

# Troubleshooting for:



# TROUBLESHOOTING

**NOTICE:**

**Maintenance shall be performed by qualified technicians only, following the appropriate procedures and warnings as presented in this manual.**

PROBLEM	CAUSE
Pump Not Priming See causes 1 through 7	1. Suction/discharge valve incorrectly set. 2. Leaks in suction piping. 3. Incorrect rotation. 4. Broken shaft.
Reduced Capacity See causes 1 , 2, 3, 6 through 10	5. Pump vapor locked. 6. Incorrect pump speed. 7. Vanes damaged, worn or incorrectly installed.
Noisy See causes 1, 6, 7, 8, 9, 11 through 14	8. Cavitation. 9. Damaged or worn pump or system components. 10. Excessive piping/system friction losses.
Damaged Vanes See causes 8, 11, 16 through 21	11. Relief valve incorrectly set, worn or damaged. 12. Operating against a closed discharge. 13. Shaft bent or misaligned.
Broken Shaft See causes 7, 11, 13, 16, 17&20	14. Worn or damaged bearings. 15. Piping inadequately anchored. 16. Foreign objects entering the pump.
Motor Overload See causes 9, 13, 17, 22 & 23	17. Viscosity too high 18. Excessive heat. 19. Worn or damaged push rods. 20. Hydraulic hammer - pressure spikes. 21. Incompatible fluid(s). 22. Inadequate horsepower. 23. Incorrect voltage, wiring, phase loss.

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# GENERAL PUMP TROUBLESHOOTING

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### LEAKAGE

#### Location

Between the head & casing

Around the shaft

#### Probable Cause/Corrective Action

Damaged head O-ring: Inspect and replace if necessary.

Burrs/dirt in head O-ring groove or casing: File and clean as necessary.

New Mechanical Seals: New seals may leak slightly at start up, but should seal up shortly thereafter.

Damaged mechanical seals: Check for damaged O-rings or cracked, scratched or worn seal faces

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### SHAFT BINDING

#### Probable Cause

Burrs, dirt or foreign particles on the heads or discs.

Improper bearing adjustment.

Contaminated mechanical seal faces.

#### Corrective Action

During assembly, both heads and discs must be clean and smooth. File any burrs or rough spots, and wipe the discs with a clean cloth and alcohol to remove any dirt or foreign particles.

Bearings must be adjusted properly to center the rotor and shaft between the head & bearing housing. Refer to the "Pump assembly " section of this manual.

Any trace of grease or dirt on the seal faces will prevent the faces from mating properly, causing the rotor and shaft to bind or turn hard. Use a tissue paper & alcohol to clean the seal faces. NOTE: Apply a light oil or suitable lubricant to bronze seal faces only.

#### OTHER POSSIBLE CAUSES OF SHAFT BINDING:

- Foreign particles on rotor, liner or vanes.
- Damaged vanes or rotor.

- Bent push rods.
  - Liquids that "set up" when inactive.
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### OVERHEATING

#### Probable Cause

Pump is in bypass (internal or external) mode too long or the bypass loop is too short

#### OTHER POSSIBLE CAUSES OF OVERHEATING:

- Improper system bypass valve and/or internal relief valve adjustment
- Plugged discharge line.
- Closed valve.

#### Corrective Action

Adjust the bypass valve and/or internal relief valve so that the pump does not operate in bypass mode so long.

Route the external bypass line back to the supply tank.

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### LOW DELIVERY RATE

#### Probable Cause

Bypass valve and/or internal relief valve setting too low, causing the liquid to bypass.

#### OTHER POSSIBLE CAUSES OF A LOW DELIVERY RATE:

- Restriction in the suction line.
- Resistance in the discharge line.
- Air leaks in the suction line.
- Damaged or worn pump parts.
- Pump speed too low or too high.

#### Corrective Action

The bypass valve and/or internal relief valve setting should be 20 psi (1.4 bar) higher than the differential pressure.

- Bypass valve leaking.
- Bypass valve sticking open, or not properly seating.
- Dirty strainer.
- Liner installed backwards
- Pump running in reverse

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# GENERAL PUMP TROUBLESHOOTING

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## EXCESSIVE NOISE AND VIBRATION

### Probable Cause

Cavitation or vaporization of the liquid resulting from excessive vacuum on the pump due to starved suction.

Entrained air or vapors in the pump.

Pump speeds exceed the recommended maximum.

Liner Installed Backwards

Continual or long term bypassing of liquid through system bypass valve.

### Corrective Action

Check for:

- Inlet piping too long or too small in diameter.
- Strainer plugged or dirty.
- Undersized or restrictive fittings, such as globe valves or partially closed valves.
- Excessive amount of elbows.
- Suction lift too great.
- Pump speed too high for the viscosity of the liquid being pumped.

Check pipe joints for leakage of air. Sometimes when recirculating liquid in a tank, the returning liquid falling through the air carries air down into the tank, which eventually gets back into the pump.

Check the recommended RPM for your specific application.

The word "INTAKE", which is cast on the liner MUST be towards the intake side of the pump

Check for restriction in the discharge line, or an improper bypass valve adjustment

### OTHER POSSIBLE CAUSES OF NOISE AND VIBRATION:

- Excessively worn vanes
- Bearing Worn or Damaged.
- Loose or improperly installed piping.
- Misalignment of pump and driver.
- Pump base not properly mounted.

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## POOR OR NO PRIMING

### Probable Cause

- Air leaks in the suction line.
- Restriction in the suction line.
- Damaged or worn pump parts.
- Too much lift for the vapor pressure of the fluid.
- A dirty or clogged strainer.
- Worn vanes.
- Suction Valve Closed.
- Incorrect pump rotation
- Bypass Valve partially open, valve not seating properly.

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## DAMAGED VANES

### Probable Cause

- Foreign objects entering the pump.
- Running the pump dry for extended periods of time.
- Cavitation.
- Viscosity too high for the vanes and /or the pump speed.
- Incompatibility with the liquids pumped.
- Excessive heat.
- Worn or bent push rods, or worn push rod holes.
- Settled or solidified material in the pump at start-up.
- Hydraulic hammer - pressure spikes.
- Vanes installed incorrectly (see "Vane Replacement").

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## BROKEN SHAFT

### Probable Cause

- Foreign objects entering the pump.
- Viscosity too high for the pump speed.
- Bypass valve not opening.
- Hydraulic hammer - pressure spikes.
- Pump/driver, driveline/drive shaft misalignment.
- Excessively worn vanes or vane slots.
- Settled or solidified material in the pump at start-up.

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## SEAL LEAKAGE

### Probable Cause

- O-rings not compatible with the liquids pumped.
- O-rings nicked, cut or twisted.
- Shaft at seal area damaged, worn or dirty.
- Excessive cavitation.
- Mechanical seal faces cracked, scratched, pitted or dirty.
- Ball bearings worn.

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## MOTOR OVERLOAD

### Probable Cause

- Horsepower of motor not sufficient for application
- Improper wire size / wiring and/or voltage to motor.
- Misalignment in pump drive system.
- Excessive viscosity, pressure or speed.
- Faulty or worn bearings.
- Rotor rubbing against head or liner.
- Dirty mechanical seal faces.

# PUMP TROUBLESHOOTING

## NOTICE:

Maintenance shall be performed by qualified technicians only,  
following the appropriate procedures and warnings as presented in this manual.

SYMPTOM	PROBABLE CAUSE
<b>Pump Not Priming</b>	<ol style="list-style-type: none"> <li>1. Pump not wetted.</li> <li>2. Suction valve closed.</li> <li>3. Air leaks in the suction line.</li> <li>4. Strainer clogged.</li> <li>5. Suction line or valves clogged or too restrictive.</li> <li>6. Wrong rotation on motor.</li> <li>7. Broken drive train.</li> <li>8. Pump vapor-locked.</li> <li>9. Pump speed too low for priming.</li> <li>10. Worn Vanes.</li> </ol>
<b>Reduced Capacity</b>	<ol style="list-style-type: none"> <li>1. Suction valves not fully open.</li> <li>2. Air leaks in the suction line.</li> <li>3. Excessive restriction in the suction line (i.e.: undersized piping, too many elbows &amp; fittings, clogged strainer, etc.).</li> <li>4. Damaged or worn parts.</li> <li>5. Excessive restriction in discharge line causing partial flow through the relief valve.</li> <li>6. Relief Valve worn, set too low, or not seating properly.</li> <li>7. Vanes installed incorrectly (see "Vane Replacement").</li> </ol>
<b>Noise</b>	<ol style="list-style-type: none"> <li>1. Excessive vacuum on the pump due to:               <ol style="list-style-type: none"> <li>a. Undersized or restricted fittings in the suction line.</li> <li>b. Pump speed too fast for the viscosity or volatility of the liquid.</li> <li>c. Pump too far from fluid source.</li> </ol> </li> <li>2. Running the pump for extended periods with a closed discharge line.</li> <li>3. Misalignment of the pump.</li> <li>4. Baseplate not securely mounted.</li> <li>5. Sleeve Bearings (bushings) worn or damaged.</li> <li>6. Vibration from improperly anchored piping.</li> <li>7. Bent shaft, or drive coupling misaligned.</li> <li>8. Excessively worn rotor.</li> <li>9. Malfunctioning valve in the system.</li> <li>10. Insufficient oil in the gear reducer.</li> <li>11. Damaged vanes (see following category).</li> </ol>
<b>Damaged Vanes</b>	<ol style="list-style-type: none"> <li>1. Foreign objects entering the pump.</li> <li>2. Running the pump dry for extended periods of time.</li> <li>3. Cavitation.</li> <li>4. Viscosity too high for the vanes and /or the pump speed.</li> <li>5. Incompatibility with the liquids pumped.</li> <li>6. Excessive heat.</li> <li>7. Worn or bent push rods, or worn push rod holes.</li> <li>8. Settled or solidified material in the pump at start-up.</li> <li>9. Hydraulic hammer - pressure spikes.</li> <li>10. Vanes installed incorrectly (see "Vane Replacement").</li> </ol>
<b>Broken Shaft</b>	<ol style="list-style-type: none"> <li>1. Foreign objects entering the pump.</li> <li>2. Viscosity too high for the pump speed.</li> <li>3. Relief valve not opening.</li> <li>4. Hydraulic hammer - pressure spikes.</li> <li>5. Pump/driver misalignment.</li> <li>6. Overtightened V-belts, if equipped.</li> <li>7. Excessively worn vanes or vane slots.</li> <li>8. Settled or solidified material in the pump at start-up.</li> </ol>

# PUMP TROUBLESHOOTING ....Continued

SYMPTOM	PROBABLE CAUSE
<b>Overload on Motor</b>	<ol style="list-style-type: none"> <li>1. Horsepower of motor not sufficient for application.</li> <li>2. Improper wire size or wiring.</li> <li>3. Misalignment.</li> <li>4. Excessive viscosity, pressure or speed.</li> <li>5. Faulty or worn sleeve bearings (bushings).</li> <li>6. Rotor rubbing into head.</li> <li>7. Excessively tight packing (see "Packing Adjustment").</li> <li>8. Unevenly tightened stud nuts, causing shaft interference with packing follower.</li> </ol>
<b>Mechanical Seal Leakage (if equipped)</b>	<ol style="list-style-type: none"> <li>1. Seal Rings/O-rings not compatible with the liquids pumped.</li> <li>2. Seal Rings/O-rings nicked, cut or twisted.</li> <li>3. Shaft at seal area damaged, worn or dirty.</li> <li>4. Excessive cavitation.</li> <li>5. Mechanical seal faces cracked, scratched, pitted or dirty.</li> <li>6. Pump sleeve bearings worn excessively.</li> </ol> <p><b>NOTE: Consult commercial mechanical seal manufacturer for more information on mechanical seal troubleshooting.</b></p>

## AFFF SERVICE PUMPS – Special Notes

**NOTICE:**

Design and materials of construction should be suitable for use with the type of foam concentrate to minimize corrosion, foaming, or sticking

**NOTICE:**

Blackmer NP pumps are not approved for use in systems where automatic system pressure balance exceeds 200 psi, 13.79 bar (175 psi, 12.07 bar for the NP4).

### DESCRIPTION

AFFF pumps were previously listed as FFNP models. They are now NP pumps with specific options:

- Duravanes (1.5" – 3")
- Laminate Vanes (4")
- Lip Seal
- Corrosion Resistant RV
- Stainless Steel 200 psi spring
- Buna-N O-Rings
- Casing Drain

**TABLE 1 – TECHNICAL DATA**

	1.5", 2", 2.5", 3"	4"
<b>Maximum Differential Pressure</b>	<b>200 psi (13.79 Bar)</b>	<b>175 psi (12.07 Bar)</b>
<b>Maximum Working Pressure</b>	<b>220 psi (15.17 Bar)</b>	<b>195 psi (13.44 Bar)</b>

### LOCATION AND PIPING

**NOTICE:**

A system pressure control device, in addition to the pump relief valve, is required.

### OPERATION

**NOTICE:**

The pump must be tested, for a ten minute period, every 30 days. During this activity, the pump discharge must be recirculated through a bypass system. Do not operate the pump against a closed discharge.

An electrical time clock is recommended to record elapsed operating time. Refer to the 'Scheduled Maintenance - Pump' section.

### PUMP RELIEF VALVE

**NOTICE:**

The pump's internal relief valve is designed to protect only the pump from excessive pressure and must not be used as a system pressure relief valve. Foam system pressure must be controlled by a separate bypass pressure control valve which returns bypassed fluid to the foam storage tank.

### SCHEDULED MAINTENANCE - PUMP

1. Pump MUST be disassembled and checked after each ten hours of system trial operation, or five years, whichever occurs sooner. The heads (20 & 23), cylinder (12), bushing (24) and vanes (14) MUST be inspected for wear. Replacement of worn parts is required. Inspect the rotor and shaft for wear or corrosion. If rotor & shaft indicates wear, scaling, flaking rust particles or cracking, replacement is required.
2. If during operation of the system the contents of the foam concentrate tank has been depleted OR there is reason to believe the pump has run dry, the pump MUST be completely disassembled and carefully inspected for damage or wear. The heads (20 & 23), cylinder (12), bushing (24) and vanes (14) MUST be inspected for wear. Replacement of worn parts is required. Inspect the rotor and shaft for wear or corrosion. If rotor & shaft indicates wear, scaling, flaking rust particles or cracking, replacement is required.