



TECHNICAL MANUAL

for
Series
TFSR
Centrifugal Separators



Complete information for
Engineering, Installation, Operation & Maintenance
of Tower-Flo® Series TFSR Centrifugal Separators

UNITED
INDUSTRIES
INCORPORATED

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Separator Model Number: _____ Separator Serial Number: _____

Warrant only to _____,

the original retail purchaser, that the products which are manufactured by United Industries, Inc. are free from defects in material and/or workmanship for a period of twelve months from the date of documented installation or, in absence of documented installation date, 12 months from the date of factory shipment. The warranty registration card in this manual MUST be completed and returned to United Industries, Inc. in order to establish the date of installation and extend the warranty period. If, within the period provided by this warranty, any such product shall prove defective, it shall be either repaired or replaced.

For repair/replacement, the original retail purchaser shall first contact the installing dealer, as soon as possible after discovery of the defect, but in all events prior to the expiration date of the warranty. Upon notification by the dealer, United Industries, Inc., 202 East Cleveland, Sterling, Kansas 67579 will advise the purchaser of the address to which the defective item may be shipped. The serial number and the date of purchase of the item must be included. Regular UPS cost for shipping replacement part(s) to the customer will be borne by United Industries, Inc.; shipping other than regular service will be at the customer's expense. Customer is responsible for cost of shipping defective part(s) back to United Industries.

If an installing dealer was not involved, then the customer should contact United Industries, Inc.

EXCLUSIONS

1. This warranty shall not apply to any failures resulting from: negligence, abuse, misuse, misapplication, improper installation, alteration or modification, chemical corrosion, or improper maintenance.
2. Any items manufactured by other companies and used by United Industries in its products may carry warranties by the original manufacturers.
3. United Industries is not liable for incidental or consequential damages, loss of time, inconvenience, incidental expenses, labor or material charges in connection with removal or replacement of the equipment.

United Industries is not responsible for any implied warranties or representations by others, and the foregoing warranty is exclusive and in lieu of all warranties provided herein. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

IMPORTANT

Read and fully understand the WARNING labels on the equipment. DO NOT OPERATE this unit if any unsafe conditions exist.

WARNING

THIS CENTRIFUGAL SEPARATOR SYSTEM OPERATES UNDER PRESSURE. DO NOT OPEN WHILE PUMP IS RUNNING AND/OR UNTIL ALL PRESSURE IS RELEASED. SECURELY TIGHTEN SEPARATOR VESSEL OPENING(S) AND PUMP PRE-STRAINER LID ACCORDING TO MANUFACTURER'S INSTRUCTIONS. RAISE PRESSURE SLOWLY. **DO NOT EXCEED THE MAXIMUM WORKING PRESSURE OF THE SEPARATOR VESSEL.**

DANGER! EXTREME CARE MUST BE TAKEN DURING PRESSURE TESTS. FAILURE TO FOLLOW THESE INSTRUCTIONS EXPLICITLY CAN RESULT IN PERSONAL INJURY.

Continuous sidestream filtration or separation for removal of suspended solids is one, very important portion of a total water quality management program, which should also include the services of competent water treatment professionals for proper control of water hardness, pH, and biological contaminants.

EXTEND YOUR WARRANTY!

COMPLETE AND RETURN THIS WARRANTY REGISTRATION CARD WITHIN 10 DAYS OF INSTALLING YOUR CENTRIFUGAL SEPARATOR TO EXTEND YOUR WARRANTY PERIOD!

Congratulations on your selection of a TOWER-FLO® Centrifugal Separator System by United Industries, Inc.!

Your TOWER-FLO Centrifugal Separator is designed and manufactured for years of virtually maintenance-free service. As with any mechanical equipment, however, components can and do fail. If you ever have a problem, Tower-Flo is committed to supporting you and helping you get your separator back in operation as soon as possible, whether it remains under warranty or not.

Your TOWER-FLO Centrifugal Separator is covered by a limited warranty as stated on the previous page. This warranty is for 12 months from the date of documented installation or, in the absence of documented installation date, 12 months from the date of factory shipment. **In order to receive the maximum warranty benefit, you must complete and return the Warranty Registration Card below within 10 days of installation to register your warranty and ensure your warranty rights.** Failure to complete and return this Warranty Registration Card will result in your warranty being limited to 12 months from the date of factory shipment.

For Your Records

Date of Installation _____ Date Warranty Registration Card Mailed _____

Complete the card below. Cut along dotted line. Return to:

Warranty Registration
 Tower-Flo Division
 United Industries, Inc.
 P. O. Box 58
 Sterling, KS 67579

TOWER-FLO® **Manufacturer's Warranty Registration Card**

Separator Serial Number: _____

Purchased by: Company: _____

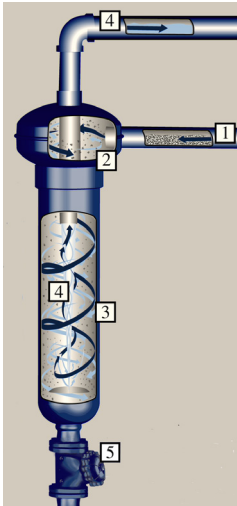
Address: _____

City: _____ State: _____ Zip: _____

Contact Person: _____ Phone: _____

Date of Installation: _____

Your Tower-Flo® Centrifugal Separator has been designed to remove separable solids 50 microns (0.00194”) or larger from circulated cooling tower / condenser water. In addition to a particle’s size, its shape and buoyancy affects whether or not it can be removed from the water. A centrifugal separator will remove small visible particles, such as dirt, but it may not remove larger, more bouyant materials like leaves or cottonwood seeds. As a general rule, if particles in a water sample sink within 30 seconds, a Tower-Flo Centrifugal Separator will remove these particles in the first pass.



CENTRIFUGAL FORCE AND GRAVITY DRIVE DIRT OUT OF RECIRCULATED WATER

1. A circulating pump drives dirty water into the separator’s tangential inlet, and the water is forced into a spinning action.
2. The spinning motion imparts centrifugal force, throwing the debris to the outside wall of the separator.
3. The friction (caused from the flow rubbing against the separator’s steel body) creates a “shear layer” of low velocity fluid, allowing the debris to fall to the bottom of the separator.
4. The clean water travels through a vortex, out through the center discharge and back to the system.
5. Debris accumulates in the bottom of the separator until either a manual valve or an automatic, time-actuated valve at the bottom of the separator opens, and the debris is flushed to the sanitary sewer.

A Tower-Flo Centrifugal Separator can only remove separable solids that are pumped to it. Repeat, any particle removal device can only remove solids that are pumped to it. In order to work the most effectively, a Tower-Flo Centrifugal Separator must be installed in a manner the promotes movement of solids to the separator for removal. See the INSTALLATION ISSUES page of this O&M Manual for a discussion of installation styles.

TOWER-FLO Centrifugal Separators are available in three basic models:

- Series TFS separator only.
- Series TFSP separator, automatic purge valve and controls, pump, motor, strainer and motor controls.
- **Series TFSR separator, pump, motor, stainer ,motor controls and continuous, zero discharge purge through a recovery bag filter, with bag monitor alarm system, returned to pump suction.**

Details of the standard, optional, and additional components for this **Series TFSR** Centrifugal Separator are found in **Project Specifications** document found on the following pages 6 and 7.

150 PSI MAX • 120°F MAX • SEPARABLE SOLIDS TO 50 MICRONS

Model Number	Flow Rate @ 75'TDh	Pump HP	Connection	
			Inlet	Outlet
TFSR-0065	65	3	2" fpt	1.5" mpt
TFSR-0080	80	3	2.5" flng	2" mpt
TFSR-0100	100	5	3" flng	2.5" mpt
TFSR-0200	200	7.5	4" flng	3" flng
TFSR-0350	350	10	6" flng	4" flng
TFSR-0450	450	15	6" flng	5" flng
TFSR-0800	800	25	8" flng	6" flng
TFSR-1200	1200	30	10" flng	8" flng

TOWER-FLO® Centrifugal Separators are available in three models and shall consist of the following major components:

- Model TFS - separator only
 - Model TFSP - separator, automatic purge controls, pump, motor and motor controls
 - Model TFSR - separator, pump, motor, motor controls and continuous, zero discharge purge to a recovery bag filter.
- Each centrifugal separator shall be shipped as a complete factory assembled and tested unit.

Project: _____ Date: _____

The TOWER-FLO Centrifugal Separator being specified for this project is a Model **TFSR-**_____ with a flow rate of _____ GPM. _____ unit(s) are specified and each unit shall be equipped with the following components:

COMPONENT SPECIFICATION

SEPARATOR _____ **Standard:** _____", _____ inlet and outlet connections, Sch 40 steel construction; exterior primer after wire brush cleaning; exterior finish coating of industrial grade enamel; 150 PSI maximum operating pressure; 120°F maximum operating temperature, _____ clean out port; inlet/outlet pressure gauges; _____" plugged port for air bleed (valve not included); and _____" fpt purge connection.

- _____ **Option:** stainless steel construction.
- _____ **Option:** ASME Code Stamped for MAWP of _____ PSIG @ _____°F.
- _____ **Option:** Maximum operating pressure of _____ PSI.
- _____ **Option:** Maximum operating temperature of _____°F.
- _____ **Option:** 22-1/2° mounting stand.

BASE _____ **Standard:** Skid base fabricated of structural steel channel and/or tube, primed and coated (same as separator coatings).

- _____ **Option:** 2" drip pan fabricated of structural steel angle and plate, primed and coated (same as separator coatings).
- _____ **Option:** skid or drip pan base of stainless steel construction.

PUMP _____ **Standard:** Non self-priming; standard fitted, horizontal flooded suction, close coupled to a TEFC motor; and capable of _____ GPM at _____ feet TDH.

- _____ **Option:** Self-priming; close-coupled to motor; specified as follows: _____ and capable of _____ GPM at _____ feet TDH.

MOTOR _____ **Standard:** Three phase; 60 Hz; TEFC; class 30 cast iron case; NEMA jm frame; rated at a service factor of 1.15 at 40°C over ambient; _____ HP; UL and CSA listed; at the following VAC, phase and Hz: _____.

- _____ **Option:** 575V.
- _____ **Option:** _____ High efficiency _____%; _____ Premium efficiency _____%

STRAINER _____ **Standard:** _____", cast iron body; stainless steel basket; bolted cast iron cover with gasket; with necessary eccentric reducer for pump connection; and gaskets, bolts and nuts necessary for complete factory assembly.

COMPONENT SPECIFICATION

CONTROLS ___ **Standard:** UL® Listed control panel with: NEMA 4X enclosure, IEC motor starter with running light and overload protection; transformer to convert primary supply to 120 VAC control power; fused branch and control circuit protection; through-the-door power disconnect; pump HOA switch with contacts for remote pump on/off from building management system. Purge Recovery adds bag monitor alarm to alert operator and building management system when Purge Recovery filter bag needs changing; including: local "Replace Filter" alarm light and alarm horn with silence button and contacts for remote indication.

 ___ **Option:** CUL® Listed control panel.

 ___ **Option:** CSA® Listed control panel.

PURGE RECOVERY VESSEL ___ **Standard:** Stainless steel bag filter vessel with _____" fpt inlet and outlet connections; 3/4" fpt drain; stainless steel basket; Buna gasket; T-bolt lid; and one standard #2, 25 micron polyester filter bag; factory installed purge-outlet-to-bag-filter-inlet piping, bag-filter-outlet-to-pump-suction piping, with two, 1"; 2-way, brass ball valves with stainless steel balls for service isolation.

 ___ **Option:** Quantity of _____ additional filter bags, _____ micron rated.

 ___ **Option:** ASME Code Stamped for MAWP of _____ PSIG @ _____°F.

OTHER OPTIONAL COMPONENTS:

ISOLATION VALVE ___ **Option:** Inlet _____.

 ___ **Option:** Outlet _____.

PURGE VALVE ___ **Option:** _____" Automatic purge valve assembly factory plumbed and wired to control panel. Includes: a 2-way brass ball valve with 24 VAC fail-safe actuator that closes in the event of power failure; a 2-way manual brass ball valve for isolation; clear PVC pipe for viewing purge liquid clarity; all fittings for complete installation to separator purge connection; add purge control timer in control panel.

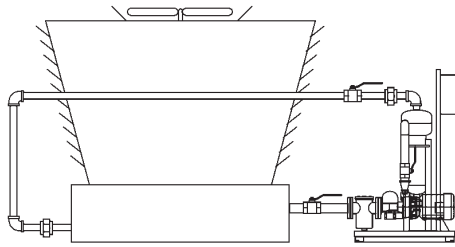
EFFLUENT POLISHING FILTER ___ **Option:** Cartridge filter factory plumbed from separator outlet to pump suction; stainless steel cartridge filter vessel, Buna gasket, positive lock cover clamp, with _____" fpt inlet and outlet connections, quantity of _____, _____ micron rated cartridge with Buna gaskets, spiral wound, 100 PSI MAWP and 300° F MAWT.

 ___ **Option:** Quantity of _____ additional cartridges, _____ micron rated.

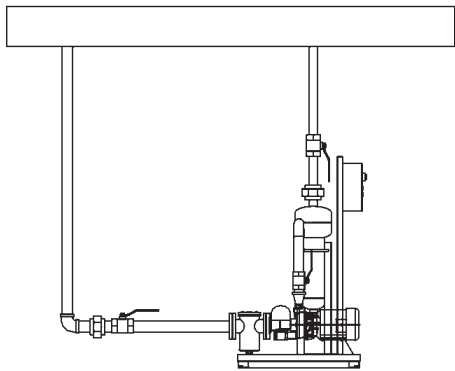
 ___ **Option:** ASME Code Stamped for MAWP of _____ PSIG @ _____°F.



REPLACE THIS PAGE IN O&M PDF WITH DRAWING OF SPECIFIC UNIT SIZE



INDEPENDENT SIDESTREAM



SLIPSTREAM

Tower-Flo® generally recommends *independent sidestream installation* of its centrifugal separator systems and its standard systems are designed and built for *independent sidestream application*. *Sidestream* installation means a system which draws water from and returns it to a static pressure reservoir of water in the cooling loop, completely independent of the cooling water recirculation system. Usually, that reservoir of water is the basin of the cooling tower or sometimes it may be a chilled water storage reservoir in the cooling loop.

However, there are occasions where a design has called for *slipstream* installation. *Slipstream* installation means a system which is installed on the pressurized recirculation piping system, "slipping" a portion of the chilled water recirculation flow through the separator. Depending on the points of connection to the recirculation piping, the *slipstream* may be either under the influence of the discharge side or the suction side of the recirculation pump.

If the separator system you are about to install is to be installed in any other fashion than sidestream, please be sure that necessary consideration has been given to operating pressure of the filter system and flow promotion issues. If you, as the installer, have any questions, contact your local Tower-Flo Representative or contact the Tower-Flo Water Filter Systems Division of United Industries, Inc.

BASIN SWEEPER PIPING

In an independent sidestream installation, a basin sweeper piping system can be used to distribute the return flow of clean water from the separator system to help sweep solids towards the separator's suction header or connection point. However, it is very important to have a reasonable expectation of such a basin sweeper piping system. It must be understood that the primary purpose of the separator system is the continuous removal of suspended solids from the water being recirculated through the cooling loop. The basin sweeper piping system provides a secondary benefit by promoting the movement solids across the basin floor toward the separator's suction point for removal.

While such a system can reduce the time and effort required for regular basin clean-out, even the best designed sweeper piping system cannot keep a cooling tower basin perfectly clean nor sweep effectively around all appertinances. If you plan to use a basin sweeper piping system, please review the information on the next page to determine the proper number of nozzles or perforations to be used with your basin sweeper piping system.

IF YOU, AS THE INSTALLER OR OWNER OR OPERATOR, HAVE ANY QUESTIONS ABOUT ANY ASPECT OF YOUR INSTALLATION AND/OR OPERATION OF THIS TOWER-FLO FILTER SYSTEM, CONTACT YOUR LOCAL TOWER-FLO REPRESENTATIVE OR CONTACT THE TOWER-FLO WATER FILTER SYSTEMS DIVISION OF UNITED INDUSTRIES, INC., BEFORE START-UP OF THIS FILTER SYSTEM.

DISCHARGE OPENINGS: The sizing of holes in a basin sweeper piping system evolves from the decision of the *type* of DISCHARGE openings to be used; either simple holes, sweeper-educator nozzles, or a combination of those two types. Different criteria must be used to determine the number of discharge holes and/or nozzles to be used for a given application, as follows:

HOLES ONLY: The total open area of discharge line openings should be equal to or slightly greater than the total open area of the discharge pipe size. Use the table or the formula below to determine the size and number of holes to be used.

NOZZLES ONLY: The total number of nozzles will be the flow rate of the filter or separator system divided by 5 gpm per nozzle.

COMBINATION OF NOZZLES & HOLES:

- 1) start with the filter or separator flow rate.
- 2) determine the preliminary number of nozzles you want to use.
- 3) multiply that number of nozzles by 5 gpm per nozzle.
- 4) subtract the outcome of 3) from the total flow rate of the filter system (this is the portion of the filter flow rate consumed by nozzles; this number cannot exceed the filter's flow rate; if it does, return to the nozzle only instructions).
- 5) divide the remaining flow rate by 3 gpm to determine the number of **1/4"** holes to be used in conjunction with the nozzles.

SUCTION OPENINGS: Irrespective of the *type* of discharge openings selected, the number and size of suction openings will **always** be determined by the following: the total open area of suction line openings should be equal to or slightly greater than 125% of the total open area of the suction pipe size.

TO CALCULATE NUMBER AND SIZE OF DISCHARGE AND SUCTION OPENINGS

- Steps:
- 1 Calculate open area of selected discharge pipe size based on its inside diameter (πr^2);
 - 2 Calculate open area of selected discharge hole size (πr^2);
 - 3 Divide result of Step 1 by result of Step 2 to find number of holes in discharge piping (round up);
 - 4 Multiply result of Step 3 by 1.25 to find number of suction holes (round up).

The calculated number of discharge openings should be spaced evenly around the discharge pipe run or across pipe runs designed to influence specific areas. Suction holes should be spaced evenly around the suction header in the water basin or reservoir. Common sense should always govern the selection of hole sizes, the resulting number of holes, and the placement of those openings; keep the number of holes to be drilled to a practical, manageable number for the run of pipe.

The tables below will help you select the size and number of holes for most Tower-Flo Filter or Separator installations. The Inside Diameter Table provides the information necessary for you to calculate hole sizes and number for other installations.

Inside Diameter of Common Pipe Sizes							
	1.5"	2.0"	2.5"	3.0"	4.0"	6.0"	8.0"
Sch 40	1.610	2.067	2.469	3.068	4.026	6.065	7.981
Sch 80	1.500	1.939	2.323	2.900	3.826	5.761	7.625

Suggested Number of Pipe Holes												
PIPE SIZE	SCH 40						SCH 80					
	# 1/4" holes		#3/8" holes		# 1/2" holes		# 1/4" holes		#3/8" holes		# 1/2" holes	
	DIS	SUC	DIS	SUC	DIS	SUC	DIS	SUC	DIS	SUC	DIS	SUC
1.5"	50	63	19	24	11	14	36	45	16	20	9	12
2"	68	85	31	39	18	23	61	77	27	34	16	20
2.5"	98	123	44	55	25	32	87	109	39	49	22	28
3"	•	•	67	84	38	48	•	•	60	75	34	43
4"	•	•	116	145	65	85	•	•	104	130	59	74
6"	•	•	•	•	148	185	•	•	•	•	133	167
8"	•	•	•	•	255	319	•	•	•	•	233	292

The Tower-Flo® Series TFSP Centrifugal Separator system includes a pumping system designed for year-round pumping of water. As with any equipment, proper installation and maintenance will improve performance and life expectancy. The following suggestions are designed to assist you in installing and operating your Tower-Flo Series TFSP Centrifugal Separator system, however, it does not exclude other methods or procedures proven by your own experience.

STEP 1. UNPACK AND INSPECT THE SEPARATOR SYSTEM

Inspect for signs of physical damage BEFORE accepting and signing the Bill of Lading. Contact the trucking company's claims department immediately if any damage is apparent. Do not operate equipment if there is any damage. Consult Tower-Flo .

STEP 2. RIGGING

Check weight of the unit and survey handling facilities to assure safe lifting. These units, particularly larger sizes, are bulky and require skilled handling. Caution must be taken not to damage the equipment.

STEP 3. LOCATION

Select a location that allows for convenience, accessibility and serviceability and as closely as possible to the tower basin, cold water storage tank, or condenser water piping connection point for best performance. If the separator is to operate year-round, exposure to winter conditions should be a considered in your location decision. Protect from freezing!

Place the TOWER-FLO TFSP system on a firm level surface. Anchor the system using the mounting clips on the system base and as required by any applicable local code. Leveling bolts are supplied to allow you to square up and level the steel base.

STEP 4. PLUMBING

Avoid all unnecessary piping obstructions. Unless an optional self-priming pump has been specified and supplied, the pump suction centerline must be below the top of your source's liquid level. The greater the height of the fluid above the pump, the better the suction condition.

Tower-Flo Series TFSP Centrifugal Separator system WILL PERFORM AS SPECIFIED ONLY IF THE FULL RECOMMENDED PIPE SIZE IS USED FOR PIPING. USE OF SMALLER THAN THE RECOMMENDED PIPE SIZE OR THE ADDITION OF UNNECESSARY RESTRICTIONS IN THE PIPING MAY RESULT IN HIGH PRESSURE LOSS, EXCESSIVE FOULING, AND POSSIBLE CAVITATION OF THE PUMP.

- A) Connect piping from water source to strainer inlet*. Strainer is generally one pipe size larger than discharge pipe.
- B) Install return piping from separator's outlet on the top of the separator back to water source*. If installed on a slipstream from condensor pipe, install return at least 10 pipe diameters downstream from the suction connection.
- C) Install waste piping from the motorized purge valve to drain. Make certain the disposal drain will handle the separator's stated purge flow rate and duration.

* NOTE: Tower-Flo recommends the installation of unions (for threaded steel pipe or solvent welded PVC connections) and valves (if not supplied by Tower-Flo) in these two plumbing connections for ease of isolation, service, or

removal should it become necessary for any reason.

- D) To permit drainage of filter system for service or winterization, add drain valve at the lowest point in side stream piping.
- E) After piping is complete, all joints should be leak tested.
- F) A pressure gage to display pump pressure is normally supplied. If not, we highly suggest you add one just after the pump's discharge.

STEP 5. ELECTRICAL

All TOWER-FLO® Series TFSR centrifugal separator systems are pre-wired at the factory and require only field connection of primary power supply.

- A) Check that line voltage to be applied corresponds to the nameplate on the control panel. In addition, the acceptable line voltage variations are + 5%, - 10%. Variations greater than + 5% will shorten motor life considerably; low line voltages will decrease motor's HP.
- B) Select power supply wire size and conduit according nameplate data on the pump motor and following all applicable federal, state, and local codes.

START UP PROCEDURE

- A) Close any drain and vent valves.
- B) Open all SUCTION isolation valve(s). Keep the discharge valve(s) closed.
- C) Prime the pump. Confirm there is fluid in the pump. NOTE: For self-priming pumps, you may need to manually add fluid to the pump casing and/or strainer. NOTE: DO NOT RUN PUMP DRY! Most Tower-Flo® pumps have a mechanical seal and the seal will be damaged if run dry.
- D) Start up the system:
 - 1) Place the MANUAL-OFF-AUTO (MOA) switch in the OFF position.
 - 2) Depress and hold the Alarm Reset button as the main disconnect switch is turned on. NOTE: Anytime the panel is energized / re-energized at the disconnect switch, it will start in an alarm condition (open circuit to 1CR) and requires the alarm reset to put 1CR into a closed holding circuit. Always depress the Alarm Reset button when turning on the main disconnect switch (to spare your ears!).
- E) Using the MOA switch, bump the pump to check pump rotation. Start pump for as short as time as possible. Check rotation. The correct rotation is determined by an arrow cast into the pump casing. For Tower-Flo standard pumps, rotation is counterclockwise as viewed from the suction end. Change rotation if needed by reversing any two of the three phase wires. NOTE: Using the AUTO position assumes a remote ON signal has been wired to control terminals 2 & 3; otherwise, start-up with the switch placed in the MANUAL position.
- F) Start up normally and check for leaks. When pump is running at full speed, open discharge valve slowly. Pressure should read a relatively high number against the shut discharge valve (referred to as "dead head pressure" and pressure should lower as discharge valve is opened.
- G) On larger separators, Tower-Flo supplies a vent on the upper dome of the separator. Slightly open the square head plug and let the air out of the separator.
- H) Tower-Flo recommends after a day or so of normal operation to record the normal operating pressure of the pump(s). Changes in this benchmark start-up pressure can very helpful to any future problem trouble-shooting. In general, lower than normal pressure suggests there may be a plugging on the suction side of the pump and, conversely, higher than normal pressure suggests there may be a plugging on the discharge side of the pump.

It is also recommended to record the voltage and amperage per phase. Changes in normal amperage can give a hint when motor bearings are starting to fail.

RECORD YOUR START UP CONDITIONS	
Start Up Date	_____
Discharge Pressure	_____
Voltages: L1	_____
L2	_____
L3	_____
Motor Amp Draw	_____

GENERAL OPERATING INFORMATION

Optimal separation occurs at a pressure drop between 3 to 10 PSIG. If the pressure drop is higher than 10 PSIG, the system is circulating water at a higher flow rate than specified. If the system can tolerate a reduced flow rate, a valve on the separator's discharge side can throttle the flow until the pressure drop falls within range. Remember, you should be concerned with pressure drop rather than pressure. As you throttle the flow, the pressure increases and the pressure drop decreases. If the pressure drop is below 3 PSI, it indicates that the flow is lower than expected, and the pump and piping should be analyzed to determine whether or not there is blockage on the pump's suction side. A pump motor ampere reading will also help you determine if the low flow rate is the result of pump wear. If the pump is worn, you will get a low ampere reading. (Consult your pump performance curve to see where you should be operating.).

The centrifugal separator requires particles to be at least 20% heavier than water for optimum separation. A material's buoyancy also plays an important role in the separator's ability to remove solids. Leaves, cottonwood seeds, etc. may be difficult to draw into the pump for removal.

WARNING

USE GOOD JUDGEMENT AND COMMON SENSE AT ALL TIMES!
LOCK OUT PUMP ELECTRICAL POWER BEFORE MAINTAINING!

If any maintenance is required, be sure that all pump disconnects are locked and tagged in the "Off" position. Insure the pump(s) cannot be restarted by another employee or automatic controller during servicing.

If checking on any electrical components, make sure all power is off to the unit.

If checking on any electrical components inside the control panel, recognize that primary power supply above the disconnect switch remains live unless disconnected at the supply panel.

CLEANING: Remove oil, dust, dirt, water, chemicals from exterior of motor and pump. Keep motor air inlet and outlet open. Regularly drain moisture from TEFC motors.

LUBRICATION: Pump motors with double shielded bearings require no lubrication. Inspect motor bearings yearly to determine the condition of the grease and replace the bearings if necessary. When single shielded bearings are furnished, semi-yearly inspect, clean, and re-lube. See motor manufacturer's specific instructions for lubrication advice.

GASKET REPLACEMENT: After pump removal, the pipe gasket must be replaced to ensure that the flange face will re-seal. Replacement gaskets may be obtained from any local pipe supplier, Tower-Flo®, or you may substitute materials proven by your own experience to withstand fluid attack at operating temperatures.

MECHANICAL SEAL REPLACEMENT: See pump manufacturer's manual attached for advice on replacing mechanical seal. Tower-Flo® stocks many of the seals used in the pumps we supply. When calling, refer to your equipment serial number to help us find the correct part.

procedures previously outlined.

The Centrifugal Separator does not have moving parts, and it does not require preventive maintenance. It will last many years in normal service.

The relays, diaphragm, motorized ball, or solenoid valves may eventually wear out, but they do not require preventive maintenance.

Always follow the start-up procedures found in this manual anytime you restart the system.

SEPARATOR IS NOT PURGING

1. Is electricity present? Is the "Power On" light illuminated? Is the fuse blown (not supplied by Tower-Flo®)? 120 volt is required to operate the purge valve.
2. Is the motorized ball valve timer set correctly? Check the settings. It may be set to purge as infrequently as every 30 hours.
3. Is the manual brass ball valve upstream of the purge valve closed?
4. Is the purge valve operable? Depress "Push to Test" to manually purge the system. The valve will cycle 180 degrees.
5. Is the purge piping or the valve plugged? Depress "Push to Test" to manually purge the system. You may need to clean out the piping. Shorten the timer cycle times to prevent this from happening in the future.
6. Is one of the two fuses located within the motorized ball valve enclosure blown? If the "Power On" LED light is not on, check Fuse F1. If the "Power On" LED light is on but the "Push to Test" button does not work, check Fuse F2. Disconnect power from the motorized ball valve before removing its cover.

SEPARATOR IS ALWAYS PURGING

1. Is the motorized ball valve stuck in the "ON" position? Close the manual brass ball valve to see if the purging stops.
2. Is the motorized ball valve lodged open from some debris?