By Michael Pennington, Severn Trent Services

PURE WATER THE WAY IT WAS MEANT TO BE

Pretreatment is the first step in a reverse osmosis system for high quality water.

Today, bottled water has taken the lead as the fastest growing segment of the beverage industry—even more so than beer and soft drink production. As the public becomes more health conscious and educated about water contamination, demand for bottled water continues to increase. In order to provide purified water, it is important to understand the reverse osmosis (RO) water purification process.

The process of RO represents the finest level of liquid filtration available today. RO systems employ a semi-permeable membrane that separates an extremely high percentage of unwanted dissolved solids such as lead or chromium. When these dissolved solids are forced through membranes, approximately 98 percent of its total dissolved count are removed. RO systems are designed to create a complete water purification system for water analysis to show which contaminants are in the water. These water purification packages can be found at water stores.

Water stores have become one of the most popular new businesses in the country. Since some consumers choose not to use vending machines and home delivery may not be an option, the best alternative is a water store.

In the past, water store owners would buy different filtration components from several different companies in order to create a water purification package. This caused problems because the store owner would have to put the equipment together with the help of a contractor, plumber and electrician. In addition, to avoid any problems, warranties would have to be attained on each individual product. Today, however, water store owners can buy a single-mounted water purification package. These skid-mounted systems come fully loaded and are specifically designed for tap water and brackish water applications where high quality pure water is required. This equipment is pre-assembled and preplumbed to allow fully automatic operation. All the owner needs to do is plumb four connections and wire the package to one main breaker. The result? The owner can pass inspections confidently with less downtime.

Why is the treatment process so complicated? There are a number of different components—or steps—the water needs to pass through in order to ensure proper system function, prevent premature failure and deliver a quantity of purified water.

The Pretreatment Process

In order to remove the chlorine and any of its byproducts from the water, the water first needs to pass through a granulated activated carbon (GAC) auto backwash filter. The GAC removes chlorine, chloramines and other chemicals from the water. This pretreatment stage should have an automatic backwash valve, which lifts the carbon bed to remove the suspended solids and prevent channeling within the column of GAC.

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Water Conditioning

The water conditioning system includes two columns (for continuous use) of resin that soften the water by removing its hardness. This column of cation resin absorbs calcium and magnesium ions and exchanges them for sodium chloride. This results in softened water. Since the resin has to be regenerated periodically, one has to ensure that the system is equipped with an automatic backwash/regeneration valve.

Particle Filters

Heavy-duty sediment filter cartridges remove any suspended solids that may be 20 microns in size or larger. For further purification, the feedwater also passes through another heavy-duty sediment filter, which removes any suspended solids down to 5 microns in size.

High Pressure Pump

The next step is for the feedwater to pass through a properly sized high pressure pump. This stainless steel, corrosion-resistant pump is used to achieve the correct pressure, volume and flow to the water so that it can be delivered to the RO membranes with the proper conditions.

RO Membranes

In water store packages, the RO membranes are the heart of the system. The purpose of the RO membranes is to remove approximately 98 percent of the total dissolved solids that may be contained in the feedwater. The number of membranes in a system determines the permeate or product water output of the unit. It is critical to protect the membranes with the proper prefiltration stages as previously described.

Water Storage Tanks

The product water can be stored in tanks or reservoirs, ready for use. In a water store, since we are dealing with drinking water, all tanks must be made from FDA-approved polyethylene. These tanks are equipped with a sealed manway for sanitary purposes. Usually, these tanks have a sub-micron 0.1 air filter installed at the top to prevent ambient contamination from entering the tank.

How many tanks does the water store need? The size of the tanks depends on the size of the water store. For example, an average water store will buy two tanks that hold up to 300 gallons each.

Distribution System

How does the water transfer from the polyethylene tanks into a customer's five-gallon bottle? When the water store owner turns on the filling faucet, the water is distributed through the pipes by a high impact pressurized tank and a heavy-duty, stainless steel, continuous-use delivery pump. This distribution system produces the proper volume and pressure levels to fill any size bottles.

Post Filtration

Even though the water inside the tanks is extremely pure, we do not know how long it has been inside these tanks. To make sure the water is fresh before it is distributed into the bottles, the water should be filtered through a high-flow, durable carbon block and sub-micron post filter to improve product water taste as well as eliminate any small particles.

Sterilization Systems

Finally, to keep the water fresh in storage tanks and to ensure the water is distributed completely bacteria free, it is sterilized by ultraviolet rays before the point of use. This high flow stainless steel sterilization system eliminates cysts, spores and up to 99.99 percent of any bacteria that may be in the water prior to point of use. The first phase of a UV system is a continuous loop disinfection process. This process allows water in storage tanks to continuously circulate through UV and back to the storage tank. This keeps bacteria from forming in storage tanks.

For even further sterilization, some store owners opt to use an ozone system, which includes an ozone generator, air dryer and properly sized ozone contact tank. This system injects ozone gas into the water before it is dispensed into the bottles. The ozone is used because it has a residual value, ensuring that the product water stays fresh until it reaches the bottle.

There is no question that fresh, purified water is the best in the world. But in order to achieve the purest water, understanding the RO process and how a water purification package purifies water is key. WQP

About the Author
Michael Pennington serves as a filtration marketing manager for Severn Trent Services, Inc., a supplier of water and wastewater treatment solutions. The Filtration division of the Water Purification Solutions Group consists of UAT membrane systems and bottling equipment lines, adsorption, evaporation, municipal treatment technologies and other unit operations. Additional information is available at www.severntrentservices.com or www.universalaqua.com.

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