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### Symptoms
- **Speed (rpm) too low**
- **Parallel operation of pumps unsuitable**
- **Total system head higher than pump design head**
- **Wrong direction of pump rotation**
- **Total system head lower than pump design head**

### Causes of System Problems
- **Excessive amount of air or gas in the water**
- **Foot valve too small, insufficiently submerged, or partially clogged**
- **Insufficiently submerged suction pipe inlet**
- **Pump or suction pipe not completely filled with water**
- **Insufficient Net Positive Suction Head (NPSH – See pg. 20)**
- **Suction line, strainer, or centrifugal pump balance line plugged**
- **Air leaks into suction line**
- **Air leaks into pump through packing box**

### Causes of Suction Problems
- **Pump not primed**
- **Insufficiently submerged suction pipe inlet**
- **Pump or suction pipe not completely filled with water**
- **Insufficient Net Positive Suction Head (NPSH – See pg. 20)**
- **Suction line, strainer, or centrifugal pump balance line plugged**
- **Air leaks into suction line**
- **Air leaks into pump through packing box**
- **Excessive amount of air or gas in the water**

### Causes of Pump Problems
- **Rotary shaft seals (packing) leak air**
- **Foreign matter in impeller**
- **Wear rings worn**
- **Impeller damaged**
- **Defective pump casing gasket permitting internal leakage**
- **Misalignment of pump and driving unit**
- **Bent shaft between pump and motor or engine**
- **Rotating part rubbing on stationary part of motor**
- **Packing gland too tight resulting in no water flow to lubricate packing and shaft**
- **Packing worn, improperly installed, or incorrect for operating conditions**
- **Cooling water not getting to water-cooled packing boxes**
- **Packing forced into pump interior**
- **Shaft or shaft sleeves worn or scored at the packing**
- **Shaft running off center**
- **Impeller or rotor (electric motors) out of balance**
- **Bearings worn**
- **Foundation or platform not rigid or mounting is loose**
- **Pipe not supported**
- **Under- or over-greasing of bearings or greasing sealed motor bearings**
- **Condensation of atmospheric moisture in the bearing housing**
- **Lack of lubrication or improper lubrication**
- **Scoring or rusting of bearings in turbine pump**
- **Improper installation of bearing, incorrect assembly of stacked bearings, and use of unmatched bearings as a pair (turbine pump)**
- **Excessive thrust (seen as shaft movement from mechanical failure or failure of hydraulic balancing device)**

### Troubleshooting Tables

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*ATTRA* Maintaining Irrigation Pumps, Motors, and Engines