

## Component Problem Solving

### IMPELLERS

TROUBLE SOURCE	PROBABLE CAUSE	REMEDY
Wear on exit vanes and shrouds. Consider	Abrasive action.	Replace impeller if excessive. coating or upgrading material.
Pitting on entrance vanes of impellers.	Cavitation.	Correct condition or upgrade material to extend life.
Pitting on impellers and bowl castings.	Corrosion/Erosion	Investigate cost of different materials. vs. frequency of replacements.
Wear on impeller skirts and/or bowl seal ring area.	1. Abrasive action or excess wear impeller skirts due to worn bowl bearings. 2. Impellers set too high.	1. Install new bearings and wear rings. Upgrade material if abrasive action. 2. Install wear rings and adjust correctly.
Impeller loose on shaft (extremely rare occurrence.)	1. Repeated shock load by surge in suction or discharge line. (Can loosen first or last stage impellers.) 2. Foreign material jamming impeller. (May break shaft or trip motor over load before impeller comes to loose. 3. Differential expansion due to temperature. 4. Parts improperly machined and/or assembled. 5. Torsion loading on submersible pumps.	1. Re-fit impellers. If collet mounted, consider changing to key mounting. 2. Remove cause of jamming. 3. If collet mounted, consider change to key mounted. Avoid sudden thermal shock. 4. Correct parts and refit. 5. Add keyway to collet mounting.

### BEARINGS

TROUBLE SOURCE	PROBABLE CAUSE	REMEDY
Bearing seized or galling on shaft.	Running without lubrication.	Check lubrication, look for plugged suction or evidence of flashing.
Bearing failure or bearing seized.	High temperature failure.	Check pump manufacturer for bearing temperature limits.
Excessive shaft wear under rubber bearings	Rubber bearings will swell in hydro-carbon, H <sub>2</sub> S & high temperature.	Change bearing material.
Premature bearing wear.	Abrasive action.	Consider conversion to water flushing pressure grease or oil lubrication on all bearings.
Uneven wear on bearings, uniform wear on shaft.	Pump's non-rotating parts misaligned.	Check mounting and discharge pipe connection for dirt between column joints. Correct misalignment, replace bearings and repair or replace shaft.
Uniform wear on bearings and shaft.	Abrasive action.	Replace parts, consider changing materials or means of lubrication.
Uniform wear on bearings, uneven wear on shaft.	1. Shaft run-out caused by bent shafts, shafts not butted in couplings, dirt or grease 2. Shafts ends not properly faced.	1. Straighten shaft or replace, clean and assemble correctly. 2. Reface shaft ends, parallel and concentric.

## Component Problem Solving (Con't)

### SHAFT AND COUPLINGS

TROUBLE SOURCE	PROBABLE CAUSE	REMEDY
Bent shaft.	Mishandling in transit or assembly.	Check straightness. Correct to .005"/10 ft. total run-out or replace.
Shaft coupling elongated (neck down).	<ol style="list-style-type: none"> <li>1. Motor is started while pump running in reverse.</li> <li>2. Corrosion.</li> <li>3. Pipe wrench fatigue on reused couplings.</li> <li>4. Power being applied to shafts that are not butted in coupling.</li> </ol>	<ol style="list-style-type: none"> <li>1. Look for faulty check valve. Could also be momentary power failure or improper starting timers.</li> <li>2. Replace couplings.</li> <li>3. Replace couplings.</li> <li>4. Check for galling on shaft ends.</li> </ol>
Shaft coupling unscrewed	Pump started in reverse rotation.	Shafts may be bent, check shafts and couplings. Correct rotation.
Broken shaft or coupling.	<ol style="list-style-type: none"> <li>1. Can be caused by same reasons listed for coupling elongation.</li> <li>2. Can also be caused by bearings seized due to lack of lubrication.</li> <li>3. Foreign locking impellers or galling wear rings.</li> <li>4. Metal fatigue due to vibrations.</li> <li>5. Improper impeller adjustment or continuous upthrust conditions, causing impeller drag.</li> </ol>	<ol style="list-style-type: none"> <li>1. Same as for coupling elongation.</li> <li>2. Same as above for bearing seizure.</li> <li>3. Add strainers or screens.</li> <li>4. Check alignment of the pump components to eliminate vibration.</li> <li>5. See Engineering Section for correction.</li> </ol>

### BOWLS

TROUBLE SOURCE	PROBABLE CAUSE	REMEDY
Wear on bowl vanes.	Abrasive action.	Coat bowls, upgrade material or rubber line.

### PACKING BOX

TROUBLE SOURCE	PROBABLE CAUSE	REMEDY
Excessive leakage.	<ol style="list-style-type: none"> <li>1. Improper packing.</li> <li>2. Incorrect type or defective packing.</li> <li>3. Worn shaft or sleeve.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repack correctly.</li> <li>2. Repack with the correct grade for service.</li> <li>3. Remachine or replace scored parts.</li> </ol>
Packing box overheated.	<ol style="list-style-type: none"> <li>1. Improper packing procedure.</li> <li>2. Packing too tight.</li> <li>3. Insufficient lubrication.</li> <li>4. Incorrect type of packing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repack correctly.</li> <li>2. Repack with the correct grade for service.</li> <li>3. Remachine or replace scored parts.</li> </ol>
Packing wears prematurely.	<ol style="list-style-type: none"> <li>1. Improper packing.</li> <li>2. Insufficient lubrication.</li> <li>3. Shaft or sleeve scored.</li> <li>4. Incorrect type of packing.</li> <li>5. Abrasive action.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repack correctly.</li> <li>2. Repack correctly.</li> <li>3. Remachine or replace scored parts.</li> <li>4. Repack with the correct grade for service.</li> <li>5. Remove source of abrasives.</li> </ol>

### INNER COLUMN

TROUBLE SOURCE	PROBABLE CAUSE	REMEDY
Water in inner column.	<ol style="list-style-type: none"> <li>1. Bypass ports plugged.</li> <li>2. Badly worn bypass seal or bearings.</li> <li>3. Tubing joint leaking.</li> <li>4. Crack or hole in tubing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove cause.</li> <li>2. Replace worn parts.</li> <li>3. Ensure tubing joint face is clean and is butted squarely.</li> <li>4. Replace section affected.</li> </ol>

### Temperature Limitations And Recommendations

MATERIAL	TEMP. RANGE °F	MINIMUM S.G.	REMARKS
Neoprene	32 to 100	1.0	Good for abrasive service. Not recommended where sulfides are present.
Nitrile	-40 to 250	1.0	Good for abrasive service. Resistant to petroleum products. Not recommended where sulfides are present.
Bronze	-60 to 200	0.5	General purpose bearing successfully applied on non-abrasive fresh or salt water and hydrocarbons.
Engineered Plastic (Elastomeric Polymer/ Thermoplastics/ PTFE)	-80 to 250	0.3	Good for abrasive service. Low friction; suitable for dry start-up. Generally inert to harsh chemical solutions.
Carbon Graphite Babbitt	-100 to 400	0.5	Good for extreme temperatures and non-abrasive fluids. Also excellent where fluid has poor lubricating properties.

Notes: Temperature and S.G. are approximate for material classes, consult manufacturer for specific material alloy properties and service limits.

Construction	TEMP. RANGE °F	REMARKS
Bearings	100-140	Increase standard clearances .005"
Bearings	>140	Increase standard clearances .010"
Impellers	>200	Keyed impellers required
Wear Rings	>200	Mechanically affixed wear rings required
General	>140	Special consideration must be made for thermal properties of dissimilar materials. Consult Factory.