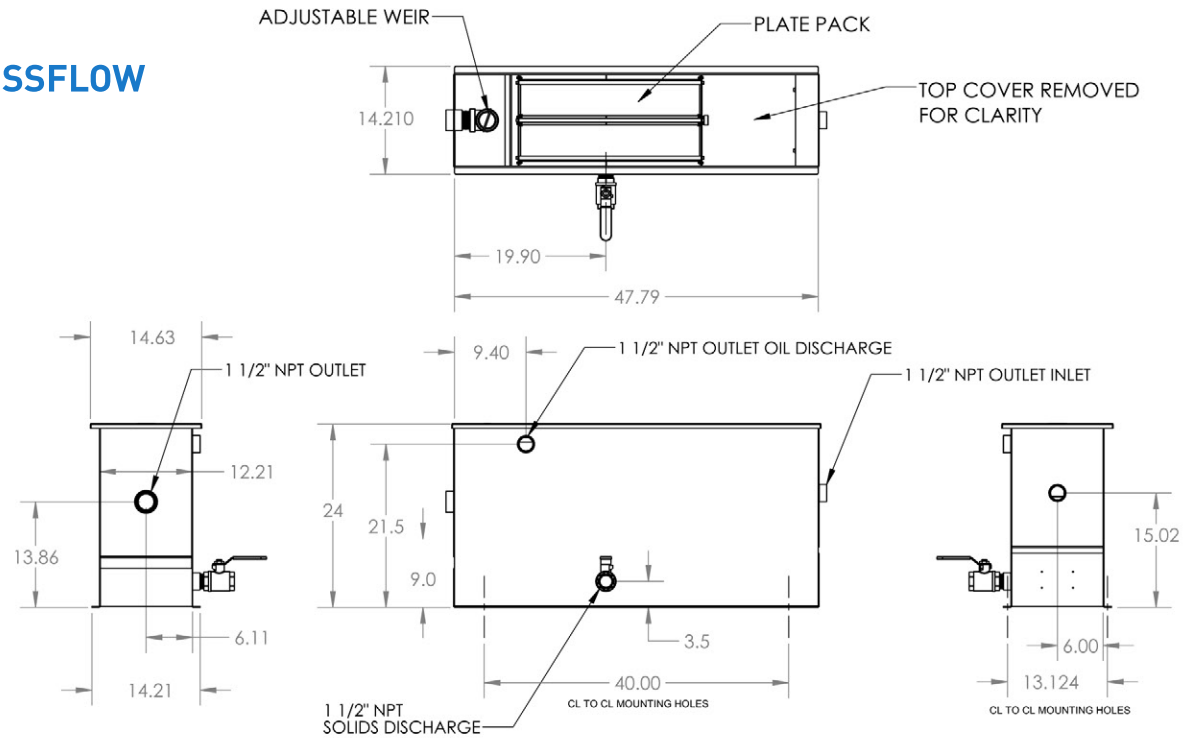
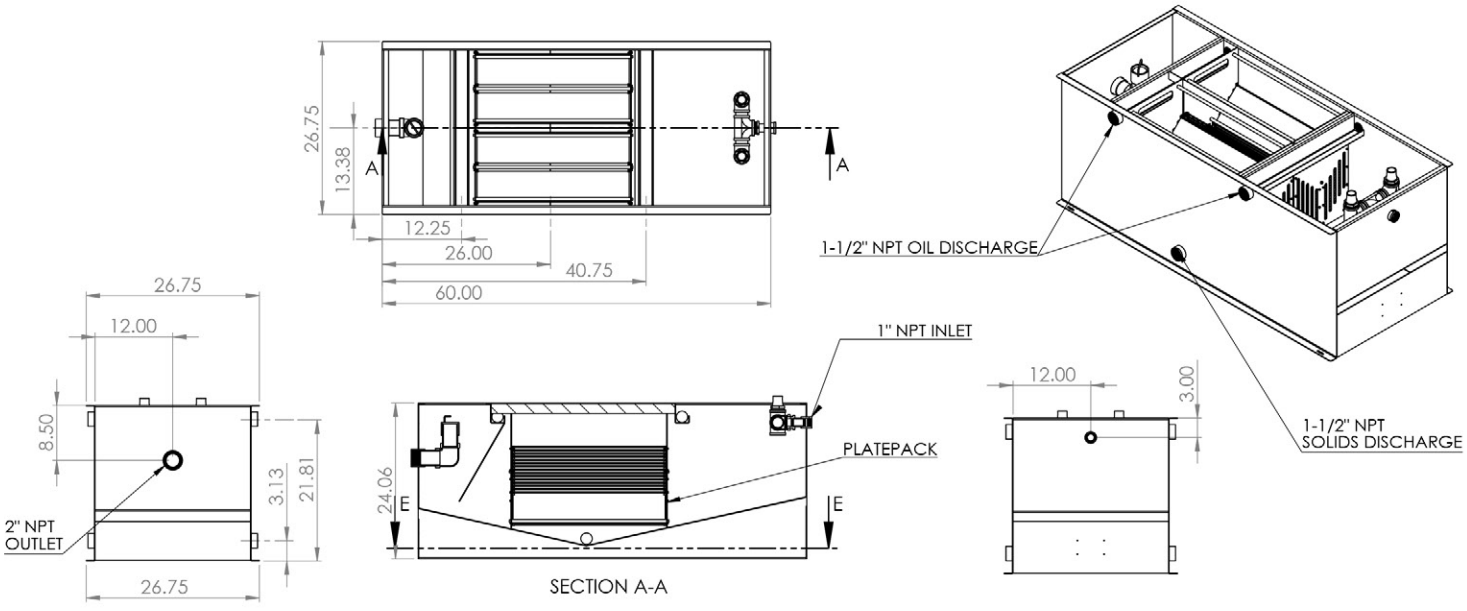
7. Installation Drawings and Photos

CROSSFLOW



CF20



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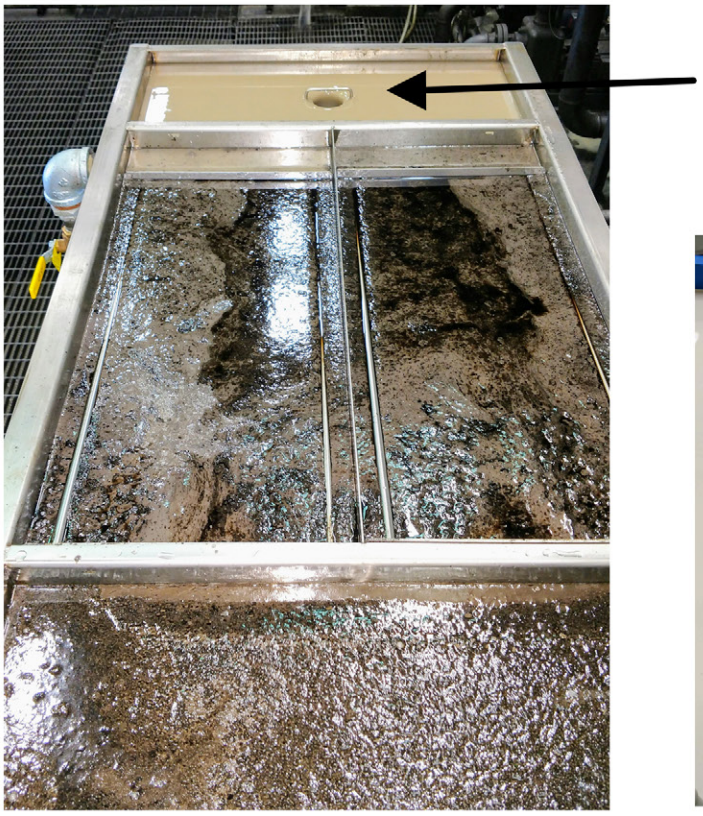
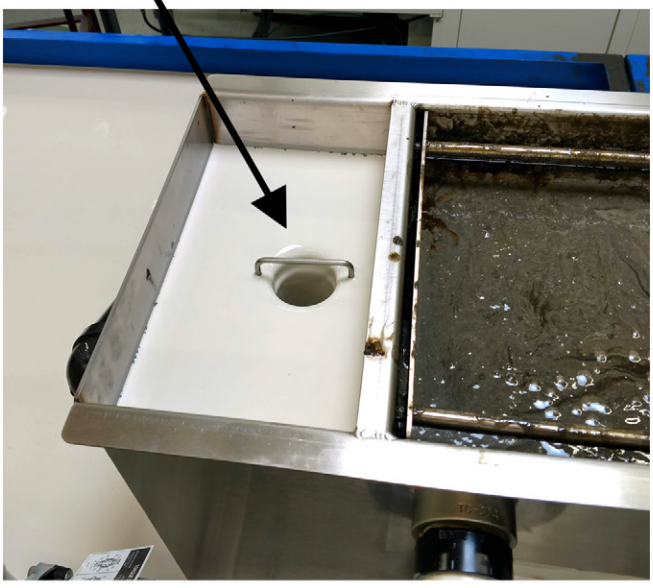
7. Installation Drawings and Photos (cont.)

Once enough tramp oil has accumulated inside of the separator, raise the overflow weir by turning the handle counter-clockwise. By raising the weir, you are raising the fluid level inside of the separator tank. Typically the top layer of the tramp oils should be 1/8" to ¼" above the slotted discharge in order for the tramp oil to efficiently exit the tramp oil discharge port.

If you like, you can keep the level raised, and just occasionally open the ball valve on the discharge port to remove the layer of oil as it accumulates. Operations where tramp oils are excessive may have the port constantly opened to continually remove the tramp oils from the system.



Adjustable overflow weir
Turn counter-clockwise to raise
Turn clock-wise to lower



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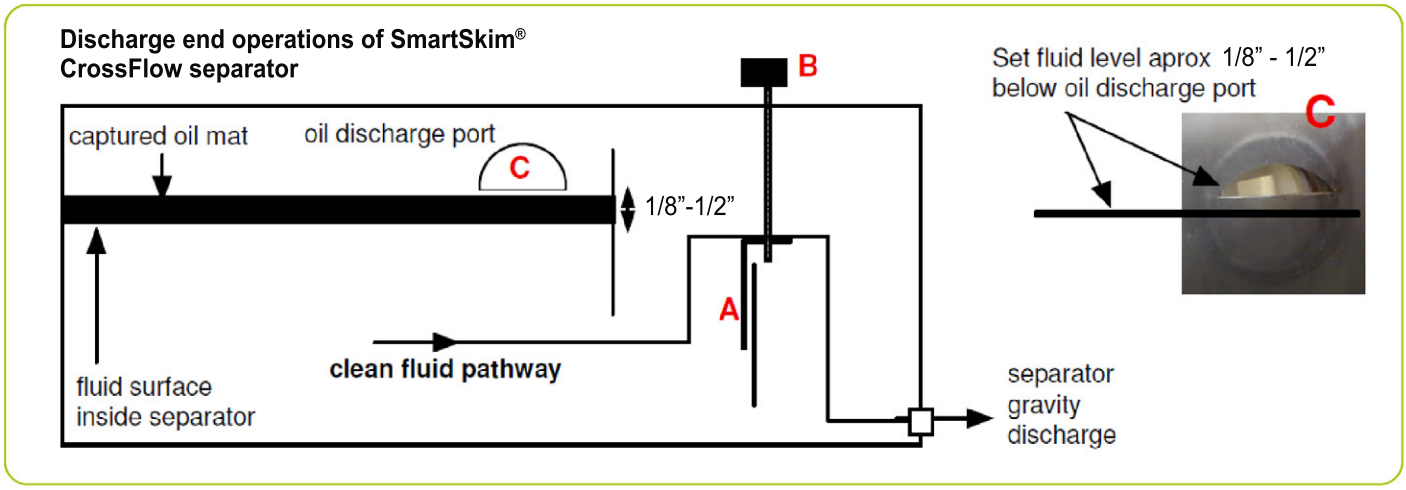
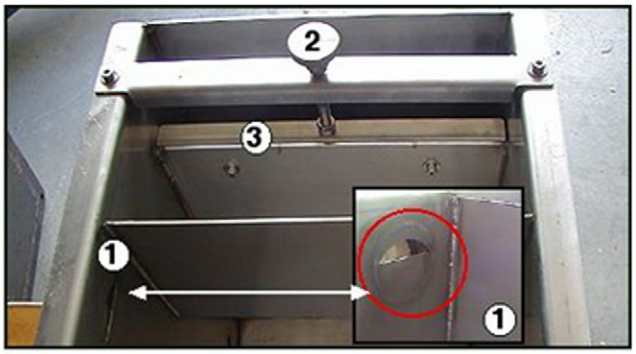
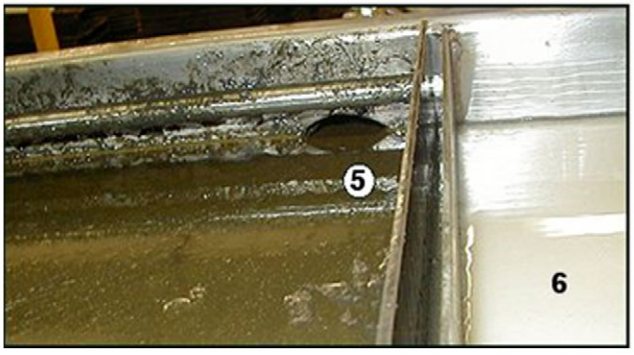
8. Tramp Oil Discharge and Level Settings







Separator Oil Discharge

1. Oil discharge port (C) in drawing above.
2. Control knob for adjustable height weir. Start system with weir in the lowest position, (B) in drawing above. After a few days of operation and tramp oil build up, you can adjust weir up to an acceptable level.
3. Adjustable height weir (A) in drawing above.
4. Shows captured oil just beginning to accumulate.
5. Shows oil discharging from the separator.
6. Cleaned fluids continuously drain by gravity back to the source tank.

Notes: At no time do you want clean fluids discharging out of the oil discharge port. Adjust weir height so fluids are at least 1/8" below oil discharge port. Once a sufficient tramp oil mat has built up, re-adjust weir height so that tramp oils are removed through discharge port.

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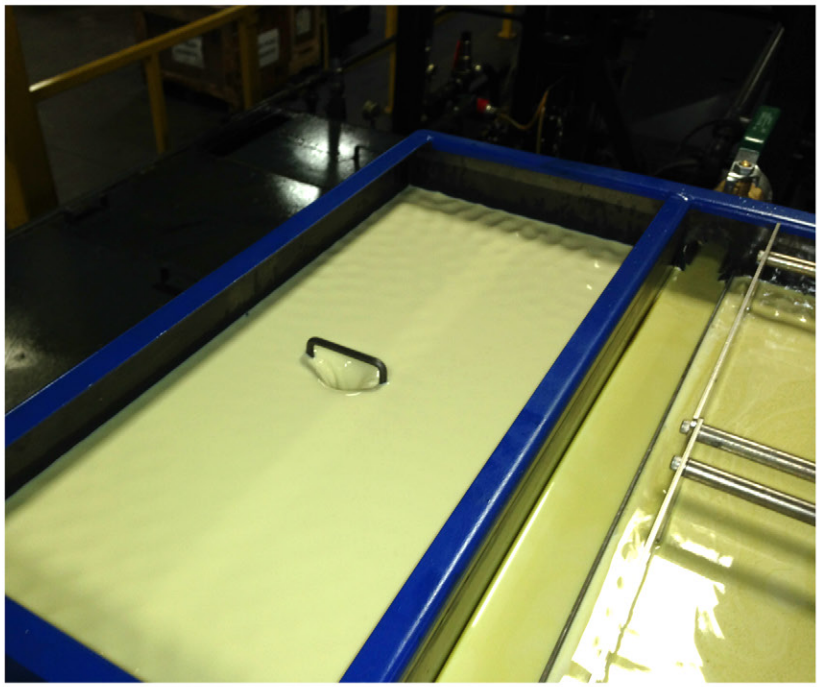
8. Tramp Oil Discharge and Level Settings (cont.)

CF20 Separator clean fluids discharge and Adjustable Overflow Weir



Oil and settleable solids are captured inside the CF20 Separator.

Clean treated fluids gravity drain over the separator exit weir back to the source tank.

Multi pass fluid treatment through the separator maximizes separation efficiency.

Notes: The level in the separator is affected by the processing flow rate of the supply pump as well as the setting of the adjustable weir.

- Start the system with the adjustable weir in the lowest level.
- Set the desired processing rate of the pump using the needle valve to control flow rate.
- Gravity separators work best when operated at the lowest flow rate that will provide satisfactory suction at the floating skimhead and give the fluid enough residence time within the separator tank.
- Typical flow rate for the CF20 Separator is between 3 – 10 gpm. The more oil rejecting characteristics that the fluid has, the higher the flow rate possible.
- After several hours of operation you can make final adjustment to adjustable weir based on oil accumulation and/or presence of foam.
- If an adjustment to the processing flow rate is made in the future, a subsequent adjustment to the adjustable weir may also have to be made.

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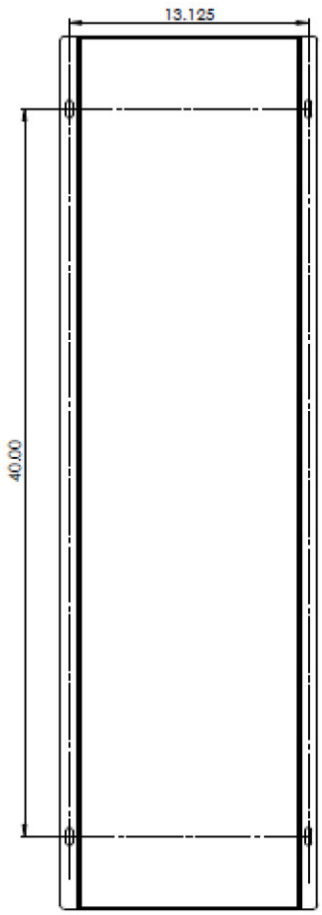
9. Mounting Hole Pattern



Mounting Hole Pattern

1. When building or buying support stands, follow all local code and mechanical specifications required to support the separator when full of fluids (approximately 500 lbs).

   NOTE: Build stands so that separator is high enough to gravity drain back to source tank (ie - washer, coolant sump)

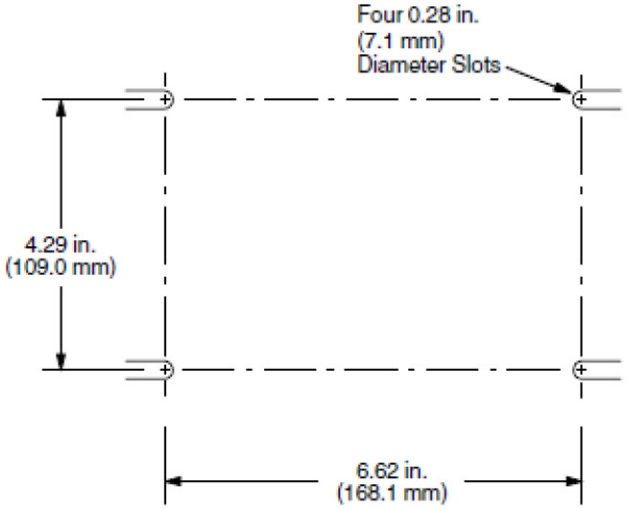
2. The separator and separator pump each have a hole pattern on its base so that it can bolt to the stand easily.

   NOTE: When mounting separator tank, mounting holes are slotted and located as follows:

   - 4" in from each end to hole center
   - 40" between hole centers end to end
   - 13-1/8" between hole centers side to side
   - Bolts used are 1/4-20

   NOTE: When mounting CF20 pump

   - A support plate for mounting the transfer pump is very helpful, See pump mounting hole pattern at bottom left
   - Bolts used are 1/4-20



1050 Pump Mounting Hole Pattern

Slotted Mounting Hole on CF20 Unit

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10. Troubleshooting

PROBLEM	CAUSE	SOLUTION
Oil escaping from the separator back to the wash / coolant tank.	There is too much flow through the separator.	Slow pump flow using needle valve.
	There is too much oil accumulating inside the separator.	Raise the level of the variable weir to purge the topmost layers of oil out of the separator into the oil capture barrel or central treatment.
	The volume of solids captured inside the separator is blocking the bottom portions of the oil separating plates.	Shut down separator. Remove plate pack. Discharge solids through the bottom solids port. Spray off any debris on plates.
Poor skimming inside the source tank.	Skimhead inlet set too low.	Reset skimhead to a position closer to the surface by threading float balls downward. (See: Skimhead Adjustment)
	Suction from pump is impaired.	Make sure suction hose between skimmer and pump is not blocked. Check that pump is operating correctly. If debris and solids continue to block the check valve, install a debris strainer to protect pump inlet.
Clean fluids being discharged along with captured oil.	Water level inside separator is too close to overflow line of the oil discharge port.	Use the knob on the variable height discharge weir to lower the fluid level inside the separator.
	Pump flow rate is too high.	Increasing the flow through the separator causes a higher fluid level inside the separator. Turn down flow rate by slowing down the pump by using the needle valve on the air service assembly.
	There is too much turbulence on the surface of the separator due to too much air in the skimmed fluids.	Reset the pump flow rate and skimhead position to eliminate high levels of air entering the skimmer and pump.

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10. Troubleshooting (cont.)

PROBLEM	CAUSE	SOLUTION
Pump running slowly or stopping.	Insufficient air pressure.	We recommend keeping 30 PSI feeding the pump. Flow control can be adjusted with the needle valve on the air service assembly serving the pump.
	Pump needs lubrication.	The Graco pumps shipped with the unit do not typically need lubrication. However in applications where there is a high moisture content in the plant air, the moisture can strip out the factory lubrication. You can test this by dripping a few drops of lightweight oil into the air line feeding the pump to see if additional lubrication is needed. See Graco Pump Manual. Open the face plate of the Graco pump and apply a white lithium grease to the air valve.
Pump running too fast with no discharge flow.	Suction blockage.	Check for blockage in hoses, skimhead inlet or pump inlet ports.
Fluids are being discharged through the air muffler.	Ruptured pump diaphragm.	Replace diaphragms.
Pump not cycling. Air discharging from air muffler continuously.	Debris in the air valve.	Disassemble air valve and remove any visible debris.