

# OPERATION AND MAINTENANCE MANUAL

## PF-60 Series

### Separator



**PUROFLUX**  
CORPORATION

## PF-60 SERIES SEPARATOR

Please read this OPERATION AND MAINTENANCE MANUAL thoroughly and understand all safety related issues before attempting any work on the PF-60 series separator.

This manual covers the 61, 62, 65 and 66 separator units

### INTRODUCTION

PUROFLUX is the right choice when it comes to having a more efficient, safe, and effective system. The PF-60 series separator are designed to assist in eliminating expensive "down-time," reducing operating costs, chemical usage, wear and tear on equipment and maintenance. With over 30 years of combined filtration experience, PUROFLUX engineers can find a solution to a wide variety of filtration problems.

Following the guidelines listed in this manual will help to insure the safety of all personnel who maintain the filter unit and related equipment. If there are any questions on the procedures or performance of the PF-60 series separator contact the local factory representative or call the factory direct at (805)579-0216. **Do Not**, operate the separator until all questions about operating procedures are answered by a qualified representative. This manual covers recommended procedures for installation and anchoring, start-up and shut down, and safety and maintenance.

**NOTE:** All recommendations are minimums. The environment/operating conditions in which the separator unit is installed will dictate the frequency of scheduled maintenance. Maintaining your PF-60 series separator are will assure a long trouble free life.

**NOTE:** Puroflux reserves the right to change, modify, or revise this manual at any time without prior notification.

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# SECTION 1

## RECEIVING AND INSTALLATION

Recommended procedures for the receiving of equipment and proper installation of the PF-60 series separator.

### RECEIVING EQUIPMENT

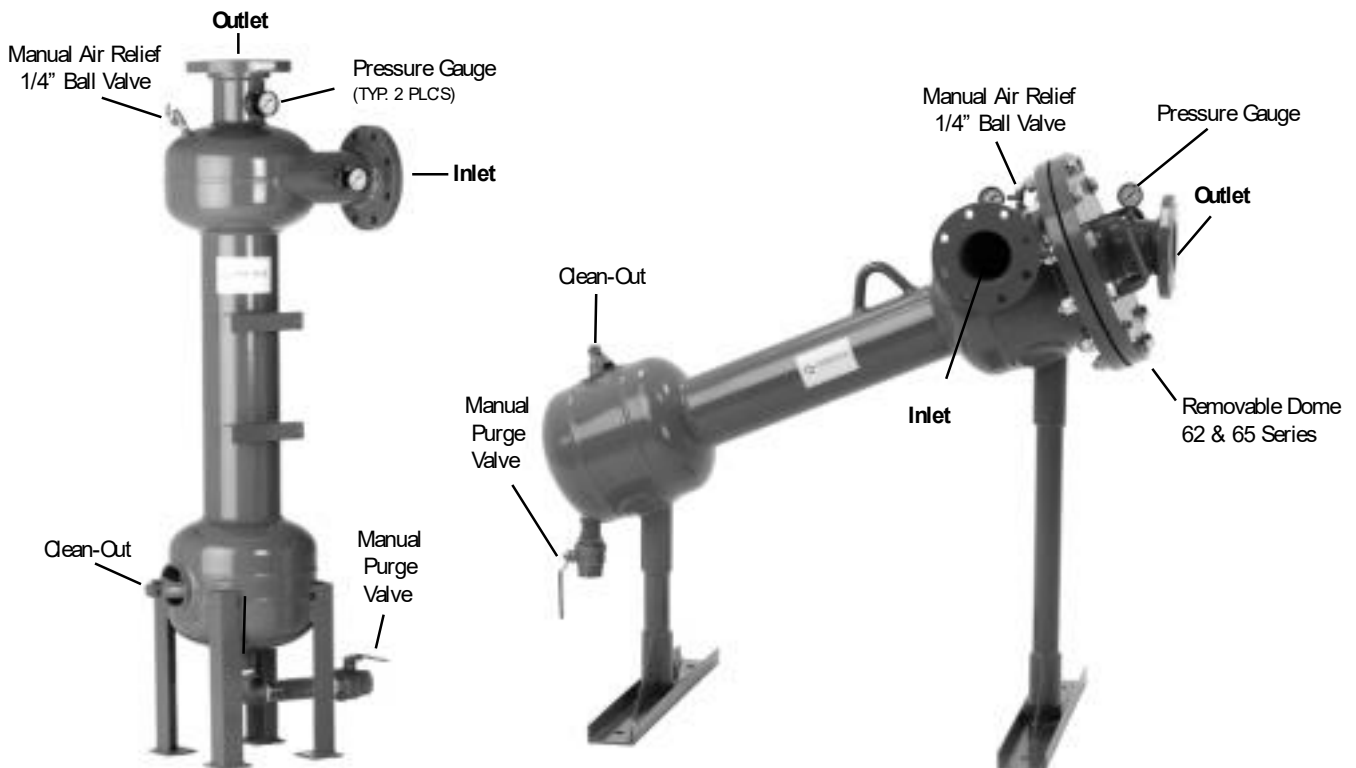
Before accepting the separator equipment and prior to signing the bill of lading, all equipment should be checked thoroughly for any shipping damage. Make sure that all required equipment noted on the bill of lading is received. See Figure #1 and Table I for components to be inspected upon receiving.

Check the model and serial number against the packing slip. Serial and model numbers can be found on a nameplate inside the control cabinet (automatic purge unit) or on the vessel (manual purge unit).

Table I – Receiving / Inspection
Separator Vessel
Gauges (Inlet/Outlet)
Purge Valve & Piping
Manual Air Vent Valve
Removable Dome Hardware (62, 65 Only)
Cleanout Gasket (4" and Larger)
Control Panel (Optional)
Purge Actuator (Optional)

### PF-60 Series Separator

Figure 1



## DESIGN CRITERIA

The PUROFLUX PF-60 series separator is designed for use in closed circuit or open process liquid applications. Standard equipment design is 150 psi @ 150 °F (higher design pressures and temperatures are available). The PF-60 series separators will remove suspended solids with a specific gravity of 1.2 or higher down to 45 micron/325 mesh.

The PF-60 series separator is constructed of a polyester coated carbon steel vessel, equipped with an industrial grade purge valve, inlet/outlet gauges and a manual air vent valve. The PF-60 series separator offer a wide variety of optional configurations depending on flow rates, pressure ratings and design conditions.

**NOTE:** Never install the PF-60 series separator in an application where the system pressure exceeds the separator design pressure of the separator or package unit.

## SUPPORT AND LIFTING

The smaller PF-60 series separator can be lifted from the body of the separator. If the unit is hoisted, lifting straps must be placed around separator body and should not come in contact with the separator components. The PF-65 & 66 series separators are supplied with lifting lugs that can be used for hoisting utilizing straps or hooks. Optional lifting lugs are available upon request for any size unit.

## INSTALLATION AND ANCHORING

The PF-60 series separator is designed for use in both full flow and slip stream use on pressurized closed systems or open atmospheric systems.

1. Determine the location and orientation of where the separator is to be installed in the piping system or open sump. A four foot clearance is recommended around the separator for service.
2. Locate the separator as close to the system piping as possible.
3. Verify that the base, wall or pad that is to support the separator will accommodate the weight of the separator under operating conditions (refer to Table II on page 18 for operating weights).
4. The PF-60 series separators should be rigidly anchored to the floor or wall (see the specification drawing for location and size of the anchor holes).
5. After the PF-60 series separator is installed in its permanent location, the inlet and outlet gauges (if not previously installed) should be installed on the separator vessel (refer to Figure 1 on page 4).
6. The inlet connection of the separator is located on the side of the vessel, the outlet at the top of the vessel and the purge connection at the bottom of the vessel. Flow to the separator must enter at the inlet connection and exit at the outlet connection.

**NOTE:** The separator will not work in reverse.

7. Before hook-up begins check the inlet, outlet and purge orifices for foreign objects, which may have entered during shipment.
8. Always use appropriate hardware to match the separator connections.

**NOTE:** Mating flange bolts, gaskets and other miscellaneous fittings are not included with the separator.

## SEPARATOR REQUIREMENTS

1. Puroflux separators are designed to operate within a specified range; 4 to 10 psi pressure drop across the separator is recommended. It may be necessary to install a flow control or throttling valve downstream of the separator in order to achieve the proper flow and pressure drop.
2. The separator should be installed to merge with the natural flow of the system, never against it. A straight run of 5 to 6 pipe diameters up and down stream of the separator is recommended to reduce turbulence.
3. The minimum inlet pressure should be at least equal to the pressure loss anticipated through the separator plus the systems down stream pressure requirements. Pipe sizes must be large enough to maintain proper flow (refer to Table II on page 18 and individual specification sheets). It is important to understand that the selection of a separator is based on the flow rate through the separator (approx. 10 ft/sec.) and not the separator pipe size (connections). Always reduce pipe sizes at the separator if necessary to maintain proper fluid velocity.

## PIPING INTERFACE CONNECTIONS

The separator piping should be installed as follows:

1. Installation of interconnecting piping
  - When mating interconnecting fittings to the separator unit make sure that separator components are securely held in place so no damage or leaks occur.
  - If welding or soldering mating flanges or fittings make sure not to overheat separator components. Overheating separator components can cause damage or leaks.
  - If welding DO NOT use the separator or its components as a ground.
2. Refer to Table II on page 20 for piping connection sizes.

**NOTE:** It is important that all piping and components associated with the separator system installation must be supported to eliminate stress on the separator and piping.

**NOTE: Do Not** reduce the pipe sizes listed, the pipe sizes are minimums. If long runs, excess fittings, or lifts are necessary, it is recommended to enlarge the pipe diameter in order to reduce friction loss. Never reduce the waste line; this can restrict the flow of the purge reducing purge efficiency.

3. Run an influent line from the pressure side of the system piping to the inlet connection labeled "INLET" (high pressure side). A service valve and flange/union should be installed in this line near the separator.

**NOTE:** The influent line should be piped from the discharge side of the process system pump.

4. Run an effluent line from the separator return labeled "OUTLET" back to the system piping (low pressure side). A service valve and flange/union should be installed in this line near the separator.

**NOTE:** The effluent line should be piped to the suction side of the process system pump. A flow control device or throttling device should be placed in the effluent line to regulate flow through the separator.

5. Run a waste line from the separator purge outlet labeled "WASTE" to the nearest sewer drain. The flow can be regulated by the purge valve. A sufficient purge line must be provided to insure proper operation. The purge line should have a slight downhill slope for drainage.

**NOTE:** A booster pump will be required if the separator is plumbed slip stream into and out of the same pressurized line, or if the differential pressure across the system pump is not high enough. The booster pump must be sized based on the separator flow, system conditions and design criteria.

**NOTE:** Always follow local, county, state or other government authorities requirements for piping hook-ups.

## RECOVERY SYSTEMS (Optional)

Separators utilizing a closed recovery system should be plumbed accordingly. The purge outlet is plumbed to the "INLET" of the recovery system. The "OUTLET" of the recovery system is plumbed back to the low pressure side of the system piping.

**NOTE:** Refer to the Recovery System Operation and Maintenance Manual for specifications, installation and safety instruction.

## ELECTRICAL CONTROLS

The standard PF-60 series separator is supplied with a manual purge valve and no electrical controls.

1. Separator units provided with automatic purge options are equipped with a NEMA Type 4X rated control cabinet containing a terminal strip, HOA switch, fuse protection and purge timer. Standard automatic purge option includes an electric valve actuator mechanically coupled to a brass ball valve. Standard voltage is 120/1Ø/60 hz. All other voltages are optional.

The PF-60 series separator can be supplied in a number of configurations and voltages. Control components will vary depending on separator configuration and options.

## WIRING REQUIREMENTS

**Manual Purge Unit:** No wiring is required.

**Automatic Purge Unit:**

1. Install circuit breaker between the closest branch distribution panel and the control panel (110v/1Ø/60hz).
2. The control box is pre-wired and includes short circuit protection. A door disconnect switch is not provided.
3. The electric purge actuator will draw approximately 1 amp.

**NOTE:** All incoming power supply lines must be connected to the door disconnect when provided.

**NOTE:** Always follow local, county, state or other government authorities requirements for electrical hook-up.



## **SECTION 2**

### **THEORY OF OPERATION**

The Puroflux PF-60 series separator utilizes high centrifugal forces to separate solids from liquids. The suspended particulate is simply dropped from the carrying fluid where it is collected for discard. The PF-60 separators do not require a backwashing and will not interrupt throughput when purging. Because no backwash is required large amounts of system fluids will not be wasted. The 60 series separator collects and concentrates particulate as it falls from the process fluid into the accumulation chamber. Because the separator and the accumulation chamber are at equal pressures, there is no need for any additional pressure to induce purging. Purging the accumulation chamber can be done quickly without excess waste of system fluid while

Influent is fed tangentially into the separator acceptance chamber. The influent is spun in a downward motion pushing the suspended particulate to the walls of the separator vessel by centrifugal forces. Suspended solids are forced downward into the collection chamber for purge. The clean liquid then reverses direction moving upward entering the vortex finder where it is then returned back to the process system.

### **OPERATION AND MAINTENANCE**

The following information pertains to the procedures, operation and general maintenance of the PF-60 series separator.

Please read this entire OPERATION and MAINTENANCE MANUAL thoroughly and understand all safety related issues before attempting any work on the PF-60 series separator.

## GENERAL MAINTENANCE PROCEDURES

Always follow the start-up and shut down procedures before and after any service or maintenance is done on the separator unit. The PF-60 series separators are designed for low maintenance and minimal service. With proper care the PF-60 series separator will provide trouble free service. The following is a list of maintenance check points and schedules for standard units and includes optional components.

**NOTE:** All recommendations are minimums. The environment/operating conditions in which the separator unit is installed will dictate the frequency of scheduled maintenance. Maintaining your PF-60 series separator will assure a long trouble free life.

1. Visually inspect separator every 48 hours (minimum) for proper operation (check for unusual noise or vibration).
2. Read pressure gauge (gauge reading should not exceed design pressure).
3. Purge separator as required (refer to Purge Cycle on page 11). Check for a build up of debris in accumulation chamber.

**Manual purge** - Open purge valve for a minimum of 5 seconds or until purge liquid becomes clear.

**Auto purge** - Run a manual purge cycle by switching the HOA switch to "HAND" position. Leave the purge valve open for a minimum of 5 seconds or until purge liquid becomes clear. Reposition the HOA switch to the "AUTO" position

4. Check condition of inspection port gaskets (4" units and larger).
5. The differential pressure of the separator should not exceed 10 psid. Throttle back the flow to decrease differential pressure.
6. The PF60 series separators are designed to operate within a specific flow range. Keeping the separator within the design flow range will produce optimal pressure drops and increase the separator efficiency. Running below the design flow rates will reduce efficiency while running above the design flow will increase wear (refer to Flow Rate vs Pressure Loss chart).

## SETTING PURGE TIMER

### Timer Settings

The Puroflux auto purge timer is equipped with control dials to program the purging cycles to match your specific needs.

**\*\* POWER SHOULD BE TURNED OFF BEFORE CHANGING SETTINGS \*\***

### Operation Mode

Middle Dial (Mode): Timer operation mode factory setting: "D".

### Cycle time

Lower dial (T1): Frequency of purging

Range (1H): 36 minutes to 30 hours

Factory setting: Every 6 hours

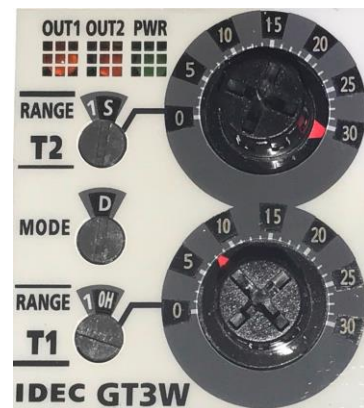
### Purging time

Upper dial (T2): Duration of purging

Range (1S): 0.6 to 30 seconds

Factory setting: 30 seconds

Once the HOA switch is placed into the "AUTO" position the timer initiates the off interval (valve closed). Upon completion of the off interval time, the relay is energized and the purge duration begins. Once the purge open duration (valve open) is completed the purge valve will close. The cycle repeats until the HOA switch is turned "OFF" or "MANUAL" position. The purge off (T1) interval can be adjusted from 36 minutes to 30 hour period. The purge duration (T2) can be adjusted from 0.6 to 30 seconds.



## PURGE CYCLE

The PF-60 series separators must be purged regularly as debris accumulates in the unit's collection chamber. If the purge chamber becomes full and is not purged the separator will no longer perform efficiently.

During start-up the amount of purged solids generated by the separator may be high. It is recommended that the separator be purged frequently (every 1 to 2 hours) until it is visually obvious that the frequency can be cut down. If the purge concentration is still high, adjust the purge frequency until 4 to 6 seconds is required to clear solids from the purge chamber. For most applications after the initial start-up the purge frequency can be reduced.

Several purge options can be utilized:

Manual purge - purge valve is opened manually every time a purge cycle is required.

Continuous purge - manual purge valve is throttled to maintain a constant purge.

Automatic purge - automatic valve is installed to purge on a preset time cycle.

For units equipped with automatic purge, the purge cycle can be initiated either manually or automatically by the purge cycle timer. The separator control cabinet is equipped with an Hand-Off-Auto (HOA) switch. The HOA switch allows for the automatic or manual purging of the separator. In the "HAND" position the purge valve will energize to an open (purge) position. In the "AUTO" position the cycle timer is energized and controls the purge time and frequency (refer to Setting Purge Timer). The "OFF" position will disable the purge function in a closed position.

## **AUTO PURGE CYCLE**

For units equipped with automatic purge, the purge cycle can be initiated either manually or by the purge cycle timer. The separator control cabinet is equipped with an Hand-Off-Auto (HOA) switch. The HOA switch allows for the automatic or manual purging of the separator. In the "HAND" position the purge valve will energize to an open (purge) position. In the "AUTO" position the cycle timer is energized and controls the purge time and frequency (refer to Setting Purge Timer). The "OFF" position will disable the purge function in a closed position.

## **MANUAL PURGE**

For units equipped with manual purge; the purge cycle can be initiated at any time during operation simply by manually opening the purge valve. The manual purge valve should be adjusted to its full open position at the start of each purge cycle. Once there is a solid continuous flow from the purge valve, the purge can be throttled if necessary. Allow the concentrated purged waste to clear before closing the purge valve. Note the frequency and length of the purge cycles so a maintenance schedule for the purge cycle can be initiated. It is imperative that the purge cycle be maintained for proper operation of the separator.

## **CONTINUOUS PURGE**

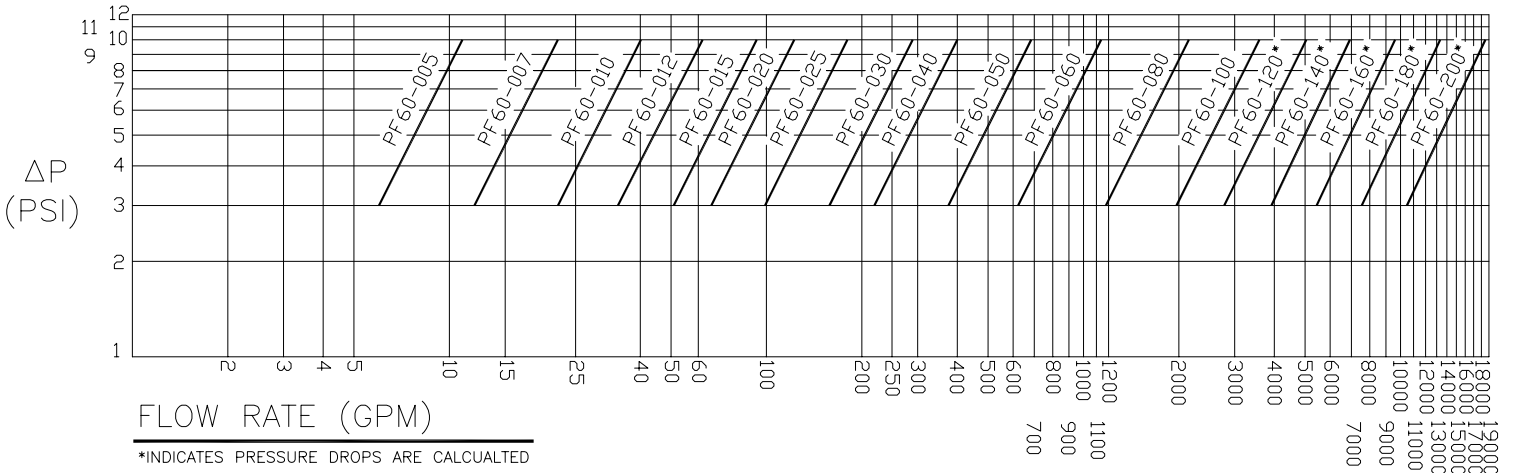
For units equipped with manual purge that will utilize a constant purge cycle, set the purge rate simply by manually throttling the purge valve to the desired flow. Make sure that the purge valve is opened enough to pass larger particulate. It may be necessary to occasionally open the valve fully to clear any larger particulate that is trapped in the purge chamber. The purge line should be checked on a regular basis to ensure there is proper flow.

### SEPARATOR VESSEL

The 60 series separators have no internal components or moving parts. The separator vessel is constructed of carbon steel with a fusion bonded polyester coating. Separators 4" and larger are equipped with a handhole located in the purge chamber for service. The 62 & 66 series separators are equipped with removable dome head for inspection and service. The 61 & 62 series separators are constructed in 90° vertical profile and the 65 & 66 are a horizontal 22-1/2° low profile.

**NOTE:** The 62 & 65 series separator will require a spool piece in the outlet line for inspection and service. Consult factory or local representative for recommended spool piece length.

**NOTE:** Always relieve internal vessel pressure before attempting any repairs or adjustments on the separator unit.



FLOW RATE (GPM)  
 \*INDICATES PRESSURE DROPS ARE CALCULATED



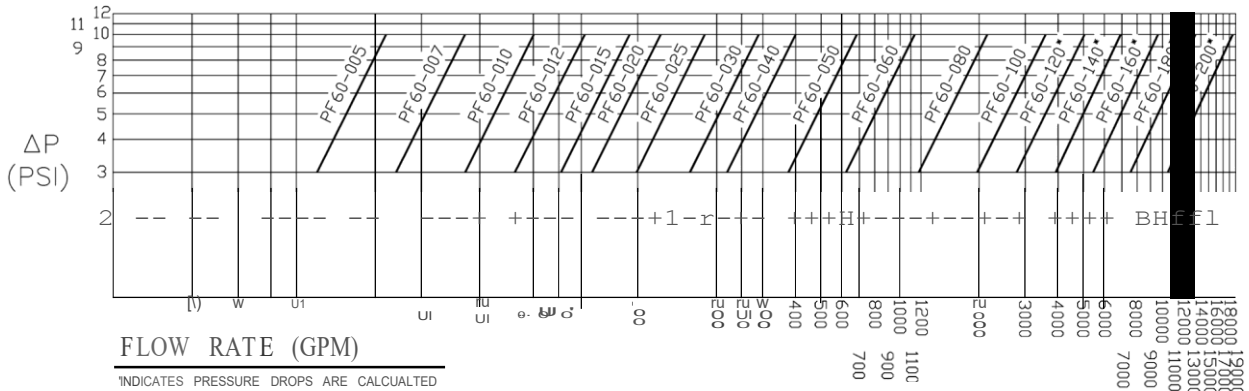
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**NOTE:** The 62 & 65 series separator will require a spool piece in the outlet line for inspection and service. Consult factory or local representative for recommended spool piece length.

**NOTE:** Always relieve internal vessel pressure before attempting any repairs or adjustments on the separator unit.

## FLOW RATE VS. PRESSURE LOSS





## SECTION 3

### START-UP PROCEDURE

Before initial start-up or after a shut-down period, the separator unit should be thoroughly inspected.

**NOTE:** Perform the first five recommendations with the electrical power off and locked out. Refer to the section under "Safety" regarding the safeguarding of maintenance personnel from biological contaminants prior to start-up.

1. For units supplied with automatic purge set the HOA switch to the "OFF" position.
2. Check the service valves in the separator inlet, outlet, and purge lines to verify they are open.
3. Open the manual air relief valve on top of the separator vessel. The separator vessel will begin to fill with water (air from the separator will be evacuated through the relief valve). Once a steady stream of water is coming out and all air has been evacuated the manual air relief valve can be closed.
4. Check the separator unit for any unusual noise or vibration. If any problems persist shut the separator unit off and close isolation valves. Contact your local PUROFLUX representative if there are any questions about the operation or performance of the separator unit.
5. Check the separator unit and all integral piping to the unit for any air or fluid leaks. All air leaks must be found and repaired. Failure to do so could result in poor performance or personal injury.
6. Purge the separator (refer to Purge Cycle on page 11). After purging the separator check the inlet and outlet pressure gauges and record the start up pressures differential. Use this as a bench mark whenever routine maintenance is preformed.
7. After several hours of run time from start up, perform steps 3 through 6 again.

**NOTE:** An excessive amount of air released from the vent valve can indicate an air leak. All leaks must be repaired before running the separator unit.

8. If a pump and pre-strainer is supplied, loosen the four hex bolts around the pump pre-strainer lid. Remove the lid, inspect gasket and lubricate if necessary. Clean debris from the pump pre-strainer basket. Prime the pump and associated piping by filling the pre-strainer housing. Replace the basket, lid and tighten bolts.
9. Turn the pump and motor shaft by hand to insure free rotation.
10. Check pump rotation by bumping the motor. Verify rotation with the arrow on the pump volute. **DO NOT** run the pump for an extended period of time in reverse direction or dry. Have a qualified electrician change leads to correct rotation.
11. Check the voltage and current of all leads on the pump motor. The correct amperage draw can be found on the motor nameplate
12. For units supplied with recovery vessel refer to the Recovery System Operation and Maintenance Manual for specifications, installation and safety instruction.

## **OPERATION IN COLD WEATHER**

When the PF-60 series separator is exposed to below-freezing temperatures, it will require protection to prevent freezing. An indoor installation in a heated room is the best way to preventing freezing of any liquid in the separator unit. If an indoor installation is not practical, sufficient insulation or supplemental heat must be supplied. Heat tape and insulation around the liquid filled separator components must be used to prevent freezing. Make sure the purge line is installed so that all purged liquid will empty from the pipe and no standing liquid is left to freeze. The separator unit should be drained when not in use for long periods of time (refer to Shutdown below).

## **SHUTDOWN**

The following service should be performed if the separator is off-line for a prolonged time period. Some items listed are optional components.

1. Run the separator unit through a complete purge cycle.
2. Close the service valves in the separator inlet and outlet lines.
3. Open the purge valve and manual air relief valve. Allow the vessel to drain fully. Once the separator is empty close the purge valve and manual air relief valve.
4. Shut off and lock out all electrical power.
5. Drain all external piping.
6. If supplied, drain all liquid from the pump and pre-strainer.

## RECOMMENDED SPARE PARTS

PUROFLUX maintains a complete stock of replacement parts. When ordering replacement or stock parts, be sure to include the unit serial and model numbers.

The following spare parts are recommended:

1. Inlet/outlet gauges.
2. Inspection port gaskets (4" units and larger).
3. Fuses (automatic units only).
4. Pump seal and gasket kit (optional).

## FLUID TREATMENT

Separation is an effective way of reducing the level of suspended solids in a system. However, it is only one portion of a complete treatment program. Dissolved solids will not be removed from the system by separation. It is important to realize that the dissolved solids will concentrate, and can cause damage to a system. Furthermore, airborne impurities and biological contaminants may be introduced into the system through the equipment being separated.

To control all potential contaminants, a chemical treatment program must be employed by a competent professional. Such treatment should be initiated before the system start-up and continued regularly thereafter.

## SAFETY

All electrical, mechanical, and rotating machinery are potential hazards. It is important to be familiar with the design, construction, and operation of all equipment before performing any work. Always use adequate safeguards (including use of protective clothing where necessary or required) whenever installing, operating, or working on the equipment.

Care should be taken when working on, near, or around this equipment. Appropriate safeguards must be established to prevent personnel and/or public from injury and to prevent damage to the equipment, affiliated system, and premises.

It is important to be thoroughly familiar with the equipment, associated system, controls, and the procedures set forth in this manual. Only qualified personnel should operate, maintain, and repair this equipment. Always follow proper procedures and use the correct tools, when handling, lifting, installing, operating, maintaining, or repairing the equipment. This will aid in the prevention of personal injury and/or property damage.

## WARRANTY

PUROFLUX will guarantee all products to be free from manufactured defects in materials and workmanship for a period of 12 months from the date of shipment. Puroflux has an extended limited warranty of 5 years on all its separator vessels. In the event of any such defect, PUROFLUX will repair or provide a replacement.

**NOTE:** Replacement part(s) may be new or remanufactured, at Puroflux's option. All warranty products, which prove to be defective will be shipped F.O.B. Puroflux's plant. Puroflux will not replace, repair, or pay for any charges without a written agreement prior to such work.

This warranty is not extended to any defects which can be attributed to having been caused by accident, alteration, abuse, misuse, consumer negligence, normal expected wear, chemical corrosion or outside influences.

To obtain any needed repair(s) or replacement of defective parts or product, a Return Goods Authorization (RGA) number must first be obtained from PUROFLUX. This will be the record for tracking all items returned to PUROFLUX. The RGA form must be returned with the defective items in order to insure proper credit.

Before the replacement part can be sent a purchase order must be issued to cover the cost of each replacement part and shipping. Upon inspection and an issue of credit of the defective items by PUROFLUX and/or PUROFLUX'S vendor(s), credit will be issued.

**NOTE:** Items deemed defective will be replaced with a new or remanufactured part (at PUROFLUX'S option). This includes both mechanical and electrical components.

**NOTE:** Shipping and handling, labor, or repair charges are not covered by PUROFLUX'S warranty policy.

**NOTE:** The return of defective items must be made within thirty (30) days of shipment or the invoice will be considered due and payable.

**NOTE:** Any damage to the separator unit during shipment must be claimed at the time of accepting the separator (note all damage to the separator unit on the bill of lading before signing). All damages received during shipping are the sole responsibility of the freight company and must be taken care of through the freight company.