Vacuum Pump Troubleshooting Guide

Vacuum Pump Systems, Inc.

Vacuumpumpsystems.com

HOW THE LIQUID RING VACUUM PUMP WORKS

The liquid ring vacuum pump has one moving part - a balanced rotor. This rotor is a cylinder of blades or vanes like a paddle wheel. The rotor is mounted in a circular housing that is off-center from the center of the rotor (see Figure 1 and Figure 2, Step 1-4). The housing is partially filled with a liquid, usually water. As the rotor turns, a "liquid ring" is formed by the rotating water, and the water is forced to follow the shape of the off-center circular housing.

On the compression side, water is forced into the spaces between the vanes by the wall of the off-center housing as the housing gets closer to the center of the rotor. On the opposite side, water is thrown out from between the vanes because the wall of the housing is farther away from the center of the rotor. The movement of the water in and out of the rotor creates a piston-like pumping action. We call this action rotating water pistons that fill, compress, and discharge with each rotation.

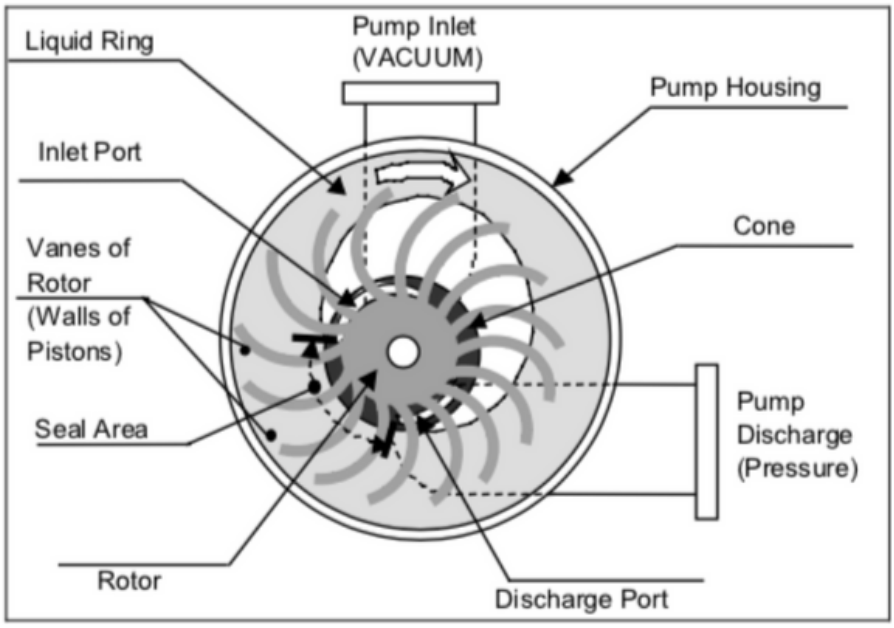


FIGURE 1: VOONER® Liquid Ring Vacuum Pump Interior

WORKING PRINCIPLES OF THIS PUMP

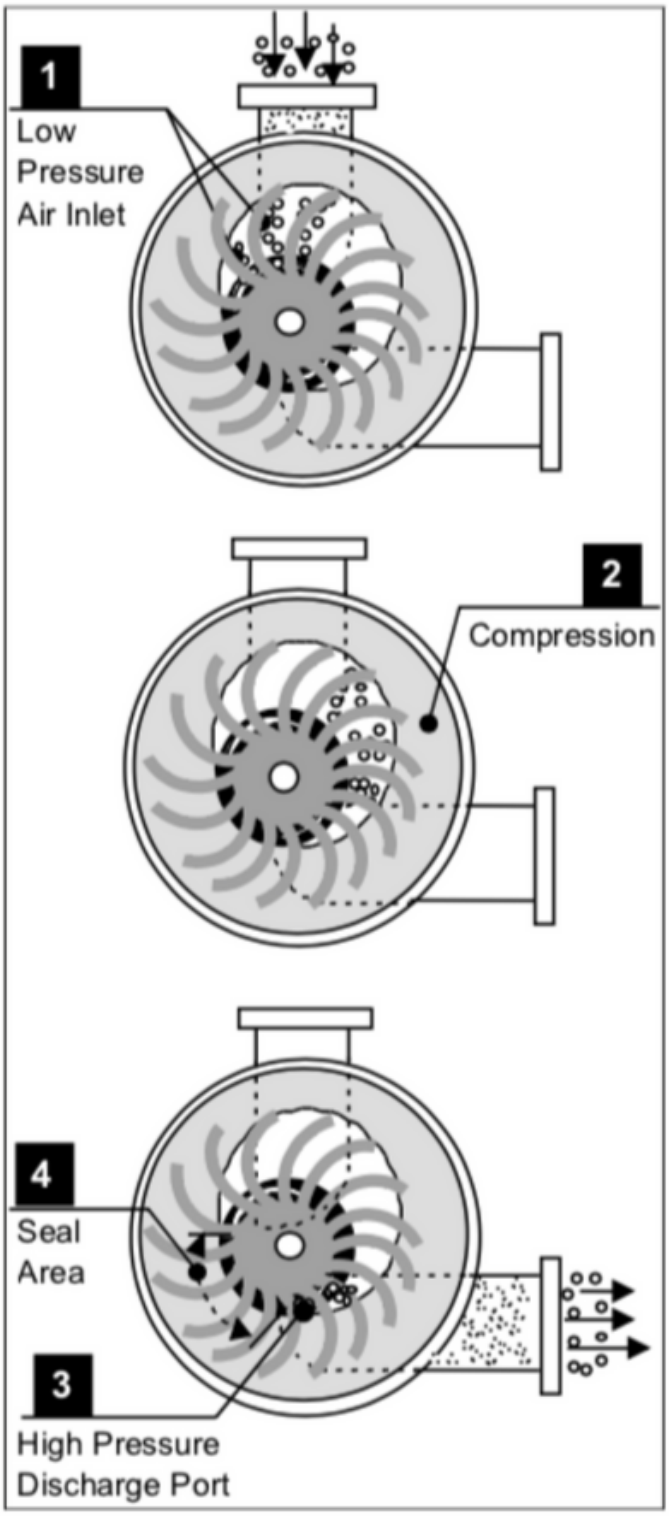
STEP 1 - When the water leaves the vanes, space is created for the air (or process) gas to fill I the chamber in the rotor vane.

STEP 2 - As the rotation continues, the air is compressed by the liquid ring as the water is forced into the rotor chambers.

STEP 3 - The compressed air is exhausted out of the chamber through the discharge port Some of the water goes out with the compressed gas.

STEP 4 - A seal area prevents high-pressure discharge gas from "slipping by" into the low-pressure inlet area. The chamber is noo empty and ready to start another compression cycle.

FIGURE 2: How the Pump Works



Vacuum Pump Systems

Click Here For The Vacuum Pump Systems Contact Page

LIQUID RING VACUUM PUMP TROUBLESHOOTING

First, make certain that process conditions have not been changed or adjusted since the last time the pump was known to be operating normally.

Symptom	Possible Causes	Solutions
No Vacuum	- Pump not rotating - Pump rotating backward - Pump is running dry - Defective vacuum gauge - Isolation valve improperly open or closed	- Check motor/starter - Reverse motor polarity - Feed sealant continuously - Replace gauge - Operate valves correctly
Reduced Pump Capacity or Insufficient Vacuum	- Air leak in the system - Low rotational speed - High sealant temperature - Low sealant flow rate - Inlet (suction) piping clogged or restricted - Undersized inlet piping	- Locate and repair - Check voltage, sheave sizes, belt tension, and gear speed - Adjust coolant flow and temperature - Increase flow - Clear inlet piping - Increase inlet pipe size
Vacuum Level Unstable; Pump Surging	- Pump operating below suggested min. vacuum- - High sealant flow rate- - High flow or widely varying flow of process liquid- through the pump inlet- - Inlet separator flooding - Low areas in inlet piping-	- Review system requirements & pump performance curves - Decrease Flow - Install inlet separator with barometric drop-leg or unloader pump - Check separator sizing, barometric drop-leg design, or condition of unloader pump - Locate and eliminate trapping liquid
Pump Binding	- built up of rust, scale, etc - - Foreign object in pump - Packing rings too tight - Clearances improperly set	- Clean pump interior/ process solids on pump interior - Remove object - Adjust packing rings - Readjust clearances

LIQUID RING VACUUM PUMP TROUBLESHOOTING

Symptom	Possible Causes	Solutions
Motor Overloads or Draws High Amperage	- High discharge pressure	- Check discharge line
	- High sealant flow rate	- Decrease flow
	- Too high rotational speed	- Check motor, drive components
	- Coupling/sheave misaligned	- Realign
	- Defective bearing	- Replace bearing
	- Pump binding	- See "Pump Binding" above
Pump Overheating	- Low sealant flow rate	-Increase flow
	- High sealant temperature-	- Check supply and adjust
	- Defective bearing-	- Replace
	- Coupling/sheave misaligned	- Realign
	- Pump binding	- See "Pump Binding"
Excessive Noise or Vibration	- Cavitation	-Seek to lower sealant temperature
	- High sealant flow rate	- Decrease flow
	- High discharge pressure	- Check discharge line
	- Coupling/sheave misaligned	- Realign
	- Defective pump or motor	- Replace bearing
	- Pump not properly anchored	- Anchor properly
	- Poor structural foundation	- Repair, improve foundation
Abnormal Bearing Wear	- Inadequate/excessive lubricant	-Review and initiate correct lubricatio procedures
	- Contaminated lubricant	- Inspect/replace sealing devices, flingers, and lubricant
	- Coupling/sheave misaligned	- Realign
	- Excessive belt tension	- Properly adjust belt tension
	- Strain from piping	- Support piping, use flexible connectors
	- Soft foot on pump	- Properly shim and anchor pump
	- High discharge pressure	- Check discharge line
	- High thrust load on out-board bearing	- Split service pump with a vacuum differential greater than 5"HgV from one side of the pump to other

LET US HELP YOU WITH YOUR VACUUM PUMP NEEDS AT VACUUM PUMP SYSTEMS, INC.

Click Here For The Vacuum Pump Systems Contact Page

At Vacuum Pump Systems it is our goal to provide solid value, help, and support for our clients in a way that will strategically make your business run more smoothly and successfully. It is our mission to do this with the utmost integrity and solid character in which you can trust.

Whether we can help with simple troubleshooting, provide parts, service, or replace your vacuum pumps, we have a team of knowledgeable experts to do so. We do everything possible to provide you with the equipment and systems knowledge to help keep your equipment running efficiently with less downtime.