Smart Pumps: Frequently Asked Questions

Check out this FAQ to help you navigate some of the biggest questions about smart pumps. Find more resources at betterbricks.com/pumps.

What applications are best suited for pumps?

Pumps are in nearly every building, and service a variety of industries and applications. In commercial buildings, chillers and boilers produce cold and hot water which are distributed via piping systems by pumps. This water for cooling and heating is essential to the hydronic HVAC systems used in many buildings. Rooftop cooling towers also use pumps as part of the process to remove heat from large buildings on hot summer days.

Another important job for pumps in commercial buildings is pressure boosting. Water pressure provided by the city is insufficient to bring water to the higher floors of a building; therefore, pumps are needed to increase the pressure and move water to all the areas it is needed.

In municipal water systems, water is brought from rivers, wells, and reservoirs to water treatment facilities before being transferred via pressurized piping systems throughout the community.

Industrial facilities also rely on pumps to transport clean water used in various manufacturing applications. This pumped water is necessary to cool off materials, maintain specific water pressure, clean products, and aid in many manufacturing processes.

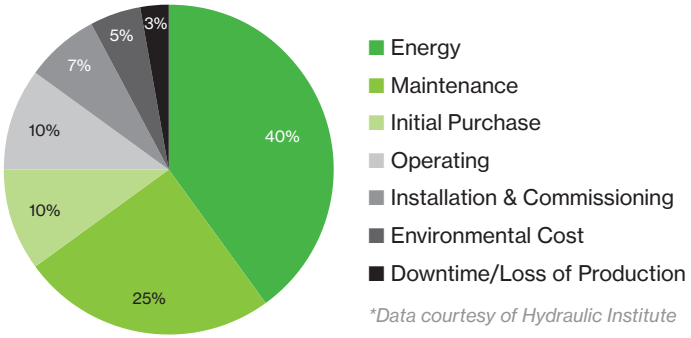
Pumps are also commonly used for agricultural irrigation to lift water up from groundwater wells and move it from reservoirs or canals onto crop fields. Check out the Imagine a World Without Pumps resource from Hydraulic Institute to see other ways pumps impact your daily life.

What should I consider when purchasing a pump?

Energy use and total lifecycle cost are two of the biggest factors to consider when purchasing a pump. The energy a pump uses amounts to 40% of the total lifecycle cost of owning a pump. When combined with maintenance, that number increases to 65%.

When investing in a new pump, many people mainly focus on the initial purchase price, installation, and commissioning, which only equates to approximately 17% of the total lifecycle cost. Even though the general focus tends to be on buying a pump without going over budget, understanding this factor can help you see the bigger picture and not miss the long-term opportunity. Installing the right pump for your application can result in overall process efficiencies that may reduce your building's energy costs.

Lifecycle Cost of a Typical Pumping System



Data courtesy of Hydraulic Institute

How can I compare available pump options?

The Hydraulic Institute Pump Savings Calculator can help you make a side-by-side comparison of all investment factors – including model types, installation costs, and using a variable speed drive – to provide an estimate of expected energy savings over the life of the pump. The calculator accounts for elements such as speed control, efficiency, maintenance, and other useful data. You can also estimate payback, internal rate of return, and total cost of ownership.

Although many pump buyers are used to seeking a like-for-like replacement or the lowest cost option, it is important to consider long-term impacts during the decision-making process. Understanding the lifetime cost of ownership can reinforce why energy savings is a key variable in making the right investment. The long-lived nature of the product means a new pump purchase may only happen once every 10 to 15+ years.

How can I tell what an individual smart pump has to offer before I purchase the product?

Hydraulic Institute collaborated with manufacturers, the U.S. Department of Energy, and other organizations to develop the Energy Rating Label. This labeling system applies to commercial and industrial pumps (C&I) and circulator pumps and is featured on the product package.

- **The C&I Pump Label** was created in 2020 to provide a streamlined, at-a-glance approach to understanding the efficiency of a pump. Rather than relying on manual calculations, the label features numbers and measurements indicating how much more efficient a specific pump is, compared to the federal baseline for pumps allowed to be sold in the United States. Read "A Tool for the Future: Commercial and Industrial Energy Rating Label," for a more in-depth look at the C&I Label, including explanations about the featured data and how it helps buyers select the right pump, increase efficiency, and save money.

- **The Circulator Pump Energy Rating Label** is similar in appearance to the C&I Pump Label and is designed to assist those who need guidance with new projects and/or are retrofitting older pumps. In addition to the energy rating and energy savings, the label features information about the Circulator Energy Index and lists control methods that may be available on the pump. Read "A Closer Look: Hydraulic Institute's Circulator Pump Energy Rating Label," to learn the importance of these features and the suitable applications for these types of pumps.

What should I consider to improve the efficiency of my pump?

There are three main ways for pumps to become more energy efficient.

1. **Hydraulic efficiency:** Manufacturers are improving their hydraulic engineering, making tolerances between moving metal pieces smaller and tighter, using advanced materials, and creating better designs for impellers. The better the hydraulic efficiency, the more efficient the pump. However, there is less room for improvement with hydraulic efficiency due to physical limits, whereas additional efficiency opportunities are present with motors and drives.
2. **Motor efficiency:** Motors are already generally quite efficient in the United States. One way to get more efficiency in the motor is to deploy an Electrically

Commutated Motor (ECM). ECMs use permanent magnets and electronics to spin the motor and are more efficient than permanent-split capacitor induction motors, which is an older technology still used in many motors. ECM circulators with integrated sensors enable precise flow control based on several factors – including temperature, pressure, and schedule – to better meet the water flow needs for each application. ECMs are the most efficient type of motor on the market, and can reduce power consumption 30% to 50%, compared to a traditional motor. Adding advanced speed controls can lower it by as much as 75%, compared to an older model.[1]

3. **Variable Frequency Drive (VFD):** Deploy a VFD to slow the pump's speed to meet the load and use less energy by controlling your pump and motor more precisely than using mechanical means such as balancing and throttling valves. Smart pumps with integrated VFDs do not require external sensors to adjust to changes in system demand because they have every point on their pump curve programmed into them at the factory. While smart pumps offer the biggest savings opportunity, deploying wall-mounted VFDs is also an impactful way to increase efficiency for systems that didn't previously have one installed.

I've heard some smart pumps are "self-sensing," but what does that mean?

Instead of a differential pressure (DP) sensor being required to measure performance at a distant point in the pipe run, smart pumps perform this function by knowing all the places on the pump curve they can operate, based on detailed lab test data.

These pumps understand their exact pressure and flow condition at any time by:

1. Continuously monitoring their input power and motor shaft speed, and
2. Knowing how those relate to what pressure and flow they can deliver based on the precise performance mapping programmed into the pump at the factory.

Having that factory-programmed data in the pump motor and drive combo creates a product that doesn't need a DP sensor to determine the pressure in the pipe run. These smart pumps can determine that same information by knowing two variables continuously measured at the pump: Input Power (exactly how much power draw at this moment) and Motor Shaft Speed (how fast is the motor shaft spinning). It's a way to use technology and science to get to a solution that is a little more durable and all-in-one, instead of requiring another piece of equipment with a data feed.

Is water reduction one of the non-energy benefits or selling points for smart pump technology?

Yes. For circulators in particular, water reduction is one of the added benefits. Water conservation is a big issue for the dry parts of the country. Most people get up in the morning and take a nice hot shower, but a significant amount of clean water goes down the drain as they wait for the water to heat up. Domestic hot water circulators can reduce that water waste, but they do use some electricity in the process to run the pump. Circulators are being marketed as a best practice for multifamily homebuilders in the dry areas of the country such as California, Arizona, and Nevada, and are being considered by building code officials in various states.

Additional Pumps Resources

Federal Standards for Circulator Pumps Released May 2024

Smart Pumps in New Construction

Smart Pumps: The Future of Efficient and Reliable Pump Control

[1]Analysis of the Regional Technical Forum circulator Unit Energy Savings measures. https://rtf.nwcouncil.org/measure/circulator-pumps