Handy Checklist:How to ImprovePumpKnow-How andCut Downtime

A diligently maintained pump can reduce your costs while increasing efficiency. This review offers suggestions for minimizing pumping time, cutting fuel consumption, and ultimately boosting profits

By Mike Austen

It's no secret that a pump that runs at peak efficiency uses less fuel, experiences less downtime, and costs less to operate. The time you spend maintaining your pump is actually an investment in its lifetime performance and value. In fact, there are many ways that a diligently maintained pump can reduce your costs while increasing efficiency. For instance, by ensuring your pump investment brings an ease-of-service design, the time you spend on maintenance can be significantly minimized.

Using the information below, see if you can identify your own trouble spots and uncover potential solutions to get back on the road to good pump health, boosting profits along the way.

First, let's review the commons signs of inefficiency in a self-priming centrifugal pump.

1. A noticeable difference in pump flow.

Take notice of the discharge flow. Has it visibly decreased? Is it taking your pump longer to do the same job than it used to? The slowed flow may be caused by a collapsed suction hose lining, a leaking gasket, a plugged suction line, or a damaged or worn impeller or wear plate.

To determine the cause of any decrease in flow, the discharge pressure and the suction vacuum should be measured while the pump is operating. If the pump discharge pressure and suction vacuum were measured at start-up, the latest readings should be compared to the originally recorded readings. When troubleshooting any pump and system, follow the high abnormal reading taken earlier. A higher than normal discharge pressure reading indicates a decrease in suction vacuum and could be a sign of a clogged or partially clogged discharge line, a closed valve, air unable to evacuate, or any obstruction outboard of the point the gauge was installed into the discharge line. It's a common practice to install gauges approximately two to four pipe diameters from the pump.

Both gauges can also decrease. If they do, the problem is located between the installed locations of the gauges. In this case, the problem is within the pump. A clog at the eye of the impeller, wear, wide clearances, and air induced into the suction line could all cause both gauge readings to decrease. Note that gauge readings almost always teeter back and forth. But again, follow the problem to the highest abnormal gauge reading.

2. The pump isn't re-priming as rapidly as it once did.

Most commonly, slower re-prime can be attributed to excessive face clearance. If this is not the cause of your slowdown, check to see if the seal is leaking, if all hardware at gaskets is tight, if the cutwater section of the volute is badly worn, and if the re-circulating port is clogged.

A maximum vacuum check can be performed to determine the location of the problem. Fill the pump with the minimum amount of water than what the volute casing normally retains for re-priming. To do so, simply remove the suction flap valve, priming the volute casing and energizing the pump. After the pump achieves dynamic operation, turn the pump off and allow the liquid in the pump to return to the sump.

Whatever product remains in the volute casing is the minimum left for a re-prime cycle. Install a vacuum gauge on the suction side of the pump and close a valve in the suction line outboard of the gauge. If there are no valves in the suction line, a solid gasket without an inside diameter hole may be installed in a pipe joint to create a "valve" effect. Energize the pump and inspect the vacuum gauge. The pump will pull a vacuum against the closed valve or solid gasket. This reading is the equivalent to the pump's lift capabilities. If a vacuum gauge calibrated in inches of mercury is used, multiply that reading by 1.13 to convert to feet of water.

3. The pump is making excessive noise.

If your pump sounds like a bunch of marbles rattling in a can, this may be an indication of cavitation and could be caused by a suction lift that is too high; a suction hose that is too long, plugged, or has a collapsed lining; a clogged strainer; a combination of any of these; or perhaps a problem on the discharge side of the pump.

Failing bearings can also cause excessive noise. Noise should be qualified as mechanical or hydraulic noise. Run the pump briefly without water. If the noise is no longer present, the noise is one of a hydraulic nature. If the noise is present after removing the product, the noise is mechanical. A quality set of gauge readings will direct your attention to the problem side of the system if the noise is deemed to be hydraulic.

4. The pump is clogging frequently.

If a pump's suction check valve is clogged, the strainer may be too large or too small, or face clearance could be too wide. Alternatively, the strainer may be stuck in mud, plugging the suction side.

5. The pump is overheating.

In this case, very likely, the flow of liquid in or out of the pump is being restricted. Improper impeller clearance could be slowing re-priming, the suction strainer or recirculation port in the volute casing may be clogged, or the pump's ability to handle air through an air release line, air release valve, or open-ended discharge line may be obstructed. Never open a hot pump. Allow the pump to cool to the touch prior to opening. Even after cooling, there may be lingering pressure inside the volute casing.

Next, let's review ways to achieve peak efficiency and profitability. Here is a checklist for the suction line, the pump itself, and the discharge line.

1. The Suction Line

Check for air leaks.

Using a vacuum gauge, make sure that the suction line, fittings, and pipe plugs are airtight. Certain pumps have a tapped hole for easy connection of a vacuum gauge. Use pipe dope to seal gauge threads and pipe plugs. A vacuum gauge will fluctuate or give erratic readings while handling air during operation. At shutdown, the suction gauge reading will display the vertical distance from the gauge tap to the product level. If this vacuum falls off after shutdown, atmospheric pressure is entering the suction pipe, causing the pump to lose its static lift. Replace the suction flap valve if worn, and check for air leaks if the product returns to the sump. Replace leaky seals and badly worn hoses if necessary.

Check the suction hose lining.

The rubber lining in a suction hose can pull away from the fabric, causing partial blockage of the line. If the pump develops a high vacuum but low discharge pressure, the hose lining may be blocking suction flow. Gauge readings during operation will be higher than normal with the lining collapsed. To rectify this problem, simply replace the hose.

Check the suction strainer.

Frequent inspection and cleaning of the suction strainer is particularly important when pumping liquids containing solids. Gauge readings during operation will be higher than normal if debris obstructs the flow through the strainer. Always use the proper size strainer to prevent the pump from clogging.

2. The Pump Itself

Check the volute casing, impeller vanes, wear plate or wear rings, and

attaching hardware.

A removable cover plate on the pump allows for quick, easy access when inspection of the impeller and wear plate is needed. These components should be inspected every six months or sooner, depending on the pump application, because they are subject to faster wear when pumping abrasive liquids and slurries.

Some wear plates and wear rings can be replaced without replacing expensive castings. A shut-off test can be performed to measure the internal wear. Start the pump and allow it to achieve full flow. Slowly close a discharge valve and record suction and discharge gauge readings. Those reading should equal the maximum pressure noted on the pump performance curve at zero flow.

Check the impeller clearance.

Pumping efficiency will be reduced if the clearance between impeller and wear plate or wear rings is beyond the recommended limits. If the clearance is less than recommended, components will wear by rubbing, causing excess work for the engine or motor. Check the impeller clearance against the pump manual's specifications and adjust it if necessary. A shut-off test can be performed to verify not only wear but also face clearance.

Check the seal.

Better pumps are equipped with a double seal, which is lubricated under pressure by a spring-loaded grease cup, or an oil-lubricated seal for long, trouble-free service. Some pumps are equipped with a single seal that is lubricated by the liquid being pumped. Sand or other solids can cause rapid wear of the seal faces. Check and replace the seal if worn. The maximum vacuum test will qualify the integrity of the pump's seal. Replace the seal liner or shaft sleeve if they have scratches.

Check the bearings.

Worn bearings can cause the shaft to wobble. Eventually, the pump will become noisy and overheat. Worn bearings will reflect higher amperage readings due to the increased wear. Sooner or later, it will freeze up and stop. Replace bearings at the first sign of wear to alleviate destructive damage caused when bearings fail catastrophically.

Check the engine or motor.

The pump may not be getting the power it needs to operate efficiently. The engine may need a tune-up, or the motor may need service. Refer to the owner's manual often for optimum efficiency.

3. The Discharge Line

Check the operating condition.

Check air release devices, valves, check valves, and shock control devices for proper operation. Old discharge lines are subject to internal rusting and pitting, which cause friction loss and reduce flow by as much as 15 percent. A discharge gauge reading will increase with the additional losses. Replace badly deteriorated lines.

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