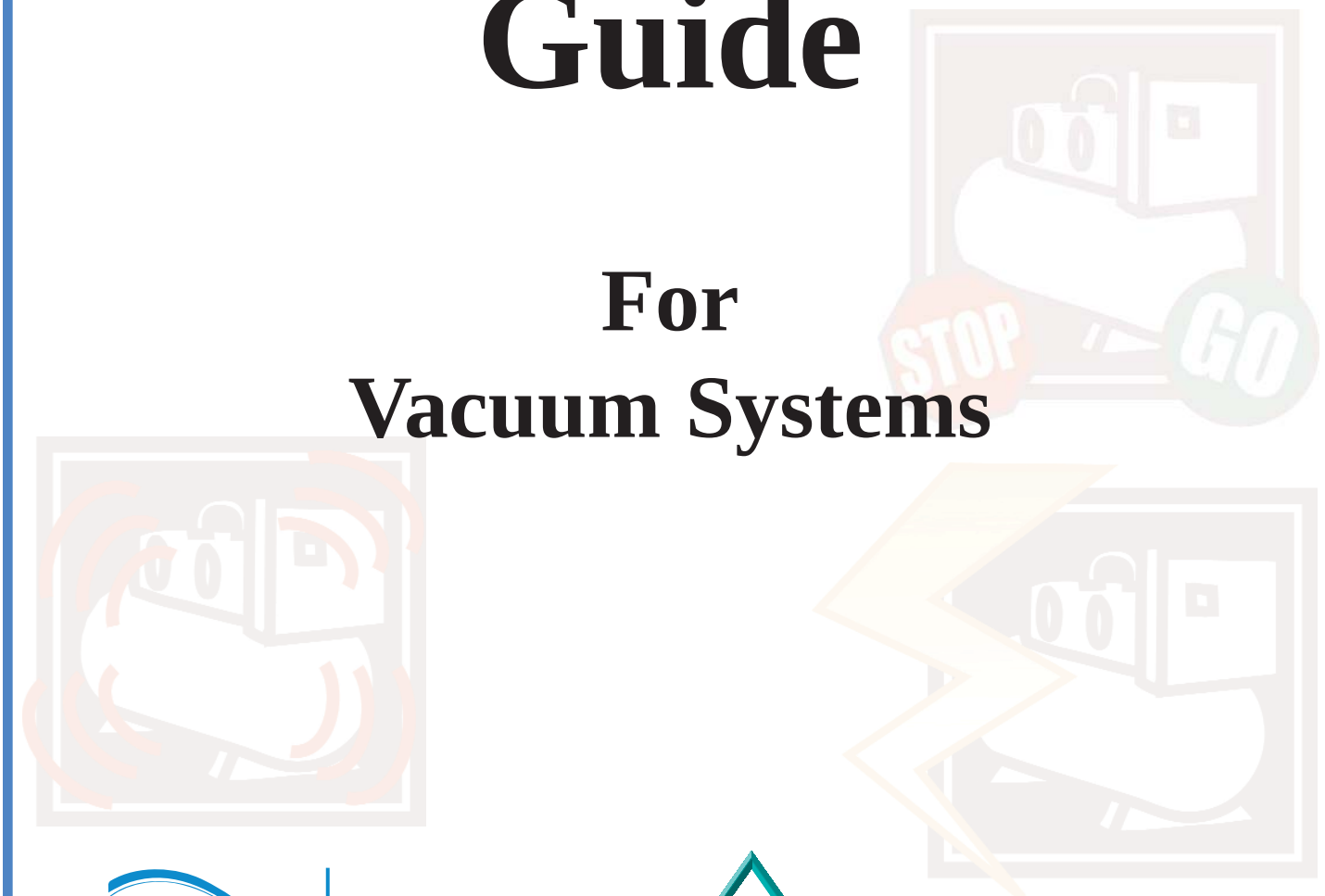
Troubleshooting Guide

For Vacuum Systems



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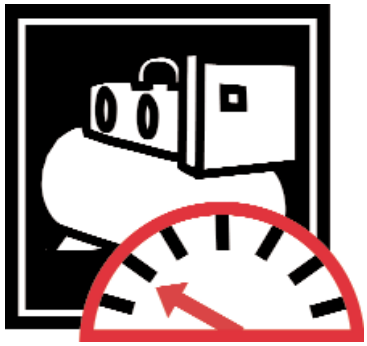
TROUBLESHOOTING - Rotary Vane

ROTARY VANE VACUUM SYSTEM



IF YOUR SYSTEM IS DOING THIS:

Providing a low level of performance.

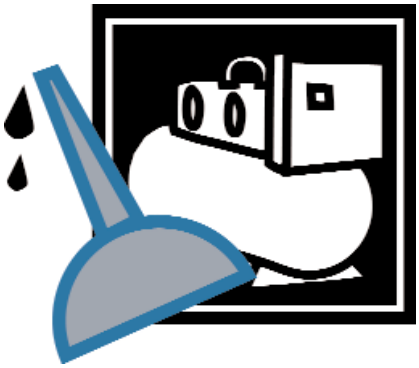
WE SUGGEST YOU CHECK THIS:

A. If your system is equipped with a **vacuum relief valve**, it **could be stuck open**. The purpose of the relief valve is to open to atmosphere if the vacuum level achieved exceeds the desired level, thereby protecting the pump and other system components. However, if **the vacuum relief valve seat is dirty or** stuck open, the vacuum pump will always pull air from atmosphere, reducing the desired level of vacuum.

B. The system could also have a **defective inlet check valve**. If it is partially stuck closed, this could impede the amount of flow through the vacuum line, reducing performance. If you have a multiplex system and one of the inlet check valves is stuck open, the other pump could be pulling vacuum through the pump with the bad valve, instead of only evacuating the process line. This situation could also cause reduced vacuum performance.

C. Your vacuum pump may also have **clogged exhaust filters.** Their purpose is to eliminate oil mist from the discharge line. However, if they become clogged with contaminant's, this could create excessive back pressure, resulting in poor performance.

D. Your pump could have **worn vanes**. Each time the pump is energized, the vanes slide out of the rotor and contact the cylinder wall. When the vanes become worn, they will contribute to reduced pump performance and will need to be changed. If the vanes become very worn, they could come out of the rotor when energized and create severe pump damage.



IF YOUR SYSTEM IS DOING THIS:

Experiencing oil blowby.

WE SUGGEST YOU CHECK THIS:

A. The vacuum pump could have a **defective discharge exhaust filter.** For example, the filter could have a broken seam, allowing oil to flow past the filter and into the exhaust line.

B. The **exhaust filter could be loose or not seated correctly.** A worn or unseated gasket seal could be the cause. Like situation A above, the oil would be able to escape past the filter and into the exhaust line.

C. It could be that the vacuum pump is **operating at too low a vacuum level.** In such a situation, the pump could be moving an excessive level of air flow, or CFM, allowing a substantial amount of oil to escape out the discharge.

D. The pump could have a clogged scavenger line. Most rotary vane pumps have scavenger lines that **scavenge the oil that normally passes the exhaust filters** back to the pumping chamber.

IF YOUR SYSTEM IS DOING THIS:

Generating excessive heat.

WE SUGGEST YOU CHECK THIS:

A. Your pump may have a **clogged oil to air heat exchanger. If the oil to air heat** exchanger is not clean and clear the heat exchanger will not function properly. The heat exchanger must be able to suspend the oil and allow air to pass over the fins to properly cool the oil.

B. The vacuum system may be subject to **heat generated by other equipment** in the room. This can be the case in mechanical rooms that have a lot of mechanical equipment located close together. Vacuum systems require a minimum amount of open space around them for ventilation and service. Make sure that your vacuum system is not directly in the path of heat rejection from other equipment.

C. The ambient **temperature in the room may be too high**. Most rotary vane vacuum pumps and systems are air cooled. One of the necessary conditions for effective heat control is proper room temperature. The room where your system is located may require additional ventilation or an external source of cooling brought to the room. Make sure to follow manufacturers recommendations regarding maximum allowable ambient temperatures for your system.

D. You may consider retrofitting your pumps for **liquid cooling.** If your facility has a source of chilled water, you may be able to liquid cool the pump oil through a liquid to liquid heat exchanger.

E. You may also consider the **use of synthetic oil** if allowed by the pump manufacturer. Many synthetic oils are more tolerant to high temperatures, resulting in less oil break down and possible longer service intervals.

TROUBLESHOOTING - Rotary vane

IF YOUR SYSTEM IS DOING THIS:

Frequent starts and stops.

WE SUGGEST YOU CHECK THIS:

A. Your system may have a **worn vacuum switch.** This could result in sending signals to the motor to start and stop more frequently than necessary.

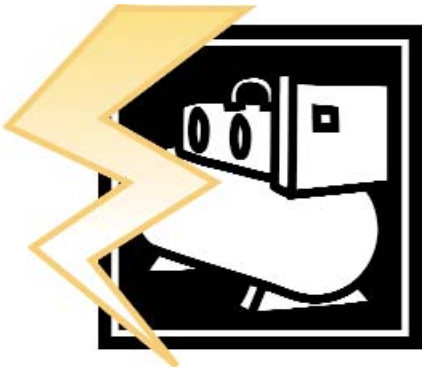
B. If your system is a multiplex system, the pump other than the one starting and stopping excessively could have a **defective check valve** on it. If it is stuck open, the valve may cause the other pump to start and stop excessively, as it is trying to maintain vacuum from a partially open vacuum line.

C. The system vacuum switches could be set at **differential pressures that are too close** together. The closer the differential pressures are set, the more the pumps will be energized, attempting to meet the switch settings.

D. **No minimum run timer**. Some systems, particularly larger ones, operate best when equipped with a minimum run timer. Such a device is designed to ensure that the pump, once energized, will run for a specified minimum time before shutting off. This device is used to help save energy due to excessive power inrush and heating of pump motors.

IF YOUR PUMP IS DOING THIS:

Experiencing high amp draw and motor trip out



WE SUGGEST YOU CHECK THIS:

A. **Low line voltage**. Power consumption is a function of line voltage and amperage draw (P=I x E). If the facility's line voltage dips below required levels, the pump and motor may draw excessive amps, resulting in excessive heat and motor trip out.

B. The motor starter could have a **worn or pitted contactor**. Such a situation would not allow the contactor to handle the proper level of amperage, causing it to interrupt power to the motor prematurely.

C. There could be a **loose wire** in the main power feed or the circuit to the pump motor. Loose or inadequate wire connections will cause excessive resistance and subsequent high amp draw.

D. Your pump could have **restricted discharge filters**. This condition could cause excessive back pressure, resulting in high amp draw and motor trip out.

E. Your pump could also have highly **contaminated** oil due to the ingestion of particulates. Such oil breakdown could cause the pump's motor to trip.

F. **A weak motor**. If the pump's motor is old, it could become weak due to numerous occasions of heating and cooling. The motor may need to be replaced.

IF YOUR PUMP IS DOING THIS:

Making a loud chattering noise.

WE SUGGEST YOU CHECK THIS:

A. The pump's **vanes may be worn** and need replacing. Whether your rotary vane pump is oil sealed or dry running, the vanes will eventually wear. The chattering noise **could be caused by the excessive travel required when vanes are worn past the manufactures specifications.**

B. The pump's **cylinder may be wash boarded** due to contaminated oil or the ingestion of particulates into the pumping chamber. Due to the tight clearance between **the** vanes and **rotor slots**, **contaminated oil or particulates in** the pump's cylinder **could cause the vanes to come out of the rotor slots on an angle, damaging** the vanes, cylinder, or both.

TROUBLESHOOTING - Liquid Ring

LIQUID RING VACUUM SYSTEM

IF YOUR SYSTEM IS DOING THIS:

Making a noise that sounds like marbles rolling around inside

WE SUGGEST YOU CHECK THIS:

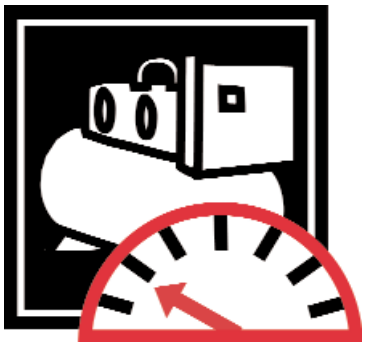
A. The pump could be operating at a vacuum level that is too deep for its intended use. To make this determination, please consult a performance curve or chart for your pump model. One way to limit the maximum attainable vacuum level is to use a vacuum relief valve near the inlet of vacuum pump. When the vacuum level exceeds the setting of the relief valve, it will open and bleed in air from atmosphere.

B. It could be that your pump is starved for water or that the sealing water temperature is too high. Remember that a liquid ring vacuum pump needs water to form a “ring” as it pumps water into a progressively smaller cavity. The normal water level in a liquid ring pump is the centerline of the pump’s shaft. Do not overfill the pump past the shaft centerline or the pump’s impeller and/or shaft could be damaged. The most common method used to determine when a liquid ring vacuum pump is starved for water is to install a compound gauge on the water recirculation line, when operating between the ranges of 0-25” Hg, the compound gauge should read between 0-10” Hg. Any reading deeper than this is a good indication the vacuum pump is starving for water.

C. The check valve at the inlet of the vacuum pump could be defective. This is a mechanical device that opens and closes when the pump turns on and off. Over time, the valve could become defective due to corrosion or the introduction of particulate matter. This should be checked to make sure that it is opening and closing properly.

IF YOUR SYSTEM IS DOING THIS:

Providing Low Performance



WE SUGGEST YOU CHECK THIS:

A. You might have a clogged Y-Strainer in either the makeup water line or supply water line. Y-Strainers are used to filter out particulates in the water lines and can be serviced by twisting off the cap, pulling the screen down from the housing, and cleaning the screen.

B. Your sealing water may be too hot. Keep in mind that the stated capacities of water sealed liquid ring vacuum pumps are dependent upon proper water temperature, usually around 60 degrees F.

If your water temperature rises significantly above that, your pump's performance is likely to decrease, especially at deeper vacuum levels. If your system is equipped with a liquid to liquid heat exchanger, such as a plate and frame or shell and tube type, check it to make sure it is not clogged, preventing water flow through it. Depending on the type of heat exchanger you have, it could be cleaned or it may have to be replaced.

C. Your inlet check valve is partially closed, restricting flow. This is a mechanical device that can become contaminated over time and it may not open and close as needed.

D. Your pump may be worn out, needing replacement. Over time, mineral deposits can build up on a liquid ring pump, or the internal parts may become rusted beyond repair. When this happens, performance of the pump will suffer.

IF YOUR SYSTEM IS DOING THIS:

Experiencing excessive water loss

WE SUGGEST YOU CHECK THIS:

A. Your makeup water pressure may be too high. If this is the case, the high pressure water may be forced through the pump, causing excessive water use.

B. The solenoid in the makeup water line may be stuck open. Many systems are equipped with a solenoid valve in the makeup water line that is designed to open and close when the pump needs water, either for more cooling or for basic operation due to low water level. If the solenoid is stuck open, water will continually flow, whether the pump needs it or not, causing a waste of makeup water.

C. Level switch malfunction. Many systems are equipped with a level switch in the water reservoir or separator. Its job is to indicate when the water level is too low, causing the inflow of makeup water. If the switch is defective, it could be triggering the makeup water solenoid to remain open, even if there is an adequate level of water in the reservoir.

D. There could be a restriction in the vacuum discharge line. Such a restriction, such as a plugged vent line or significant water build up in the vent line, could create excessive back pressure, resulting in water loss.

E. You may be operating your system in too low a vacuum range for its intended operation. This will cause excessive water discharge from the vacuum pump.

F. System is a once-through configuration. Many older systems are configured for once through operation, but can be converted to either partial recirculation or total recirculation. Partial recirculation uses available city water to join some discharge water to maintain temperature. Total recirculation systems require a source of chilled water to maintain temperature.

TROUBLESHOOTING - Liquid Ring

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Frequent starts and stops.

WE SUGGEST YOU CHECK THIS:

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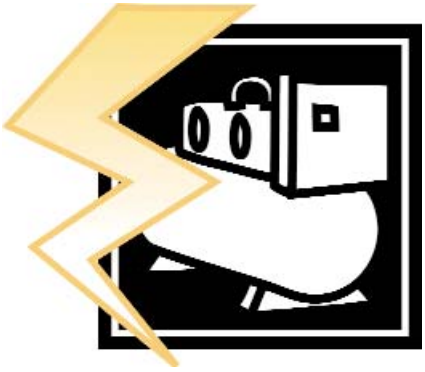
Experiencing high amp draw and motor trip out



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B. The motor starter could have a defective contactor. Such a situation would not allow the contactor to handle the proper level of amperage, causing it to interrupt power to the motor prematurely.

C. There could be a loose wire in the main power feed or the circuit to the pump motor. Loose or inadequate wire connections will cause excessive resistance and subsequent high amp draw.

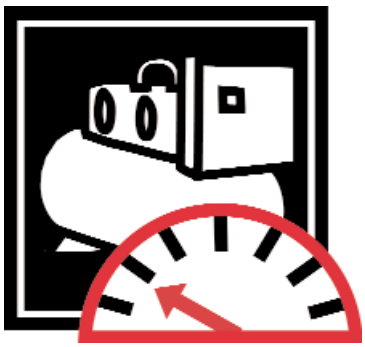
D. Heavy rust or scale buildup in the pump. If the pump is old or the seal water contains significant mineral deposits, the pump may build up heavy scale or rust. This will present a heavy load on the pump's motor and could cause it to trip out.

E. A weak motor. If the pump's motor is old, it could become weak due to numerous occasions of heating and cooling. The motor may need to be replaced.

F. Excessive sealing water in pump or excessive liquid carry over to the pump's inlet. Too much liquid in the pump will cause high amp draw and could damage the pump.

IF YOUR PUMP IS DOING THIS:

Low Performance—Oil Sealed Systems Only



WE SUGGEST YOU CHECK THIS:

A. Clogged Y Strainer. As mentioned, Y strainers are used to catch contaminant's in sealing and cooling liquid lines. If one of them in the sealing oil line is clogged, the pump will not perform adequately.

B. Plugged Heat Exchanger. Oil sealed systems can be cooled by either a liquid to liquid or liquid to air heat exchanger. If the heat exchanger is clogged, the pump will not receive adequate sealing oil to perform its work.

C. Inlet check valve partially stuck closed. Such a condition would restrict inlet air flow, lowering performance considerably.

D. Clogged exhaust filter. Most oil sealed liquid ring vacuum pumps are equipped with oil mist exhaust filters attached to the oil/air separator. If the filter is clogged, it could create back pressure, restricting air flow through the pump.

E. Oil scavenger line open too much. The scavenger line is used to route oil trapped by the exhaust filter back to the oil reservoir. If the line is open too much, the pump could be pulling air from atmosphere, resulting in low performance.

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Ohio Medical Corporation - 1111 Lakeside Drive - Gurnee, Il 60031-4099
Phone: 800-448-0770 - Fax: 847-855-6300-
wwww.ohiomedical.com