Troubleshooting for:

Liquiflo
Chemical Processing Pumps

115 Hilton Street West • Easton, PA 18042 USA • (800)854-0539 • fax: (800)926-9508 • http://www.ProcessFlo.com

Appendix 7: Troubleshooting Guide

Troubleshooting Guide – Part 1

Problem	Possible Cause	Corrective Action
No discharge	Pump not primed	Verify suction pipe is submerged. Increase suction pressure. Open suction valve.
	Wrong direction of rotation	Reverse motor leads or reverse suction and discharge piping.
	Valves closed	Open all suction and discharge valves.
	Bypass valve open	Close bypass valve.
	Air leak in suction line	Tighten connections. Apply sealant to all threads. Verify suction pipe is submerged.
	Clogged strainer	Clean strainer.
	Pump worn or damaged	Rebuild pump.
Insufficient discharge	Suction pressure too low	Increase suction pressure. Verify suction piping is not too long. Fully open any suction valves.
	Bypass valve open	Close bypass valve.
	Partly clogged strainer	Clean strainer.
	Speed too low	Increase driver speed, if possible. Use larger size pump, if required.
	Pump worn or damaged	Rebuild pump.
Loss of suction after satisfactory operation	Pump not properly primed	Reprime pump.
	Air leaks in suction line	Tighten connections. Apply sealant to all threads. Inspect gaskets, if applicable. Verify suction pipe is submerged.
	Air or vapor pockets in suction line	Rearrange piping as necessary.
	Increase in fluid viscosity	Heat fluid to reduce viscosity. Reduce pump speed.
Excessive power consumption	Fluid viscosity higher than specified	Heat fluid to reduce viscosity. Reduce pump speed. Increase driver horsepower.
	Differential pressure greater than specified	Increase pipe diameter. Decrease pipe run.
	Gear clearances insufficient for fluid viscosity	Purchase gears trimmed for the correct viscosity.
	Plastic gear clearance insufficient for fluid temperature	Purchase plastic gear trimmed for the correct temperature.
	Rotating parts binding or severely worn	Disassemble pump and replace worn parts.

Appendix 7: Troubleshooting Guide (Continued)

Troubleshooting Guide – Part 2

Problem	Possible Cause	Corrective Action
Rapid pump wear	Abrasives in fluid	Install suction strainer. Limit solids concentration. Reduce pump speed or use larger pump running at lower speed.
	Corrosion wear	Use materials of construction that are acceptable for fluid being pumped.
	Extended dry running	Install power sensor to stop pump.
	Discharge pressure too high	Increase pipe diameter. Decrease pipe run.
	Housing stress from piping	Align piping with pump ports. Support piping independently of pump.
	Misalignment (long-coupled pump)	Align pump and motor.
Excessive noise and vibration	Suction and/or discharge piping not anchored or properly supported	Anchor per Hydraulic Institute Standards.
	Base not rigid enough	Tighten hold-down bolts on pump and motor or adjust stilts. Inspect grout and regrout if necessary.
	Worn pump bearings	Replace bearings.
	Worn motor bearings	Replace bearings or motor.
	Pump cavitation	Increase NPSH available.
	Misalignment (long-coupled pump)	Align pump and motor.
Excessive product leakage	Static seal failure caused by chemical incompatibility or thermal breakdown	Use O-rings or gaskets made of material compatible with fluid and temperature of the application.
	Static seal failure caused by improper installation	Install O-rings or gaskets without twisting or bending. Use star-pattern torque sequence on housing bolts during assembly. Allow Teflon O-rings to cold flow and seat during tightening. Torque bolts to specification.
	Dynamic seal worn or damaged	Disassemble and replace seal. Prime pump and avoid dry running.
	Pump port connections not properly sealed	Use Teflon tape or other suitable sealant. Use gaskets compatible with fluid and temperature of the application.
	Crevice corrosion of pump housing material	Only pump chemicals that are compatible with the pump housing material. Decrease temperature to reduce corrosion rate to acceptable value. Flush idle pumps that are used to pump corrosive chemicals. Eliminate contaminants in the fluid that can accelerate corrosion wear.

Appendix 7: Troubleshooting Guide

Troubleshooting Guide – Part 1

Problem	Possible Cause	Corrective Action
No discharge	Pump not primed	Verify suction pipe is submerged. Increase suction pressure. Open suction valve.
	Wrong direction of rotation	Reverse motor leads or reverse suction and discharge piping.
	Valves closed	Open all suction and discharge valves.
	Bypass valve open	Close bypass valve.
	Air leak in suction line	Tighten connections. Apply sealant to all threads. Verify suction pipe is submerged.
	Clogged strainer	Clean strainer.
	Pump worn or damaged	Rebuild pump.
	Magnetic coupling has decoupled	Stop driver and check temperature and viscosity of fluid. Verify position of outer magnet. Stronger magnetic coupling may be needed.
Insufficient discharge	Suction pressure too low	Increase suction pressure. Verify suction piping is not too long. Fully open any suction valves.
	Bypass valve open	Close bypass valve.
	Partly clogged strainer	Clean strainer.
	Speed too low	Increase driver speed, if possible. Use larger size pump, if required.
	Pump worn or damaged	Rebuild pump.
Loss of suction after satisfactory operation	Pump not properly primed	Reprime pump.
	Air leaks in suction line	Tighten connections. Apply sealant to all threads. Inspect gaskets, if applicable. Verify suction pipe is submerged.
	Air or vapor pockets in suction line	Rearrange piping as necessary.
	Increase in fluid viscosity	Heat fluid to reduce viscosity. Reduce pump speed.
Excessive power consumption	Fluid viscosity higher than specified	Heat fluid to reduce viscosity. Reduce pump speed. Increase driver horsepower.
	Differential pressure greater than specified	Increase pipe diameter. Decrease pipe run.
	Gear clearances insufficient for fluid viscosity	Purchase gears trimmed for the correct viscosity.
	Plastic gear clearance insufficient for fluid temperature	Purchase plastic gear trimmed for the correct temperature.
	Rotating parts binding or severely worn	Disassemble pump and replace worn parts.

Appendix 7: Troubleshooting Guide (Continued)

Troubleshooting Guide – Part 2

Problem	Possible Cause	Corrective Action
Rapid pump wear	Abrasives in fluid	Install suction strainer. Limit solids concentration. Reduce pump speed or use larger pump running at lower speed.
	Corrosion wear	Use materials of construction that are acceptable for fluid being pumped.
	Extended dry running	Install power sensor to stop pump.
	Discharge pressure too high	Increase pipe diameter. Decrease pipe run.
	Housing stress from piping	Align piping with pump ports. Support piping independently of pump.
Excessive noise and vibration	Suction and/or discharge piping not anchored or properly supported	Anchor per Hydraulic Institute Standards.
	Base not rigid enough	Tighten hold-down bolts on pump and motor or adjust stilts. Inspect grout and regrout if necessary.
	Worn pump bearings	Replace bearings.
	Worn motor bearings	Replace bearings or motor.
	Pump cavitation	Increase NPSH available.
Excessive product leakage	Static seal failure caused by chemical incompatibility or thermal breakdown	Use O-rings or gaskets made of material compatible with fluid and temperature of the application.
	Static seal failure caused by improper installation	Install O-rings or gaskets without twisting or bending. Use star-pattern torque sequence on housing bolts during assembly. Allow Teflon O-rings to cold flow and seat during tightening. Torque bolts to specification.
	Pump port connections not properly sealed	Use Teflon tape or other suitable sealant. Use gaskets compatible with fluid and temperature of the application.
	Crevice corrosion of pump housing material	Only pump chemical fluids that are compatible with the pump housing material. Decrease temperature to reduce corrosion rate to acceptable value. Flush idle pumps that are used to pump corrosive chemicals. Eliminate contaminants in the fluid that can accelerate corrosion wear.

Troubleshooting for:

EnviroGear®
INTERNAL GEAR PUMPS
A DOVER COMPANY

PSG™
PUMP SOLUTIONS GROUP
A DOVER COMPANY

115 Hilton Street West • Easton, PA 18042 USA • (800)854-0539 • fax: (800)926-9508 • http://www.ProcessFlo.com

CHAPTER 7: TROUBLESHOOTING

Symptom or Problem: Pump is excessively noisy.
Possible Cause(s):

- Air in the inlet fluid stream.
- Relief valve is opening.
- Pump has decoupled.
- Pump components are damaged or worn.
- Pump is cavitating.
- Discharge line is too restrictive.
- Cooling path is plugged.
- Ball bearings are worn or damaged.

Symptom or Problem: Pump does not prime.
Possible Cause(s):

- Discharge line is too restrictive.
- Suction lift is too great.
- Pump is not wetted.
- Air leak in the suction line.
- Pump is running in the wrong direction.
- Head is positioned incorrectly.
- Cooling path plugs are not installled.
- Pump is locked up with hardened fluid or foreign items.
- Pump components are damaged or worn.
- Pump has decoupled.
- Inner magnets have weakened.
- Cooling path is plugged.
- Relief valve is stuck open.

Symptom or Problem: Flowrate is too low.
Possible Cause(s):

- Head is positioned incorrectly.
- Cooling path plugs are not installled.
- Discharge line is too restrictive.
- Viscosity is lower than expected.
- Air in the inlet fluid stream.
- Pump is cavitating.
- Relief valve is opening.
- Pump components are damaged or worn.
- Bypass or auxiliary line in the discharge piping is open.
- Cooling path is plugged.
- Relief valve is stuck open.

Symptom or Problem: Pump does not develop enough pressure.
Possible Cause(s):

- Air in the inlet fluid stream.
- Viscosity is lower than expected.
- Pump is cavitating.
- Relief valve is opening.
- Pump components are damaged or worn.
- Bypass or auxiliary line in the discharge piping is open.
- Head is positioned incorrectly.
- Cooling path plugs are not installled.
- Cooling path is plugged.
- Relief valve is stuck open.

Symptom or Problem: Relief valve does not open.
Possible Cause(s):

- Pump is running in the wrong direction.
- Relief valve is stuck closed.

Symptom or Problem: Leakage from head/casing area.
Possible Cause(s):

- O-ring material is not compatable with the pumped fluid.
- Sealing surfaces for the o-rings are damaged.
- Bolt(s) are loose or missing.
- O-ring is damaged or missing.

Symptom or Problem: Leakage from casing/magnet housing area.
Possible Cause(s):

- O-ring material is not compatable with the pumped fluid.
- Sealing surfaces for the o-rings are damaged.
- Casing or magnet housing mounting flanges are cracked.
- Bolt(s) are loose or missing.
- O-ring is damaged or missing.

Symptom or Problem: Leakage from head/valve body area.
Possible Cause(s):

- O-ring material is not compatable with the pumped fluid.
- Sealing surfaces for the o-rings are damaged.
- Bolt(s) are loose or missing.
- O-ring is damaged or missing.

Symptom or Problem: Leakage from drive shaft area.
Possible Cause(s):

- Canister is damaged and leaking.

Symptom or Problem: Excessive vibration.
Possible Cause(s):

- Air in the inlet fluid stream.
- Relief valve is opening.
- Pump has decoupled.
- Pump components are damaged or worn.
- Pump is cavitating.
- Ball bearings are worn or damaged.
- Inner magnets have weakened.
- Cooling path is plugged.

Symptom or Problem: Pump draws too much power.
Possible Cause(s):

- Pump components are damaged or worn.
- Relief valve is stuck closed.
- Ball bearings are worn or damaged.
- Viscosity is higher than expected.

CHAPTER 8: HOW TO RETURN PUMP TO FACTORY

If a pump must be returned to the PeopleFlo factory, a Return Goods Authorization (RGA) must be obtained from PeopleFlo or its authorized selling partners. No RGA can be issued without a review of the appropriate Material Safety Data Sheets (MSDS). Pumps must be cleaned of all fluids and the ports plugged to prevent foreign material from getting into the pump.

CHAPTER 9: WARRANTY

PeopleFlo Manufacturing, Inc. ("PMI") warrants that on the day of delivery, all products manufactured by it shall be free from defects in materials and workmanship. For a period twenty four (24) months from the date of shipment from PMI, PMI will, at its sole and exclusive discretion, either replace or repair any products found by PMI to be defective in workmanship or material, at no charge to the Purchaser.

The warranty does not apply to:

- any products which have been modified or altered by persons other than PMI; or
- any products subjected to any misuse, neglect, misapplication, improper installation or accidental damage; or
- any goods manufactured by a third party; or
- any products damaged by the effects of abrasion, erosion or corrosion.

No returns will be accepted by PMI unless accompanied by PMI's written authorization and PMI will assume no field expense for service or parts unless authorized in writing by PMI in advance. All warranty replacement or repairs must be performed by PMI or a PMI Authorized Service Organization.

PMI assumes no liability for consequential damages of any kind and the purchaser, by acceptance of delivery, assumes all liability for the consequences of the use or misuse of PMI products by the purchaser, the purchaser's employees or others.

This warranty is exclusively for the benefit of the first purchaser of the product, other than a purchaser for resale, and cannot be transferred or assigned.

THERE SHALL BE NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER OBLIGATION ON THE PART OF PMI WITH RESPECT TO PRODUCTS EXCEPT THE WARRANTY OR WARRANTIES CONTAINED HEREIN.

Troubleshooting for:

Tuthill®

115 Hilton Street West • Easton, PA 18042 USA • (800)854-0539 • fax: (800)926-9508 • http://www.ProcessFlo.com

Troubleshooting

1. **Problem: No fluid is delivered.**

   a. Power is not on.

   b. Net positive suction head available (NPSHa) is lower than required for the vapor pressure of the liquid pumped. You should calculate NPSHa and redesign piping, if necessary.

   c. Leaks in suction line or port passages. These can be detected by submerging pressure line from discharge side of pump into a pail of liquid where the air will be seen in the form of bubbles.

   d. Direction of shaft rotation is incorrect.

   e. Relief valve setting is too low. Liquid is discharging through the bypass port.

2. **Problem: Capacity is too low.**

   a. Air leaks in suction line.

   b. Suction losses are too high. The suction lift is too great or the suction line is too small or too long. This can be detected by installing a vacuum gauge directly at the pump suction. The maximum vacuum at the pump suction should never exceed 15” of mercury. Vaporization caused by higher vacuums will generally result in capacity drop off. Redesign suction conditions.

   c. Pump speed is too slow.

   d. Strainer too small or obstructed.

   e. Suction pipe or port not immersed deep enough in liquid.

   f. Piping improperly installed permitting air pocket to form in the pump.

   g. Increased clearances or wear in the pump will sometimes cause the pump to deliver an insufficient supply of liquid. This may be corrected by reducing the thickness of the cover gaskets. A folded gasket or a slight amount of dirt can exaggerate the problem and cause leakage. Refer to Assembly Procedure section for minimum end clearances.

3. **Problem: Pump works spasmodically.**

   a. Leaky suction lines.

   b. Suction conditions vary.

   c. Air or vapor in liquid.

4. **Problem: Excessive power draw.**

   a. Pressure too high.

   b. Liquid more viscous than originally expected.

c. Suction or discharge lines obstructed.

d. Insufficient horsepower.

e. Mechanical defects:
   - Drive shaft and pump are misaligned.
   - Pump is binding due to insufficient end clearance.
   - Pump shaft is bent.
   - Misalignment within pump due to bad piping or poor installation, causing strain or distortion.

5. Problem: Pump is noisy.

a. Pump is cavitating due to inadequate suction conditions.

b. Misalignment of coupling.

c. Coupling set too close to pump.

d. Vibration of pump due to worn or bent shaft.

e. Air leaks on suction side of pump or air entrainment in fluid.

6. Problem: Pump leaks.

a. Bolts need tightening, allowing gaskets or O-rings to leak.

b. Gaskets or O-rings are damaged.

Note: Packings are designed to leak. Leakage should be at a rate that will prevent excessive heating on the bracket at the packing area.