

About the Author

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Selecting a Pump for Seawater Reverse Osmosis

Reverse osmosis (RO) has become a significant process used in the purification of water. Selecting the correct pump is a significant step in a well-designed and properly operating system. Although the pump is a relatively small part of the overall cost of an RO system, expenses resulting from downtime and inefficiency quickly can diminish the productivity of the system and your return on investment. Due to the corrosive atmosphere and high demands on these sea water RO systems, special attention is required in the pump selection process. There are several key factors that will help to ensure optimum pump and system performance.

Pump Compatibility

Pump compatibility is a key element in the selection process. Due to the fact that seawater is a corrosive liquid, it may contain a variety of microorganisms and the water temperature may vary, the materials of construction of your pump are critical. Some locations and water conditions may tolerate a liquid-end construction of nickel aluminum bronze. Other locations may demand more corrosion-resistant materials such as 316SS and Duplex Stainless Steel. Each installation must be reviewed on its own merits, but having these pump options assures the best fit to the installation.

Pump Efficiency

Pump efficiency is a key element in keeping the costs of providing fresh water at an affordable price. Generally, positive displacement (PD) plunger pumps operate in the 80–90 percent efficiency range, while centrifugal pumps are between 30–60 percent efficient. With the lower efficiency pumps, the addition of an energy recovery system is required. When these energy recovery systems are coupled with the higher efficiency PD pumps, you can achieve maximum output and return on your investment.

Pump Speed

Lower revolutions per minute (rpm) operation is highly recommended when working with corrosive liquids such as seawater. Higher rpm operation will further aggravate the corrosion-erosion wear process initiated by

seawater. Lower rpm also helps to reduce the risk of cavitation.

Ease of Installation

Easy and compact installation is a consideration. Many RO systems are on board cruise ships, naval vessels, freighters, off shore platforms or at hotels and resorts. Space and weight are two primary considerations. Convenient, easy connection of inlet and discharge plumbing is preferred. Installation is easier when system accessories conveniently attach to the pump head or immediately in the inlet and discharge lines. This minimizes delays in valve response time and facilitates periodic visual checks of the system performance. The pump should be adaptable with booster pump feed as most often the seawater is lifted from a well or through the ship hull valve or sea chest.

Accessories for Your System

System accessories are nearly as important as the pump itself. Without proper pressure relief installed in the system, the pump is subject to deadhead

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Making the Right Decision

By Wendi Hope King, WQP Staff

As with any water treatment application, the right product needs to be selected in order to perform at its best. The pump selection for desalination projects is no exception. Key to any project's success will be the quality of the pump and the service you receive from the manufacturer.

The most common types of pumps used in desalination projects today are plunger pumps, according to Iver Schmidt, president of SK Watermakers, Inc. "Multistage centrifugal pumps can be used but are not as efficient and generally require more maintenance because of the higher speed of operation."

Many times it may be price that motivates a particular purchase, but there are many other things to consider such as the product's quality, the manufacturer's service or the "lifetime" of the product. Here are some tips to guide you through the pump selection process.

- **Required maintenance.** For Whitney W. Irons, president of Matrix Utility Corp., Matrix Desalination, Inc., trouble-free operation is the most important aspect to consider when making the purchase decision. "We look for pumps that run without significant ongoing maintenance," he says.

Other tips for getting longer life out of a pump include running it regularly to prevent corrosion, change the seals, flush with fresh water and change the oil monthly. Plunger/pony shafts should be kept clean and free of salt and corrosion to avoid seal failure, adds Irons.

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Making the Right Decision

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- **Costs.** Aside from the up front costs of purchasing the pump, consider the "hidden costs." "We look for spare parts availability and cost," Irons says. "You can buy an inexpensive pump but spend a fortune on spare parts." He recommends checking for life cycle cost over a 10-year period.
- **Size selection.** Once you have determined the size pump you will need, think about purchasing a larger one. "A larger pump will bring down the rpm," Schmidt says. "Pay particular attention to the suction side (air removal, suction dampness, etc.)."

- **Materials of construction.** You know what solutions you are working with. Make certain the pump's materials are compatible with all solutions and treatments it will come into contact with.
- **Customer service.** The service a manufacturer provides could mean the difference between a project's success and its failure. Despite a well-constructed product, you may need to contact the manufacturer in the future. Select the manufacturer that is willing to work with you on purchasing questions; future maintenance, repair or spare parts needs; and any other service needs you may have down the road.
- **Price.** Consider the price after determining the previously mentioned items. It is sometimes faster to jump on the price, but you could pay more in the long-term. **WQP**

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and destruction should the system fail or become blocked. Pulsation is damaging to the RO membranes. A pulsation dampener will minimize pulsation and prolong the life of the entire system. A suction stabilizer or captive acceleration tube will minimize the inlet pulsations and reduce the risk of cavitation. A pressure gauge is essential in the system as a monitor of system performance. As soon as pressure drops or begins to fluctuate, a maintenance inspection should take place. Prolonged operation with worn components can result in more serious and costly repairs.

Service and Support

Pump serviceability is a significant factor in selecting an RO pump. Delivering fresh water requires a continuous-duty system and downtime is not tolerated. Periodic maintenance should be minimal, easy to perform and require few tools. Easily removed pump valves and seals, and replaceable heads are preferred. Good technical support and readily available parts are essential. Selecting a manufacturer that can technically support your pump once it's in operation is not only a comfort but a necessity. Knowing your pump can be serviced within 24 hours anywhere around the world is a benefit for you and your RO system.

Proven Dependable

Dependability is an absolute necessity. RO is an application where a supplier's reputation for dependability weighs heavily in the selection process. With lives and livelihoods depending on fresh water delivered by your system, you do not want to be experimenting with an unproven pump. You will want to select a pump manufacturer who has experience with this application and has a history of dependable performance. **WQP**

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