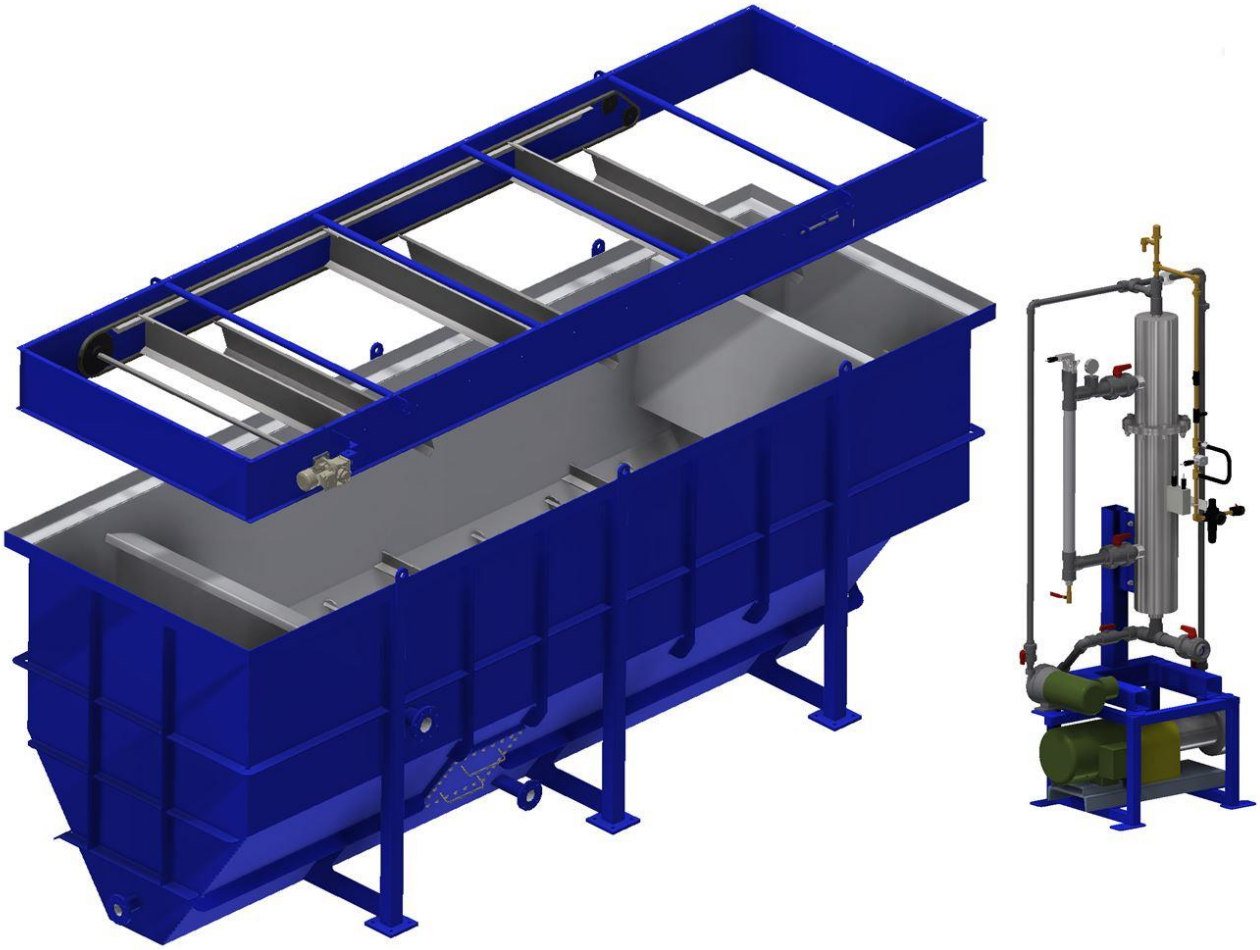
HydroFloTech

Dissolver Air Flotation (DAF) Unit

Installation, Operation & Maintenance Manual



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1.1. DAF THEORY OF OPERATION

HydroFlo Tech, Inc. DAF systems are designed to remove non-settling (either floating or stagnant) suspended solids as well as FO&G from potable water, process water and wastewater streams. The microscopic air bubbles created when the dissolved air releases are very effective at lifting even heavy particles to the surface where they exit the waste stream and are skimmed off for further processing.

The Recycle / Air Dissolving (RAD) System is designed to recycle a portion of the DAF effluent flow into a specially designed pressure vessel where the air/water interface and gas mass transfer occur. The water becomes highly saturated with air under pressure before it is injected into the influent waste stream of the DAF unit.

For detailed information on clarifier design and theory of operation, please refer to our "DAF design parameters" section.

1.2. GENERAL OPERATIONAL GUIDELINES

As stated above, a DAF's sole purpose in life is to remove non-settling (either floating or stagnant) solids from potable water, process water and wastewater streams. This being the case, an operators main focus will be on the effective management and removal of the accumulated sludge in the DAF's skimmed float chamber and sludge collection hopper.

1.3. RECYCLE-AIR DISSOLVING SYSTEM (RAD)

The RAD system is what separates the DAF unit from a typical API type Oil/Water Separator. The RAD system is used to create water that is saturated with dissolved air and introduces this air/water mixture into the DAF flotation/separation chamber at the influent point using a lance assembly (See Sec. 1.4). Once in the separation chamber, the dissolved air begins to come out of solution and create small air bubbles that attach to the particles (oil droplets, solids, etc.) in the waste steam. Once attached the air bubble and the particle rise to the surface of the separation chamber where is skimmed off of the surface by the flight skimmer and thus removed from the waste stream.

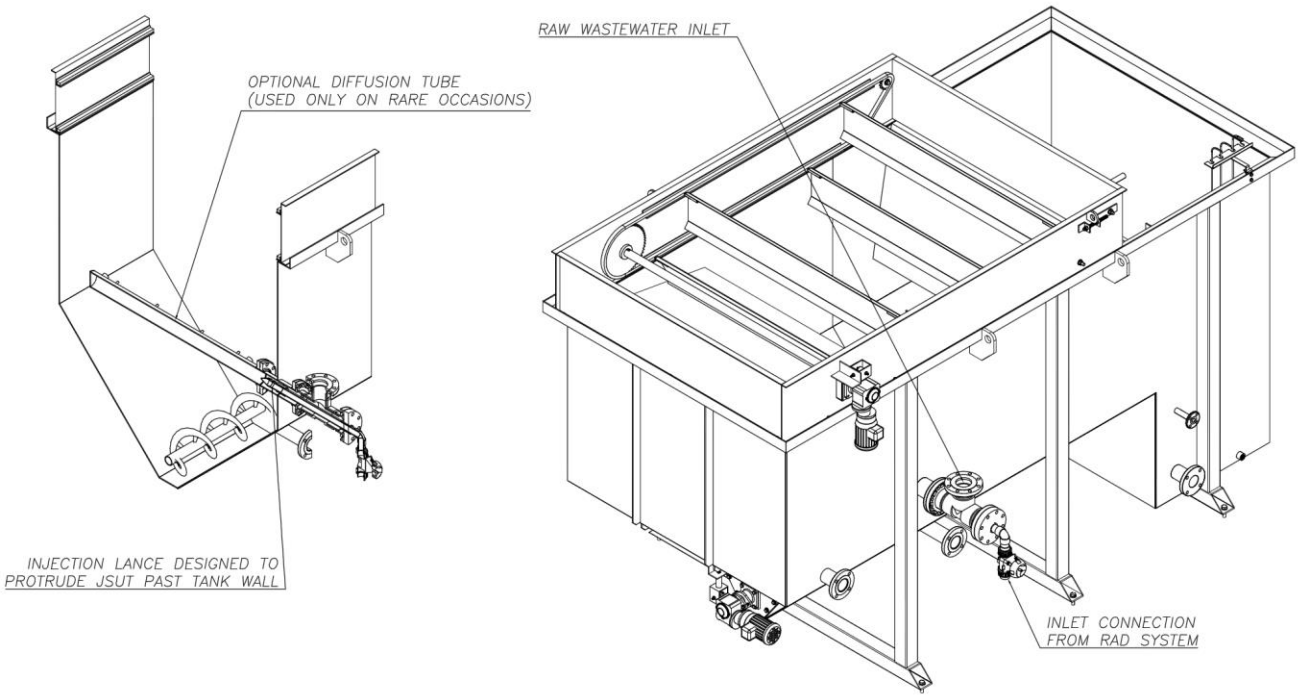
1.4. INFLUENT DISPERSION SYSTEM

The dispersion and Intermingling of the recycle and the incoming waste is achieved in two zones.

First a RAD pressure release lance assures that the incoming recycle is thoroughly intermingled with the incoming waste. This assures that the dissolved air (as it comes out of solution) forms on the suspended solids, FOG and other contaminants in the waste stream. This is a critical step in our design because when dissolved air comes out of solution, it does so on the surfaces of the solid particles. Our process insures that the wastewater and the recycled water have immediate contact achieving the best floatation achievable.

Second is the dispersion of the flow across the depth and width of the separation chamber. This is achieved via a non clog flow distribution manifold. This baffle is sized and positioned to dissipate the energy of the influent stream and evenly distribute the water as it enters the separator. A properly designed influent distribution manifold will eliminate the possibility of channeling and assure a more uniform “plug flow” through the separation chamber.

The combination of these two features results in the best possible separation of all floatable materials in the wastestream.



1.5. INDEX OF COMPONENTS

The standard RAD system consists of the following main components:

1. RAD Tube or Vessel
2. Recycle Pump
3. Air Pressure Switch
4. Air Pressure Regulator
5. Air Line Ball Check and Needle Valve
6. 2-Way Solenoid Valve with Manual By-Pass Line
7. Pressure Relief Valve
8. Swing Check Valve (Recycle Pump Discharge)
9. Sight Glass with Two-Point Level Sensor
10. Two (2) Diaphragm Valves; One (1) Recycle By-Pass and One (1) Recycle Injection

Please check your General Arrangement Drawings for the proper location of these devices for your system and verify that they are present.

1.6. COMPONENT OPERATION

1.6.1. STANDARD INTERLOCKS

Three conditions must be met before the RAD System will operate in automatic mode and energize the solenoid to deliver air to the pressurization tank. They are:

1. The Air Pressure Switch (if provided on the air supply line) must detect sufficient pressure (typically 95 psi OR 10 psi above desired pump curve).
2. The recycle pump must be running.
3. The high level sensor (LSH) must indicate the need for air.

When all of these conditions are met, the system will operate in automatic mode.

EQUALIZING THE RAD SYSTEM

Before operating the DAF, the RAD System must be equalized. In order to equalize the RAD system, follow these steps:

1. ENSURE that there is sufficient clean water in the DAF effluent chamber to fill the pressurization vessel and all of the associated piping.
2. ENSURE that the air supply pressure exceeds 90 psi OR the airline pressure switch set point.
3. SET the pressure regulator for ~ 60 psi OR the desired pump curve backpressure.
4. CLOSE the Recycle Injection diaphragm valve.
5. CLOSE the Recycle By-Pass diaphragm valve.
6. CLOSE the RAD effluent ball valve.
7. OPEN the isolation valves on the sight glass.
8. OPEN the Recycle Pump isolation ball valves.
9. Turn the Recycle Pump ON until the water level in the pressurization vessel is high enough to activate the High Level Sensor in the sight glass. Once the level at this point is achieved, turn the recycle pump OFF.
10. OPEN the manual air inlet by-pass valve and start to introduce pressurized air into the system. Continue to let air into the system until a pressure of ~ 60 psi is reached on the sight glass pressure gauge. Once this pressure is reached, turn off the air inlet by-pass valve.

During this operation, watch the pressure in the pressurization tank as well as the pressure regulator. The regulator may need to be adjusted as the pressure increases.

Once the proper water level and air pressure are achieved, let the system sit for approximately 30 minutes in order for the air to completely saturate the water. Introduce more air if the pressure drops below the desired set point.

1.7. GENERAL OPERATING INSTRUCTIONS – RAD

1.7.1. Standard Configuration RAD system Description and Operating Procedures

A DAF (Dissolved Air Flotation) system creates microscopic air bubbles that are attached to incoming wastewater particles in order to float them. Once floated, they are separated from the wastewater and skimmed from the top and into the float scum chamber. The treated wastewater then exits from near the bottom of the DAF. The DAF creates it's air bubbles with a sub-system called a RAD (Recycle Air Dissolving) system. Proper operation of the RAD system is key to DAF performance.

The standard configuration RAD system is designed to take treated effluent from the DAF effluent end, pump and pressurize it into the RAD pressure vessel where it is subject to compressed air pressure. The air pressure then dissolves air into the water to become "saturated recycle". Once saturated the recycle is introduced into the DAF inlet reaction chamber where it co-mingles with raw incoming wastewater. When the recycle is co-mingled with wastewater the pressure of the saturated recycle is released and bubbles form and are enmeshed with the wastewater particles.

1.7.2. TYPICAL RAD OPERATING SPECIFICATIONS:

Operating pressure; 30-80 psi adjustable.

Air consumption: 1-5 scfm intermittent.

Flow rate: 10-300 gpm depending on model. Flow rates are adjustable within the range of the model.

1.7.3. RAD Operating Description:

The RAD creates bubbles by maintaining pressure and an air/water interface in the RAD pressure vessel (stainless steel vertical vessel pictured above right). The interface is maintained by a dual level sensor located in the RAD clear sight tube. When the dual float sensors are wet, the logic says the level is rising and the air pressure supply solenoid is energized and air pressure is added to the RAD vessel. When the dual sensor floats are dry, the logic says the air pressure is excessive and the air supply solenoid is de-energized allowing the level to rise. The level will constantly hunt between (slightly above and below) the two sensor floats. This is normal.

NOTE: The level sensors MUST be maintained clean. If allowed to foul and malfunction the RAD pressure vessel will fill with water and bubbles will NOT be created. They are easy to remove and clean while the RAD is operating by closing the isolation valves and venting pressure with the sight tube drain valve.

The supply air pressure regulator must be maintained at minimum 10 psi above the RAD pressure. If the RAD flow rate valves are adjusted the supply air pressure must be checked to ensure it's pressure is greater than the RAD pressure or air pressure will not overcome pump pressure.

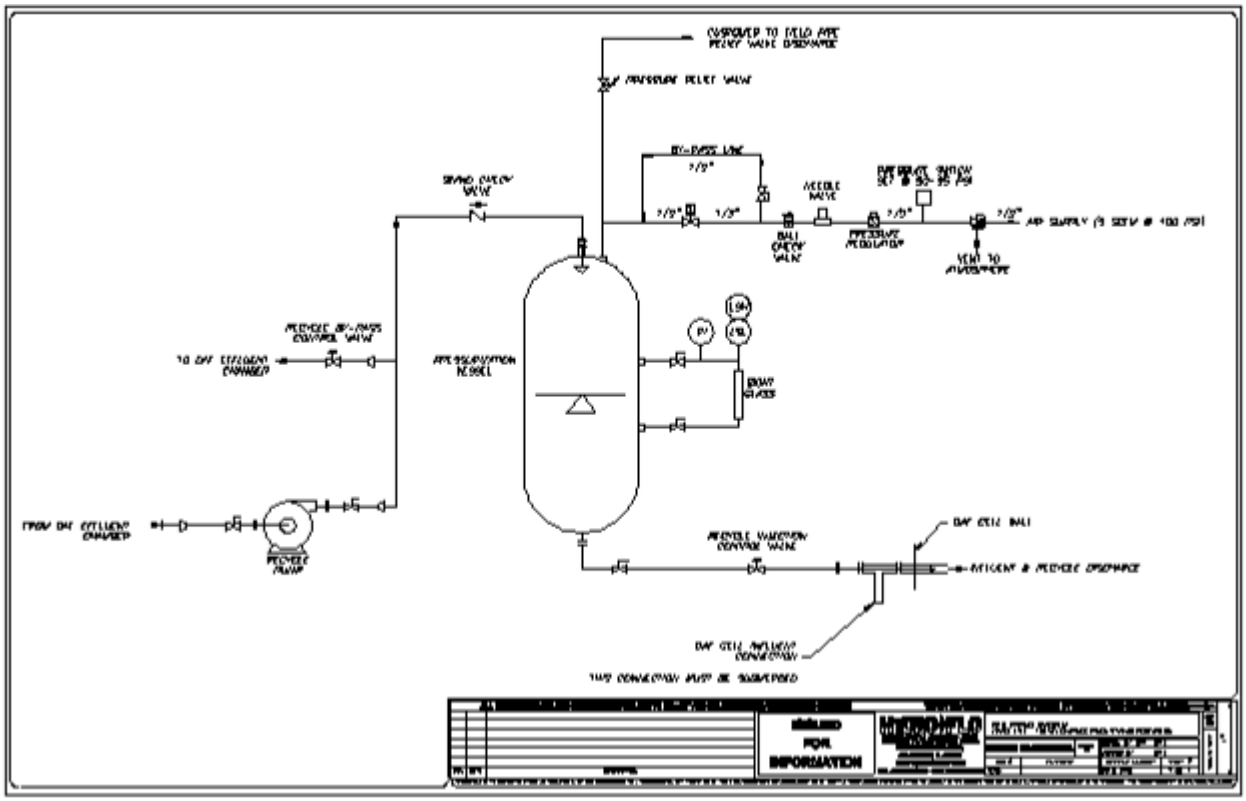
Air supply piping also has an air regulating valve (needle valve) that is used to regulate the volume or "speed" at which the air enters the RAD system. Typical setting is combination yellow/green bands. This low setting will slowly admit air to the RAD vessel to prevent pushing the RAD level downward too fast.

The RAD system flow rate is controlled by the RAD flow rate control valve and the flow rate by pass valve.

The RAD flow rate control valve is used to control bubble quantity and RAD flow rate into the DAF. The RAD by-pass valve is used to adjust pressure independently of the RAD flow rate. This way, RAD flow rate can be adjusted to achieve the bubble quantity desired and the by-pass valve is used to adjust pressure which affects bubble size. Generally speaking, lower pressure ~30 psu produces larger bubbles

and higher pressure ~80 psi produces smaller bubbles. The RAD system is typically set at 60 psi if started up by Hydro-Flo Technologies technicians. This is a good starting point.

Remember to adjust air supply regulator to 10 psi above RAD pressure if the flow rate is adjusted.



It is recommended that the RAD pump be allowed to operate continuously in order to maintain the float blanket in the DAF. If the RAD system is shut down the float blanket will degrade and floated material may sink and be flushed out with the effluent during the next startup.

1.7.4. TROUBLESHOOTING:

If the RAD system will not maintain pressure

1. Check for accumulated grease, solids buildup in the control valves or RAD pump.
2. Check for RAD pump wear.

If the RAD system will not maintain air/water interface

1. Check for RAD Dual Level Sensor proper operation. Clean and repair as necessary

2. Check for RAD air solenoid proper operation.
3. Check for available air pressure.
4. Check the air regulator valve for proper operation. Open fully to blow out debris.

 If the RAD system will not create bubbles.

1. Check the RAD water/air interface level in the RAD clear sight tube. If the tube is full of water the dual level sensors may have mal-functioned. Clean and repair as necessary.
2. Check air supply and air supply solenoid.

1.7.5. FLOAT & SLUDGE MANAGEMENT

Sludge removal is very important for the proper operation of your DAF. Draw off the settled sludge regularly. Do not allow it to accumulate excessively or operational malfunctions can result.

The sludge, or "float" that is skimmed into the float chamber should be transferred to a bulk storage tank as it accumulates. This can be performed as a manual operation (opening a valve or turning on a pump) or can be performed automatically via automatic level control systems.

If left unmonitored, sludge may accumulate to an excessive level. If the heavy sludge (that accumulates in the bottom of the DAF) level rises to a point where it will migrate into the separation chamber, suspended solids may be “washed” out of the clarifier.

Any settled sludge should be drawn off according to the accumulation rate (this sludge can be transferred to the same storage tank used for the DAF float, or another tank depending on your overall process requirements). The amount and consistency of sludge varies from application to application. We recommend settled sludge be drawn off constantly at a rate of approximately 10% of the DAF flow rate. Monitor the sludge sample ports and adjust your sludge draw off rate to match the accumulation rate. In a perfect world, the sludge draw off rate will match the sludge accumulation rate and the volume of accumulated sludge in the sludge hopper will always be at the 75% full level. This will allow for maximum compaction of the accumulated sludge resulting in the highest solids concentrations possible.

While, in some cases, the DAF can also be used as a sludge storage device (prior to disposal or dewatering), more often than not a sludge storage, thickener tank will be required. The use of an ancillary system for the storage and conditioning of the accumulated sludge will typically generate better results than the use of a DAF alone.

If your system was supplied with a bottom sludge auger/thickener it should be allowed to operate continuously as it will assist in pre-conditioning or "thickening" the sludge as well as preventing "rat-holing" in the sludge chamber.

Please consult your local city and state regulatory agency regarding specific requirements on the proper disposal of the sludge generated in your process. If you need help with the disposal or treatment of the collected sludge, please contact your local HydroFlo Tech representative.

On DAF systems that come equipped with parallel plates, consideration should be given to the maintenance of the plates. Over time, if left to their own accord, solids will slowly bond to the plates and reduce the overall efficiency of the DAF. It is a good idea, as a minimum to flush the accumulated solids from the plate during the clarifiers annual internal inspection.

1.8. INITIAL SYSTEM START-UP – DAF ONLY

Once the steps for system equalization are completed, the system is ready for initial start up. In order to complete initial system start-up, follow these steps:

1. At this point verify that both the recycle bypass and recycle injection diaphragm valves are still closed.
2. Verify that the pressure and level in the pressurization vessel are adequate. The pressure should be approximately 60 psi and the level should be such that the High Level Sensor is activated.
3. Verify that all control panel selector switches are in the proper position for automatic operation.
4. Turn the recycle pump ON.
5. Slowly OPEN the recycle injection diaphragm valve until the level begins to slowly drop. Once the level begins to drop, adjust the valve so that the level in the pressurization tank stagnates. By matching the pressure in the RAD vessel to the curve for the recycle pump, you will know your recycle flow rate. When the water level in the RAD vessel stagnates, you have matched the designated flow on the pump curve. Note: Friction loss due to excessive pipe run and fittings may reduce the actual flow rate into the DAF unit.
6. Wait for the level in the sight glass to drop below the Low Level Sensor (LSL). If the level is dropping too quickly, the needle valve on the air supply can be adjusted to limit the volume of air that is being introduced into the RAD Tube. Once this happens, the solenoid should close and the water level will slowly rise and the process will be repeated. If the level does not begin to rise, slowly open the recycle injection diaphragm valve.
7. The recycle by-pass valve can be used to adjust the actual flow that is delivered to the influent of the DAF. Having the recycle valve closed will send 100% if the flow to the influent of the DAF.

This should conclude the initial start up of the RAD System. Fine-tuning will be needed in order to find the correct positioning of the recycle injection diaphragm valve and the needle valve.

1.9. SYSTEM SHUT-DOWN

It is recommended that the RAD system be operated continuously in order to maintain the floating blanket in the DAF separation chamber. When necessary, in order to properly shut the system down, follow these steps:

1. CLOSE the RAD Effluent Ball Valve.
2. IMMEDIATELY shut down the Recycle Pump.

1.10. SUBSEQUENT SYSTEM START-UP (RE-START)

In order to properly re-start the system after a shutdown, follow these steps:

1. Turn the Recycle Pump ON.
2. OPEN the RAD Effluent Ball Valve.

This should conclude the necessary steps for a re-start as the needle valves and the recycle injection diaphragm valve have already been set to the proper position in the initial system start-up steps.

1.11. SYSTEM START-UP – DAF WITH FLASH/FLOC

DAF System Startup and Shutdown Procedures
And Checklist
Initial Startup or Extended Shutdown – Startup from a dead stop

STARTUP

1. From a power down state, turn ALL control panel switches to the OFF position.
2. Open the control panel and ensure ALL circuit breakers are in the OFF position.
3. Power up the panel main voltage with the door open. CAUTION – live high voltage is exposed. Use extreme care.
4. One at a time, turn on the 3 phase circuit breakers on the top row. Then, one at a time, turn on all other circuit breakers.
5. Secure power and close control panel door.
6. Power up again.
7. Fill the DAF with clean water (if not already full of process water).
8. Check the RAD system valves and sight glass to be sure all connections and valves are in the full open position.
9. Ensure there is air pressure to the RAD system. Set the RAD air pressure regulator to 80 psi (may be adjusted later).
10. Open the RAD flow rate control valve completely (the one nearest the DAF inlet).
11. Open the RAD by-pass valve completely (the one leading back to the DAF effluent end).
12. Turn on the RAD pump and observe the water level in the RAD sight gauge.

Once water shows in the RAD tube adjust the combination of RAD flow rate valve and by-pass valve to achieve 50 psi pump pressure (as read on the gauge on the top of the RAD sight tube). Typical setting for RAD valves is flow rate valve open ~20% and RAD by-pass valve closed.

Observe that the water level in the RAD sight tube, it should stabilize and hunt slowly to about an inch above/below the two sensors (a 6-8 inch range). The logic is that when both sensors are wet, air pressure is

applied to the RAD vessel by energizing the solenoid causing the level to drop. When both sensors are dry, the air pressure is turned off to the RAD vessel and the water level slowly rises. If the water level drops too quickly then regulate air volume with the air regulator needle valve found on the air piping. Typical setting for that valve is the second color band from shut. If the water level does not rise then check pump pressure. Typical setting is air pressure at 10-15 psi above pump pressure.

1. Observe in the DAF chamber and ensure that bubbles are forming in an effervescent way.
2. Fill the flash/floc mix tanks with water (if not already full with process water) and start all mixers.
3. Turn on chemical dosing pumps on HAND one at a time and verify pumps are primed and pumping properly. Note: Depending on the model chemical dosing pump, you may have to place each pump in "internal" mode to operate in HAND. This is done on the pump.
4. If the system has a polymer day mix tank inspect the tank contents and replenish as necessary. If the batch is older than two weeks it may need to be discarded and replaced. If the polymer is anything other than a homogenized mix, it is stale.
5. Place chemical dosing pumps in AUTO mode on the main control panel. Be sure to return them to "external" mode when priming is complete.
6. Verify the pH control system is working properly – clean and calibrate the pH probe as needed. Verify the chemical dosing pumps are adjusting pH as indicated by the pH set point. pH is typically adjusted only in the first mix tank. Allow the pH to reach the proper level of _____ (8.5 pH typically).

Prepare to manually dose each mix tank (flash/floc tanks) with chemical. This is needed to get the chemical at the proper dosage to permit flow thru the system. Obtain the dose rate from the project chemist or chemical supplier. The flash tank typically takes coagulant to around 75 ppm. The floc mix tank typically takes flocculent to 10 ppm.
Once the dose rate is known and the manual dose quantity is determined, dose BOTH the flash mix and floc mix tanks with coagulant. Then dose the floc mix tank with flocculent. Obtain visual confirmation that floc is formed.
Flash #1 mix tank coagulant needed to manually dose the tank_____ounces
Flash #2 mix tank coagulant needed to manually dose the tank_____ounces
Floc mix tank coagulant needed to manually dose the tank_____ounces
Floc mix tank flocculent needed to manually dose the tank_____ounces

1. Observe the floc mix tank. If well formed floc is observed, then start wastewater flow to the system. If not, determine the cause and correct before starting wastewater flow.
2. Set the DAF skimmer timer to accumulate 1-3 inchs of float material. Typical setting 30 seconds on and 15 minutes off.
3. SHUTDOWN – DEAD STOP – Power Down: Note, if shutdown period is short term (a few days or less), simply stop wastewater flow and leave all appropriate switches in ON or AUTO. The system is in standby. Wastewater flow will automatically start/stop the chemical dosing pumps with wastewater flow.
4. Stop wastewater flow.

5. Blowdown bottom sludge if any. Typically run the sludge pump at 5 – 10 gpm by hand for 2-3 min or until the water runs clear.
6. Operate the DAF skimmer continuously for several minutes to remove all float material from the DAF. Pump out the float scum chamber and rinse with water to prevent crusting of material.
7. Clean and flush the flocculent dosing pump and day mix tank (if equipped). This polymer will gel and prevent the pump from operating. If polymer is expected to remain in the tank for > 2 weeks, the tank must be drained and cleaned to prevent gelling.
8. Clean and flush the other chemical dosing pumps if the chemicals are the type to gel or crust during shutdown.
9. Turn all control panel switches to OFF and turn off main power.
10. Secure air supply to the RAD. Drain the RAD vessel water and pressure carefully by using the sight tube drain valve. Remove the level sensors from the top of the sight tube and carefully clean the level sensors.

1.12. FLIGHT SKIMMER

IMPORTANT:
Before startup, and periodically you will need to apply liberal amounts of wheel bearing grease to the surface flight chain and sprocket assembly. The unit is shipped without grease to prevent accumulation of road grit during shipping. Use heavy duty workman gloves with plastic coating to apply grease to entire length of BOTH chains.

The flight skimmer, operated by a gear-reduced motor and provided with a timer function as standard, is used to remove the float material from the surface of the separation chamber and into the float chamber.

The flight skimmer will arrive accurately adjusted for proper operation. This will include the proper alignment of the drive and non-drive shafts, sprockets, chain guide, flight bumpers and chain tension. Any attempt to alter these settings may require extensive adjustments to ensure proper re-alignment.

Should you have any problem with the flight skimmer assembly, please contact HydroFlo Tech, Inc. prior to making any adjustments.

In most applications, the flight skimmer will NOT need to be run continuously. In fact, running the flight skimmer continuously can, in some cases, reduce the efficiency of the system. In order to accommodate this, the unit is provided with a timer function, typically located on the door of the control panel, that is activated when the flight skimmer is placed in the AUTO mode and. The timer will allow the operator to set the ON and OFF Time for the flight skimmer throughout a wide range of settings (seconds, minutes, hours).

As a rule of thumb, the flight skimmer can be run for 3 minutes for every half hour of processing (3 minutes ON, 27 minutes OFF) to provide for adequate float collection and removal. If you find that you have an unusually large blanket of floating material when the flight skimmer begins operation after the OFF time sequence, adjust the timer so the difference between the On and OFF times are reduced (30 minutes ON and 30 minutes OFF). Conversely, if you find that there is very little floating material when the flight skimmer begins operation after the OFF time sequence, adjust the timer so the difference between the On and OFF times are increased (3 minutes ON and 45 minutes OFF).

2.1. EFFLUENT WEIR ADJUSTMENT

The DAF is supplied with an adjustable effluent weir. For most applications, the typical and maximum flow rates fall well within a common range so as to allow a single, median weir setting for all conditions.

The weir, upon initial start-up, should be set so that, at max flow, water comes to within approximately 1/2" of overflowing the float beach area.

Depending on your application, the type of "float" that accumulates on the surface of the flotation cell can be relatively thin or thick. The level of the floatation cell can be either increased or decreased (by raising or lowering the effluent weir) to allow for the most efficient skimming of either thin or thick sludge blankets.

Just remember not to set too high so as to create an overflow condition in the DAF unit scum chamber.

AND...

The weir height is not set too low so as to prohibit the flight skimmer from coming in contact with the water level in the separation chamber and properly removing the float material.

AND...

The weir is set as close to dead level to achieve completely even depth of water (during operation) over the entire weir length. This will ensure that the flow through the DAF is evenly distributed across the DAF width.

2.2. PLUMBING & CONNECTIONS

In addition to the standard plumbing data found in the general IO&M data, you will need to give consideration to the following DAF specific connections

2.2.1. CONNECT THE RECYCLE INJECTION PLUMPING

The recycle plumbing must be the same size as the injection nozzle connection size on the equipment. Do not reduce the size of the recycle piping as this might cause inappropriate velocities before it enters the unit.

It is very important to locate the pressure relief valve as close to the DAF influent "T" assembly. The farther away from the "T" the valve is located, the greater the chance that bubbles will coalesce in the plumbing between the valve and the DAF influent and cause bursts of bubbles in the separation chamber disturbing the accumulated float and also reducing the efficiency of the overall DAF system.

2.2.2. CONNECT THE RECYCLE PUMP SUCTION PLUMBING

The recycle pump suction plumping must be the same size as the DAF unit recycle effluent connection. Reducing the size of the plumbing may reduce the performance of the recycle system. Also, try to run the recycle pump suction piping as short a distance as possible, through as few changes of direction as possible.

2.2.3. CONNECT THE RECYCLE SYSTEM RE-CIRCULATION PLUMPING

In some cases, the recycle system re-circulation plumbing does not have a connection fitting on the DAF unit. For these units, the re-circulation plumbing is run over the top of the DAF unit and discharged into the effluent chamber. The re-circulation plumping must be the same size or larger than the recycle system connection.

Reducing the size of the plumbing would reduce the range of adjustment for the re-circulation valve. Also, as always, try to run the piping as short a distance as possible, through as few changes of direction as possible.

3.1. RAD Maintenance:

The RAD dual level sensors must be cleaned and maintained regularly in order to ensure their proper operation. Daily cleaning may be required if the DAF effluent is dirty and can foul the sensors. Cleaning is easy. Simply close the RAD sight tube isolation valves, open the sight tube drain valve. Remove the level sensor from the top using the “cam-lock” fitting. CAREFULLY remove the sensor. Do not bend the sensor shaft or damage the floats. Clean as necessary and replace CAREFULLY. Secure the cam-lock fitting and examine the floats to ensure they are not touching the sight tube or they may not operate. The sensor tubing can be CAREFULLY bent near the top of the sensor fitting if needed to move the floats away from the sight tube walls.

The Air supply regulator has a filter and moisture separator. The filter should be checked regularly and the moisture separator should be drained periodically as needed.

If the RAD is subjected to dirty water regularly then dirt and grease may build up in the RAD flow control and by-pass valves and in the RAD pump. If your wastewater causes this then the valves and pump may require periodic cleaning. To clean the RAD flow and by-pass valves simply open them fully with the RAD operating. This may be sufficient to blow the accumulated debris from the valve. The clean the RAD pump may require removal and disassembly.

3.2. RECOMMENDED PERIODIC MAINTENANCE TABLE

MAINTENANCE TASK	RECOMMENDED MAINTENANCE SCHEDULE
Check chemical supplies (if used) and replenish as needed.	AS REQUIRED Daily if possible.
Check for proper operation of the sludge auger/thickener (if supplied).	AS REQUIRED Daily if possible.
Check auger drive shaft seal. Tighten enough to eliminate excessive leaking (if supplied).	AS REQUIRED Weekly if possible.
Drain unit and inspect interior coatings. Touch up as necessary.	Annually
The drag skimmer sprockets and chain need to be washed inspected and re-lubricated with liberal amounts of wheel bearing grease.	Annually

3.2. SLUDGE THICKENER

If the unit comes equipped with a sludge auger/thickener device it will be powered by an electric motor connected to a gearbox for speed reduction to the auger shaft. The gearbox is maintenance free and may be mounted in any position.

The auger shaft enters the tank directly adjacent the auger drive motor. The shaft incorporates a stuffing box type seal with a compression gasket and two mounting studs with gland seal nuts.

The stuffing box seal will require tightening of the gland seal nuts to reduce leaking. When you tighten the gland seal nuts you must tighten them no more than ½ turn each and check for leaking while the shaft is turning. Never tighten more than ½ turn without checking for leaking.

When properly adjusted, the gland seal will drip approximately once every 30 seconds.

NOTE: DO NOT TIGHTEN THE SEAL TO THE POINT WHERE IT STOPS DRIPPING. Doing so will score the thickener drive shaft and cause premature shaft failure.

Over time, the stuffing box seal will reach the end of its adjustment. At this point, you will be required to install additional packing material. Typically a Teflon impregnated packing is recommended.

4.1. SKIMMER CHAIN REMOVAL AND INSTALLATION INSTRUCTIONS

USE EXTREME CAUTION WHEN PERFORMING THIS TASK

This procedure will require four mechanics to assist and ensure safety. Tools needed include: a chain breaker, hammer, pliers, tape measure, heavy duty rubber coated gloves, waterproof grease.

4.1.1. REMOVE EXISTING CHAIN:

1. Adjust skimmer chain tension bolts (2) so the sprocket(s) move toward the middle of the DAF (the shortest chain length).
2. Break chain at connector link.
3. Carefully pull both chains simultaneously over the drive or non-drive end of skimmer box as necessary removing skimmer flights (blades) one at a time as you go. Be careful not to bend or drop flights or chain into the DAF. Be careful to keep the chain riding on the chain support angles to prevent
   NOTE: You can use the skimmer drive motor to assist but use extreme caution NOT to get caught in pinch points of the chain or sprockets. The motor rotation can be reversed by changing the outside power legs. Employ a certified electrician if not comfortable or familiar with electricity or electric motors.) The chain can be pulled or installed from either drive or non-drive ends of the DAF skimmer box.
4. Once the existing chain is removed clean the flights and their pin insertion supports, the sprockets and the chain support angles.

4.1.2. INSTALL NEW CHAIN:

1. Adjust skimmer chain tension bolts (2) so the sprocket(s) move toward the middle of the DAF (the shortest chain length) if not already done so.

2. Unroll chains on the floor in the direction the chain will install into the skimmer box.
3. Locate the starting end of the chain. Measure the length of chain to the first skimmer flight pin on both chains (NOTE: must be the exact dimension on both chains, flip flop the chain if necessary).
4. Pull the starting end of the chain close to the skimmer box and grease the pins.
5. Install a flight between the two chains on the pins and place into the skimmer box on the top chain support angle. NOTE: Be careful to prevent the chain from falling off the chain support angles.
6. When you reach the end of the top chain support angle you must place the chains on the sprockets and guide the chain and skimmer flights around the sprockets and onto the lower chain support angles. (NOTE: Be careful to prevent the skimmers and chain from misaligning and falling into the DAF). Repeat procedure until all skimmer flights are installed. You can use the skimmer drive motor if necessary to assist but use extreme caution NOT to get caught in pinch points of the chain or sprockets. The motor rotation can be reversed by changing the outside power legs. Employ a certified electrician if not comfortable or familiar with electricity or electric motors.)
7. Once the chain and flights are completely installed you will need to remove chain links as needed to achieve a chain of proper length and tightness. (NOTE - IMPORTANT: Be sure to remove the same number of links from both chains to maintain even chain length). The chain should be tight enough that the middle of the chain length allows no more than 1” of deflection.
8. Grease the chains with suitable waterproof grease. HydroFlo Tech recommends using a heavy duty rubber coated cotton glove to push grease into the crevices of the chain. The grease can be applied as the chain is moving but use extreme caution NOT to get caught in pinch points of the chain or sprockets