Liquid Ring Vacuum Pump Startup & Troubleshooting

Startup

1. Pre-Installation Check

1.1. Open all cartons and inspect for shipping damage. Report any damage to your shipping carrier or NES Company immediately. Always verify that the pump nameplate Voltage, Phase, and Horsepower ratings as well as Amps rating on motor match your control panel and power supply. Warranty does not cover dam age caused by connecting pumps and controls to an incorrect power source (i.e., voltage and phase).

1.2. Site Inspection: The pump should be of the proper size and capacity for the pro posed installation. Refer to nameplate for rated capacities. Check motor voltage against available power supply.

2. Installation

2.1. Pump mounting: Install the vacuum pump on a level plane and fix with bolts though bolt holes onto the foundation. When transporting the pump we suggest lifting it with the lifting eye bolt. Pay attention to the capacity of hoisting equipment.

2.2. Pipe Connections: In order to prevent foreign matter from entering and potentially damaging your vacuum pump all piping connections have been plugged prior to shipment. It is important to leave all temporary plugs in place until you are ready to make the pipe connections to avoid allowing dirt or other matter from falling into the pump housing. All pipe connections should be made in a manner to avoid imparting stress to the vacuum pump. Connecting pipes which have the potential to push, pull, rotate, or vibrate the pump can severely damage the pump during operation. It is always best to install vibration, and or dresser couplings to reduce the potential for damage.

2.3. Air Inlet & discharge connections: The inlet connection piping should be fitted with a vacuum check and manual shut off valves in order to maintain a vacuum and prevent seal fluid backflow when the pump is not in service. When running the pump without a separator it is important to install a vacuum breaker set to break at >28”Hg on the inlet piping (see following figures). Exhaust pressure should not exceed 19 PSIG. In order to prevent weld slag and other installation debris from entering the pump it is suggested to install an inlet filter for the first 100 hours of operation.

2.4. Seal fluid connection: The seal water connection should include the following items; flow control valve, solenoid valve, manual by-pass, and y-strainer. Before starting the pump, it must be primed with seal water. Once the pump has been primed, seal water should be automatically turned off and on using a solenoid valve. When connecting the pump it is good practice to flush the pump out through the drain hole to remove any debris, oil, or lose particles that may have entered the pump during assembly and shipment.

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2.5. Seal fluid Operating Modes: When you purchase the optional discharge separator it is possible to recover up to 40 to 50% of the seal fluid by connecting the over flow drain pipe to the seal fluid port on the pump (consult factory for specific piping details) or for up to 100% seal water recovery with the addition of heat exchanger (consult factory for sizing).

WARNING: Do not run the pump dry or without verifying that it has a proper supply of seal water with a corresponding flow control valve. Running the pump with too little or too much water will result in excessive damage.

WARNING: When running the pump with no cavitation protection, the suction pressure should do not be lower than 2.36"Hg absolute when the water temperature is 60F and dry gas temperature is 70F. The higher the temperature is, the higher the lowest allowable suction pressure. Cavitation will cause excessive damage and load operation. To prevent cavitation install a vacuum breaker in the suction line to limit the ultimate vacuum level.

3. Startup - When starting up the pump follow the startup procedure:

3.1. Check all pipe connections to ensure the pump is plumbed correctly
3.2. Check that the all manual shut off valves are open
3.3. Check that the seal fluid is on and ready to fill the pump
3.4. DO NOT START THE PUMP UNLESS THE SEAL FLUID IS ON AND IT HAS BEEN PRIMED.
3.5. Open by-pass valve or manually actuate the seal fluid solenoid valve for minimum 20-30 seconds to ensure that the vacuum pump case is flooded so that the pump is properly lubricated, and can produce a vacuum when started.
3.6. Manually rotate pump by hand using the motor fan to ensure that the pump rotates freely. If necessary remove the fan cover and use a wrench. If the pump has been in storage for an extended period of time it may be necessary to jog it free prior to initial startup.
3.7. Kick start the pump using the manual start button to ensure that the pump is wired correctly and rotates according to the red arrow on the pump casing. If necessary reverse to polarity of the wiring to ensure proper rotation.
3.8. Start to vacuum pump and monitor the seal fluid flow rate. If necessary you may throttle back the seal fluid to obtain optimal flow rate (see table above).

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Troubleshooting

1. Pump will not start

1.1. Power supply not connected – check wiring to control panel and pump.
1.2. Incorrect voltage – check voltage and phases supplied to motor.
1.3. Pump, motor, or drive is obstructed – remove pump cover and drive guards and check for obstructions. Make sure the pump rotates freely.
1.4. Pump bound up by scale (rust) - on cast iron pumps check for internal rust if the pump has been idle or in transit for a long period of time. Check for deposits that may hinder rotation. Scale should be removed by acidizing, or in the case of NL, NAT, or NC pumps the rotors may be forced free by driving the rotor between maximum endplay positions. Consult factory for recommended procedures.
1.5. Pump bound up by scale (from hard water) - in locations with hard water check for scale deposit build up that may hinder rotation. Scale should be removed by acidizing, or in the case of NL, NAT, or NC pumps the rotors may be forced free by driving the rotor between maximum endplay positions. Consult factory for recommended procedures.
1.6. If motor is not tuning isolate it from the pump and re-check that it runs under no load conditions.

2. No suction on startup

2.1. Wrong direction of rotation – verify direction of rotation and reverse motor wire leads to correct.
2.2. Insufficient seal water supply – check owner's manual or consult factory to set appropriate amount of seal water flow. If unknown, manually adjust the seal water flow to create the maximum amount of vacuum or flow (read on a gauge) with the minimum amount of seal water. This is accomplished by starting with a manual valve in the full open position and turning it slowly down until the vacuum level begins fall slightly, then open back up slightly.

3. Low vacuum: poor system performance

3.1. Pump is providing sufficient suction – check the performance of the pump by slowly choking off the inlet side of the vacuum pump. As the pump becomes nearly blanked off it should be able to achieve high vacuum. Caution: Some vacuum pumps are able to sustain complete blank off and others might be damaged by it.
3.1.1. If the pump is able to achieve high vacuum (>25"Hg) then you may have a system leak or your vacuum pump is not producing enough capacity to sustain your system at a sufficient vacuum level. Check system for leaks and consult factory for methods to inspect and/or test the capacity of your vacuum pump.

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3.1.2. If the pump is not able to achieve high vacuum check the following:

3.1.2.1. Insufficient seal water supply – check owner's manual or consult factory to set appropriate amount of seal water flow. If unknown, manually adjust the seal water flow to create the maximum amount of vacuum or flow (read on a gauge) with the minimum amount of seal water. This is accomplished by starting with a manual valve in the full open position and turning it slowly down until the vacuum level begins fall slightly, then open back up slightly.

3.1.2.2. Components may be worn enough to create excessive internal clearances and reduced performance. Consult factory for procedures to verify performance, repair, or replace the worn out pump.

4. Noisy or high vibration during operation

4.1. Bearing failure - Noise is coming from the motor during operation probably indicates a bearing failure. Rotate the system or motor by hand and listen care fully to determine if noise is coming from bearings. Replace bearings and/or motor as necessary.

4.2. Pump Cavitation – If the noise is coming from the pump during operation and the vacuum level is relatively high (>24"Hg) the pump may be cavitating. The pump will vibrate and sound as if it has marbles inside. Check the factory performance curve and make sure the pump is not running above the maximum rated vacuum level. You may also bleed air into the system to reduce the vacuum level. If the noise is eliminated at lower vacuum levels it is most likely cavitation. Run the pump at a vacuum level that does not create cavitation, try reducing the seal water temperature, or consult factory for two-stage or other high vacuum options.

4.3. Drive System vibration/noise – vibration may develop because the drive system is improperly aligned (direct drive) or improperly tensioned (v-belt). Adjust alignment and/or tension as necessary to eliminate the problem.

4.4. Rotating components improperly balanced or damaged – the rotating components of the pump (rotor, shaft, cones, etc.) or the system (pulleys, belts, coupling, shafts) are not properly balanced or damaged. Consult factory and/or suppliers of other components for balancing procedures. If pump needs service consult factory for service procedures.

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5. Motor overload (high amps)

5.1. Flooded pump – check owner's manual or consult factory to set appropriate amount of seal water flow. If unknown, manually adjust the seal water flow to create the maxi mum amount of vacuum or flow (read on a gauge) with the minimum amount of seal water. This is accomplished by starting with a manual valve in the full open position and turning it slowly down until the vacuum level begins fall slightly, then open back up slightly.

5.2. Excessive loading - motor is overloaded by excessive load from rubbing components. Isolate the motor from the pump and determine if the problem is the pump or motor. If it is the pump, determine if the pump has scale build up (see section 1), If it is the motor consult a motor service provider.

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