SEAL WATER USE

Conservation tools help save money, minimize maintenance and improve reliability.

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Many pumping arrangements, including those with packing seals and mechanical seals, rely on seal water for effective operation. Seal water serves three main purposes: to cool the seal and the shaft, to lubricate the seal and to flush away impurities in the system.

A number of factors can affect how much seal water a system consumes, including product temperature, rotation speed, seal water temperature and pressure, and the surrounding system's temperature. Without proper controls, however, systems consume more seal water than they need.

Each seal type has specific seal water flow and pressure requirements, and exceeding those flow requirements does not offer any system benefits. Flushing away impurities and lubricating the seal typically requires a minimal amount of seal water. While systems may require more water for cooling, systems often consume exponentially more water than they need. Seals with no flow controls can easily use 20 to 30 gallons of seal water per minute, a figure that end users can drastically reduce with simple conservation practices.

Reducing seal water use offers a number of benefits to end users—saving money on water consumption and wastewater treatment, improving seal reliability and equipment uptime, and complying with increasingly stringent environmental regulations. To conserve water in their systems, end users should consider the strategies described in this article.

Control Valves

Control valves for sealing systems operate mechanically, like a household water tap. These valves allow operators to flush the system with seal water when the system needs cooling. However, end users often keep valves wide open all the time, increasing water consumption, wastewater output and the need for seal water filtering. To save water, end users must monitor the valves and only open them when necessary.

Flow Meters

A step up from mechanical control valves, flow meters can reduce seal water use while improving seal reliability. These devices have two valves that control seal water flow and pressure through a metering tube to meet the seal's requirements. Flow meters provide pressure and flow readings, which end users can adjust as necessary. Compared with unmetered systems, flow meters can reduce seal water use in systems by up to 90 percent. They also help seals perform at their peak by maintaining proper seal water pressure and flow.

Smart Water Control Systems

Smart water control systems offer the best, most sophisticated solution for seal water conservation. While flow meters offer water savings, smart water control systems reduce water use up to 97 percent beyond that provided by flow meters.

These control systems regulate water consumption based on seal temperature, only allowing seal water to flow through the system when needed to cool the seal. The devices available on the market monitor seal temperature and regulate water flow through a number of methods—including temperature-activated alloys with memory capabilities and spring-loaded devices. Unlike flow meters, where seal water runs through the system once and drains out, smart water control systems reuse the same water several times. When the seal water reaches a certain temperature, it drains out and is replaced with fresh water.

These devices are ideal in seal processes that are not extremely hot or cold. If the temperature is too low, the seal may not generate enough heat to activate the control device, causing water to stay in the system for long periods and possibly experience bacteria growth. In systems with high temperatures, the control system is being replenished with cold water, reducing water savings.

When choosing a water control system, end users should look for a device that operates automatically, does not require power or maintenance, and is compatible with existing equipment. For most systems, installation takes about half an hour and needs no special equipment. Other features include high-quality filters to remove impurities and backup safety valves to drain seal water during operational problems.

Seal Water Pots

Widely used in ethanol plants, closed-loop seal water systems offer end users another alternative for seal water conservation. These systems involve a pressurized seal water pot that holds several gallons of water and connects to the seal with hoses. The system circulates the same water constantly between the seal and the tank, reducing seal water use and eliminating wastewater output.

These systems can be expensive to install, need frequent infusions of fresh water and may require regular maintenance.

Calculate your savings

A double-acting mechanical seal without a water control device typically uses at least 4 to 6 liters of seal water per minute. A flow meter typically reduces the seal's water consumption to 2 to 3 liters per minute, and a smart water control system

can reduce consumption further to 0.05 liter to .5 liter per minute, depending on the application. To calculate their cost savings from seal water conservation, end users can the following formula:

Savings = (water consumption per seal per minute x number of seals x 60 x 24 x operation time, in days, every year x seal water price in dollars x reduction in water use)/1,000

Here's an example for a typical mill:

Water consumption per seal: 4 liters per minute

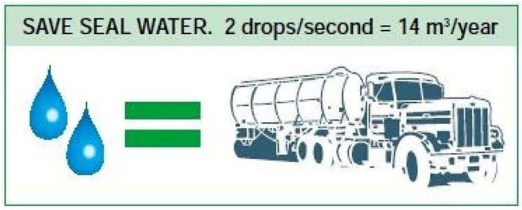
Number of seals: 200

Operation time, in days, every year: 350

Seal water price: 50 cents per cubic meter

Reduction in water use: 75%

(4 x 200 x 60 x 24 x 350 x 0.5 x 0.75)/1000 = $151,200 per year in savings



Seal water systems dramatically reduce water consumption and wastewater load, saving end users money. Based on a water price of 50 cents per cubic meter, water control devices can help a mill with 300 pumps save up to $300,000 annually.

If process fluids mix with the seal water because of seal damage or wear, the seal water can become contaminated, and the pots may be difficult to clean.

Water Filtration

Filtration is an essential part of using water wisely in a system. When water gets bogged down with impurities, it can clog the pump and cause premature wear and tear on the seal and other system components.

Low-quality water can also contribute to excessive seal water consumption if end users increase their flow rate to prevent the water from clogging the system-regulating valves.

Seal water should meet these standards:

- No impurities, such as clay, smaller than 10 micrometers
- No particles larger than 50 micrometers
- No more than 10 milligrams of silicate content per liter
- No more than 30 milligrams of organic impurities per liter
- No more than 1 milligram of iron per liter
- The total water hardness should be lower than 10 degrees dH (medium hardness)

Depending on the system, a number of filtration options are available, including inline filters and multilayer filters.

Benefits of Water Conservation

Not only does reducing seal water use help decrease water and wastewater treatment costs, but it can also help end users improve system reliability and slash time and money spent on maintenance.

It is estimated that seal water issues cause upwards of 59 percent of seal failures, with most caused by water impurities building up in the system and eventually creating blockages. System wear and tear can also cause seal water to leak into the process fluid, compromising end users' products. With the proper technology, end users can potentially increase the life span of their seals by several years. Improving the mean time between repair (MTBR) means lower maintenance costs, improved equipment uptime and better system performance. In addition, minimizing seal water use helps end users meet environmental standards. A growing number of government bodies are being stricter about water pollution and excessive water use, putting pressure on plants to reduce wastewater production and overall water consumption to comply with regulations. Using seal water wisely is simple with the help of current water conservation technology. By investing in system controls and following best practices, end users can realize a host of financial, operational and environmental benefits.