

SIHI LIQUID RING VACUUM PUMP TROUBLE SHOOTING GUIDE

| IDENTIFIED PROBLEM | CAUSE | EFFECT | CORRECTIVE ACTION |
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| <p><u>EROSION</u></p> <p>Characteristics: smooth, clean, grooved surfaces and edges.</p> | <p>Presence of sand, grit and other abrasive material.</p> | <p>Accelerated wear of impeller blades especially at the periphery. Premature wear of intermediate plate, centerbody & endcover(s).</p> | <ol style="list-style-type: none"> 1. Filter the service liquid. 2. Add pre-separators at the pump inlet. 3. Select proper pump materials. |
| <p><u>CORROSION</u></p> <p>Characteristics: Usually uneven, scaled on blackened surfaces and edges. Will occur on all wetted areas including impeller blade roots.</p> | <p>Chemical attack of wetted pump parts (usually by acidic low pH). Sources may be vapors or liquids from the process or from the service liquid.</p> | <p>Accelerated damage of the impeller, intermediate plates, center body & endcover(s).</p> | <ol style="list-style-type: none"> 1. Monitor service liquid pH & treat as necessary. 2. Purge the service liquid loop on a regular basis. 3. Look for source of corrosives and treat or remove. 4. Change to a pump material e.g. stainless steel, that will not corrode. |
| <p><u>FLOODING THE PUMP</u></p> | <ol style="list-style-type: none"> 1. Service liquid rate is too high. 2. Pump starts flooded. 3. Carryover from the process. | <p>Impeller blades fatigue failure of shaft. Shaft deflection in single acting pumps possible, leading to mechanical seal leakage, high motor amperage.</p> | <ol style="list-style-type: none"> 1. Check the service liquid rate for the specific pump. 2. Piping may be installed incorrectly. Pump should drain to the centerline after shutdown. 3. Check for proper pump inlet separation. |
| <p><u>CAVITATION DAMAGE</u></p> | <ol style="list-style-type: none"> 1. Liquid temperature too high. 2. Vacuum too high. | <p>Holes or pitting at the tips and roots of the impeller blade and intermediate. Grinding noise when pump is running.</p> | <ol style="list-style-type: none"> 1. Lower the service liquid temperatures or increase the flow of service liquid. 2. Lower the vacuum level. (increase the pressure) |

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| <p><u>VIBRATION</u></p> | <ol style="list-style-type: none"> 1. Incorrect installation of foundation 2. Poor coupling or V-belt drive alignment 3. Slugs of water carry-over to the pump inlet. 4. Piping stress at the inlet discharge or service liquid connections. 5. Pump ingested foreign material i.e. bolts, nuts, weld slag. 6. Internal damage due to cavitation, corrosion, etc. | <p>Broken couplings, worn V-belt drives or broken foundation bolts.</p> <p>Pump bearings may fail prematurely.</p> | <ol style="list-style-type: none"> 1. Check with Sterling SIHI on proper foundation and grouting procedures. 2. Check alignment or call Sterling SIHI for assistance. 3. Check for proper pre-separation 4. Add flexible connections if necessary. 5. Pump should be sent to Sterling SIHI for repair. Inlet screens should be installed before pump is started to insure material does not enter pump. 6. Repair or replace worn & damaged parts. |
| <p><u>INGESTION DAMAGE</u></p> | <p>No inlet screens on the pump or compressor</p> | <p>Broken impeller blades or seized pump.</p> | <p>Return pump to Sterling SIHI for repair evaluation.</p> |
| <p><u>SCALE</u></p> | <p>Hard service liquids i.e. lime or mud. Pumps running hotter will accelerate this problem.</p> | <ol style="list-style-type: none"> a. Scaling will close the internal pump clearances & cause binding. b. Scaling will cause a decrease in pump | <p>Use suitable descaler, but flush after use. Consult with Sterling SIHI for recommendations on the type and quantities.</p> |

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| | | <p>performance.</p> <p>c. Scaling will slowly close the service liquid lines and cause the pump to run warmer.</p> | |
| <p><u>BEARING FAILURE</u></p> | <ol style="list-style-type: none"> 1. Not using the recommended lubricant. 2. Over or under greased. 3. Couplings or V-belt drives not properly mounted or aligned. 4. Piping not properly supported and/or aligned. 5. Water in the bearings. 6. Internal pump clearances set improperly. | <p>Seized pump and broken or damaged bearing housing.</p> | <ol style="list-style-type: none"> 1. Check the Sterling SIHI manuals for recommended lubricant. 2. Check & clean bearings. (replace if worn) 3. Check alignment & foundations for proper support. 4. Use flexible connections for pump inlet, discharge and service liquid lines. 5. Check mechanical seals or packing. Shield bearings if environment is wet. 6. Consult Sterling SIHI for assembly dimension or return for repair evaluation. |

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| <p><u>PUMP RUNS WARMER THAN NORMAL</u></p> | <ol style="list-style-type: none"> 1. Insufficient service liquid flow. 2. Carryover of high temperature liquids. 3. Carryover of high temperature gases. 4. Pump RPM may be higher than recommended. | <p>Capacity levels for the vacuum pump or compressor may decline. Also the vacuum level may fall.</p> | <ol style="list-style-type: none"> 1. Check the manuals or call Sterling SIHI for the proper service liquid flow. 2. Check for proper pre-separation or call a Sterling SIHI technician. 3. High gas temperatures may be a process condition that may be unavoidable. Adjust service liquid flow as required. Call Sterling SIHI if problem persists. 4. Check pump RPM for the service. Call if necessary. |
| <p><u>PUMP LEAKS</u></p> | <ol style="list-style-type: none"> 1. Leaking packing or mechanical seal. Note some leakage is necessary to keep the packing cool. (Over tightening will harden, become hot & score the pump shaft.) 2. Leakage could be from the body, body gaskets or drain plugs. (Sometimes a result of erosion or corrosion damage.) | <p>Loss of service liquid. Potential gas leakage when shut down. In minor cases this may be a house keeping problem. In major cases this may lead to poor pump performance or damage to the pump.</p> | <ol style="list-style-type: none"> 1. Check packing and tighten or check & replace mechanical seal. Service liquid or contaminates from the process can coat or abrade mechanical seal faces. 2. Check the source of the leak. Repair may be necessary. |

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| <p><u>HIGHER THAN NORMAL PUMP NOISE</u></p> | <ol style="list-style-type: none"> 1. Pump is cavitating. 2. Pump is overloaded with liquid. 3. Pump has ingested foreign material. 4. Bearings are in poor condition. 5. Pump coupling or V-belt drive misalignment. | <p>An unusual or high noise level is an early indication of a problem. This problem may lead to pump damage or failure. Potential vibration concerns.</p> | <ol style="list-style-type: none"> 1. Cavitation can be a complex problem. Consult with Sterling SIHI for solutions. 2. Check for proper service liquid flow. Also check for good inlet pre-separation. 3. Stop the pump immediately. Disassemble and inspect or send the pump to Sterling SIHI for repair evaluation. 4. Inspect bearings. See the subject of bearing failures. 5. Coupling and V-belt drive alignment must be checked. |
| <p><u>VACUUM LEVEL PROBLEMS</u></p> | <ol style="list-style-type: none"> 1. Poor piping design. Vacuum or compressed air requirements and pumps may have been added without the required piping upgrades. 2. Warmer than recommended service liquid temperatures. 3. Incorrect service liquid flow. 4. Liquid | <p>Vacuum levels that are usually lower than required.</p> | <ol style="list-style-type: none"> 1. See the section dedicated to piping design. 2. The addition of heat exchangers, cooling towers or chillers may be required. Consult with Sterling SIHI. 3. Check the manuals or call Sterling SIHI for proper service liquid flow. 4. Check for proper pre-separation. |

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| | <p>carryover to the pump inlet.</p> <p>5. Improper pump application.</p> <p>6. Poor or insufficient vacuum control.</p> | | <p>5. Check application needs and call Sterling SIHI for assistance.</p> <p>6. Consult with Sterling SIHI for sizing and selection of relief valves or revised vacuum control needs.</p> |
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