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Pump Purchasing 201
Not-so-common tips you should know before making a pump decision
By Craig Redmond, P.E.

Today, information about sizing a pump correctly, buying one rationally, and related material are readily available regarding most pumping applications. But it's what isn't so commonly shared that can lead you to disappointment and unnecessary headache.

Many areas should be considered that could, indeed, affect pump life and quality, and the quality of the application – above and beyond pump performance. Consider these key factors before finalizing your hardware and application choices to increase pump reliability, substantially reduce the total cost of ownership, and increase the product's return on investment.

ABRASIVES
Many applications feature particles suspended in the pumped fluid. The solids range in size from small bits of sand and rock, to potato scraps or sewage. What's being pumped could be very abrasive, with the texture of liquid sandpaper that quickly wears away metals. Knowledge about material science can assist in warding off erosion.

Austempered ductile iron (ADI) is a very hard material that can protect the inner workings in an abrasive environment. CD4MCu, a hardened stainless steel developed for chemical and abrasive applications, also is suitable for wear parts, including wear plates, seal plates and impellers. Many other components also are at risk, such as the volute and

pump shaft. In some cases, a hardened volute of either ADI or CD4MCu and hardened shaft, manufactured with 17-4 PH, a type of stainless steel, are available to meet the rugged needs that some pumping applications demand.

Hardened shaft sleeves also are available for those tough applications, as are hard mechanical seal faces fabricated from silicon carbide or tungsten carbide. These hard seal faces won't deteriorate very rapidly in a harsh, abrasive environment.

A less-than-suitable material might already be installed in an existing abrasive application. In this case, knowing what questions to ask when considering a better solution can be critical. If you're pumping abrasives, hardened components count for a lot. Premature seal failures lead to increased downtime and maintenance expense, while worn impellers and other wear parts can lead to decreased pressure and flow.

SERVICEABILITY
A primary cost of ownership is the time required to maintain a pump. At some point, every pump will require maintenance. Repairing it quickly and efficiently saves money. Being able to remove the rotating elements without disturbing the plumbing saves valuable time. Investing in a pump with a back cover plate is a smart move. Also, over time, abrasion and wear will open up internal clearances, so you'll need a way to renew those clearances easily.

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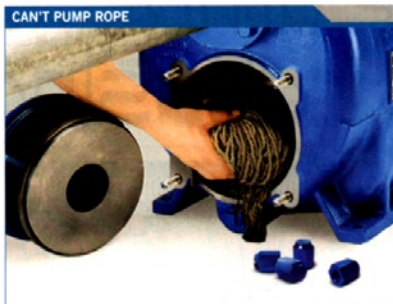


Figure 1. It's important to have access into the pump without having to disturb the plumbing or drive.

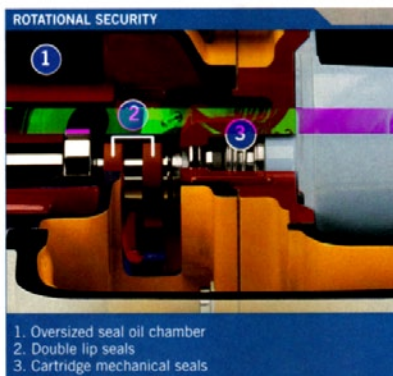


Figure 2. Attention to the seal area of the pump can extend its life.

Self-cleaning features reduce the frequency of clogs forming when stringy matter is being pumped (Figure 1). Clog-prone applications might include sewage, meat processing, hair and rags – anything that can wrap around something else. Resisting clogs maintains efficiencies and decreases downtime.

OEM PARTS AND AVAILABILITY

Nobody buys a pump just to admire it. Pumps are intended to get the work done. And, if a pump fails, the need for that work to be completed continues. You'll need to have ready access to spare parts to get the pump back up and running.

There are several smart reasons to invest in OEM parts: because a manufacturer's reputation is at stake, your assurance of getting quality and reliability are increased. The

manufacturer invested years - often decades - of research and development to ensure product quality. By providing basic information off of the pump nameplate, you should be able to rest assured you will receive the correct parts, in the correct materials when you order from the OEM. When you add it up, investing in OEM parts is an intelligent insurance policy.

SHAFT SEALS

Historically, there are two approaches to do this. Mechanical seals allow for nearly zero leakage. Packing, on the other hand, allows a small amount of leakage along the shaft. Mechanical packing, however, isn't considered state-of-the-art because it decreases efficiency while increasing the need for maintenance. The packing often scores the pump shaft, making it difficult to

WHEN A SPINNING PUMP ISN'T MOVING FLUID, AN ALTERNATIVE MEANS OF LUBRICATION GREATLY INCREASES SEAL LIFE.

SHAFT SEALS

A variable is whether there's a reservoir of lubrication for the seal. An oil reservoir helps to lubricate and cool the seal, extending seal life (Figure 2). Of further concern is dry-running or a blocked suction line. When a spinning pump isn't moving fluid, an alternative means of lubrication greatly increases seal life.

Still, if a pump requires frequent maintenance, consider using a cartridge seal, which usually carries a price premium. Another option is a relatively inexpensive, fully internal pump cartridge seal, which can be used on many pumps (Figure 2). It requires minimal disassembly to install properly.

Furthermore, seal sleeves, which protect the mechanical seal, are a vital consideration. Without one, the shaft itself might become damaged during the life of the pump, requiring the entire shaft to be replaced. Sleeves act as sacrificial parts, but, in an effort to cut financial corners, end-users at times overlook the additional value.

PACKAGE FABRICATION

When you invest in a pump, getting it mounted and driven can be a challenge. The end user, a distributor or an OEM are typically involved in specifying the entire package – the pump, the motor, the base, the guards and the controls. Involving the OEM in package fabrication will capture the decades of experience it has gained in putting packages together. The OEM is then responsible to make sure all components are compatible with each other and gives the end user one supplier to contact rather than separate suppliers for each component. Top OEMs will be able to

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test most packages prior to shipment to confirm all components are functioning properly. Considering each step involved in the design, sourcing, control selection and component manufacture, it's often best to use the OEM's experience.

CONDITION POINTS
Most experts encourage sizing a pump by means of a system curve. The intersection of the system curve and the pump curve is called the condition point - the head and flow the pump will provide.

That point of intersection is based on several assumptions and uncertainties. A plumbing change, a hardware change or a change in the required operating point itself all could arise. As a result, a fair amount of uncertainty exists in most system head calculations. Some pump styles are more forgiving of less-than-perfect condition point assumptions. This technology can play well in the end user's favor.

If the performance curve is steep, the head drops relatively rapidly compared to the flow. An error in the system calculation probably won't alter your condition point dramatically. A flatter curve, however, is much more of a concern.

You can compensate for lower-than-expected flow or a process-related flow demand increase by replacing a trimmed impeller with a larger one. Also, you can increase the pump speed, as long as you keep it within the manufacturer's standard operating range. A pump whose speed can be altered is a big advantage. Changes in belts and sheaves might yield the desired performance.

Many pump manufacturers don't design pumps to withstand V-belt loads, which imposes an additional force on the shaft. A pump that handles V-belt loads also allows for simple changes in belts and sheaves to achieve the desired flow and performance.

Some pumps must be able to function at multiple operating points. In these situations, impellers often are trimmed to meet specific applications. As a result, it's possible to have four identical pumps in use with four different impeller diameters. This makes stocking replacement parts for emergencies more expensive. A better approach would be

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THOUGHTS TO PONDER

Some additional points that might be helpful to ponder before making a final decision about an application or solution:

- How will the unit toggle on and off? Will it be done manually by the user or tied into an automated system with floats, pressure switches or level transducers?
- Packages with natural-gas backups often are a smart way to go in mission-critical applications. In the event of a power outage, pumps will continue to operate.
- Most systems also will require a discharge check valve at some point. How will this be sourced? Will it be part of the pump, or will it be installed later? Should it be purchased from the OEM? Asking questions up front can be helpful in the quest to offset expenses in the later stages of the engagement, or throughout the life of the application.
- Is the pump self-priming? If so, it's possible that an air release valve will be needed.
- If troubleshooting is necessary, gauge readings make the process considerably easier. You might want to order pumps with suction and discharge gauges already mounted so sourcing individual components is no longer necessary.

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to specify one pump, but use different speeds instead of different impeller diameters. You'll need to keep only one set of repair parts on hand. This becomes even more of an advantage when the pump uses a rotating assembly that can easily be installed.

OTHER ADD-ONS

Thermal shutdown devices are an option you might want to consider in your pump planning. If the pump is expected to run dry at any time, it will generate additional heat. Thermal-monitoring technology installed in the pump can be wired back to a control. If the pump overheats, the control shuts it off. If the pump is to be operated in a cold environment, a casing heater could be a smart investment to ensure that fluid doesn't freeze in the pump.

In short, begin your pump journey with the final goal in mind. It'll pay dividends for the plant or operation. For additional information or to address specific questions, contact your distributor, a manufacturer or a pump expert to educate yourself. When it comes to pumping applications, a dose of prevention often is worth a lifetime of hurt. ☺

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