Reversing today's water quality issues

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contributing writer

Not long ago an expert from the Los Angeles Department of Water and Power said that 70% of the people in the LA area drink only filtered water or bottled water. That's a lot of money spent for clean water.

With this growing demand for higher quality drinking water, it's no surprise that homeowners are buying and installing the same technology used by the major bottled water companies. The filtering process used by these bottling giants is reverse osmosis. Today, it's the fastest growing form of in-home water treatment in the United States.

Reverse osmosis (or simply, "RO"), also known as hyperfiltration, is a process used to purify water while removing salts and many other impurities. The key function of reverse osmosis takes place within a tight, semi-permeable membrane that allows only pure water to pass through it. Contaminants are rejected. It vastly improves water purity, color and taste.

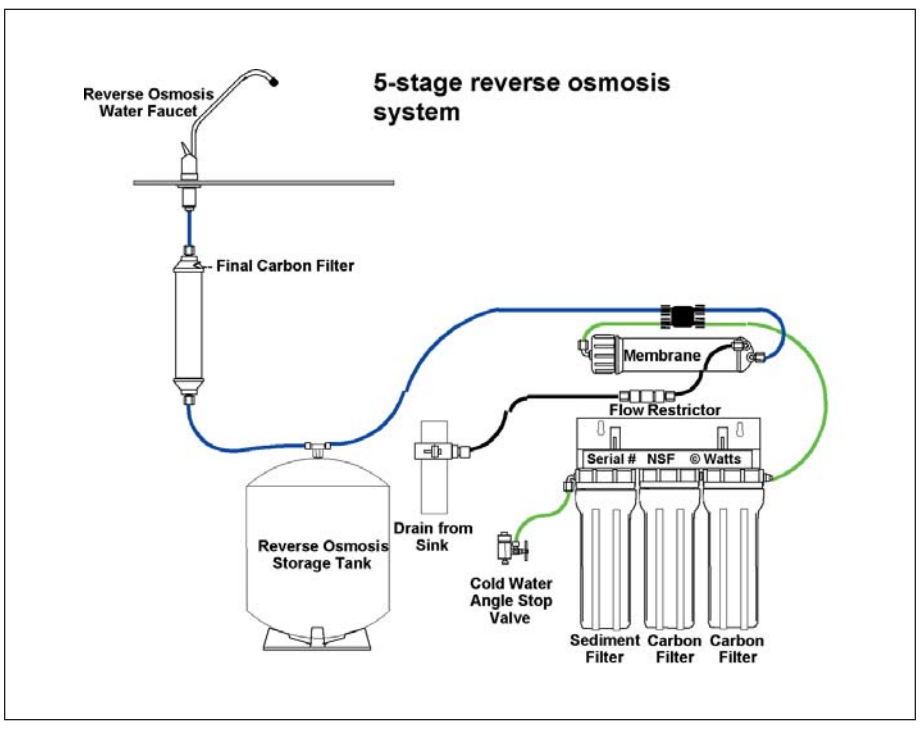

Figure 1: The typical point-of-use system, as shown here, is a 5-stage unit with three stages of pretreatment.

Sajdak connects the water storage tank. The ZeroWaste System returns the concentrate water from the RO system back to the home's plumbing, resulting in 100% efficiency.

Today, RO is considered to be state-of-the-art filtration. The process uses a thin film composite membrane to reduce particles down to the molecular level and is the best system to remove all of the most frequently-encountered drinking water contaminants such as harmful or unwanted minerals or metals, salts, sugars, proteins, bacteria, particles and dyes.

Take a look at the side of a Dasani bottle. CocaCola, bottler of the water, promotes RO as the water purification used. Pepsi's Aquafina is prepared the same way.

Are you aware that your customers can have the finest drinking water available at the tap without this high cost and hassles of bottled water?

Consumer demand for water purification and filtration has become the driving force for this relatively new and fast-paced industry. Concerned homeowners are responding to the broadly-reported knowledge that more contaminants are being found in our water every day.

Last year, the Water Quality Association conducted an independent survey that verifies the breadth and scope of their concern. The results show that:

- 86% of Americans are concerned about their drinking water;
- 70% are knowledgeable about contaminants in their water;
- 41% already use a water treatment device;
- 43% said filtered water tastes better;
- 42% said filtered water is safer;
- one in three Americans believe household drinking water isn't as safe as it should be; and
- one in 10 respondents say the plan to purchase a household water treatment system within the next year.

Interestingly, water is nature's smallest liquid molecule at room temperature. It passes with ease through the smallest holes in the RO membrane while all other larger molecules are stopped. In small RO systems, the ratio of membrane wash water to pure water is usually five to one. Most reverse osmosis technology uses a cross-flow function that permits the membrane to continually clean itself.

Most water sources are compatible with RO filtration. To operate at a peak performance, incoming tap water supply should meet the following criteria.

- Water temp: 35°F to 85°F;
- TDS: 2,000 ppm max;
- Iron tolerance: 0.5 ppm max;
- Hydrogen sulfide: must be removed;
- Silica tolerance: less than 125 ppm;
- Hardness: over 15 gpg should be softened; and
- pH range: 3-11.

Derek Sajdak prepares a ZeroWaste module for installation. The system reduces the amount of water to produce one gallon of product water.

The key components of an RO system include:

The **sediment filter**. It reduces most suspended dust, dirt, sand, rust particles and other sediments.

Sajdak installs the unique adapt-a-valve for the cold water connection. All of the concentrate water from the RO system is routed to the hot water supply via a fitting on the angle stop valve.

The **activated carbon filter** reduces chlorine, volatile organic chemicals (VOCs) such as chlorine and pesti-

reverse osmosis

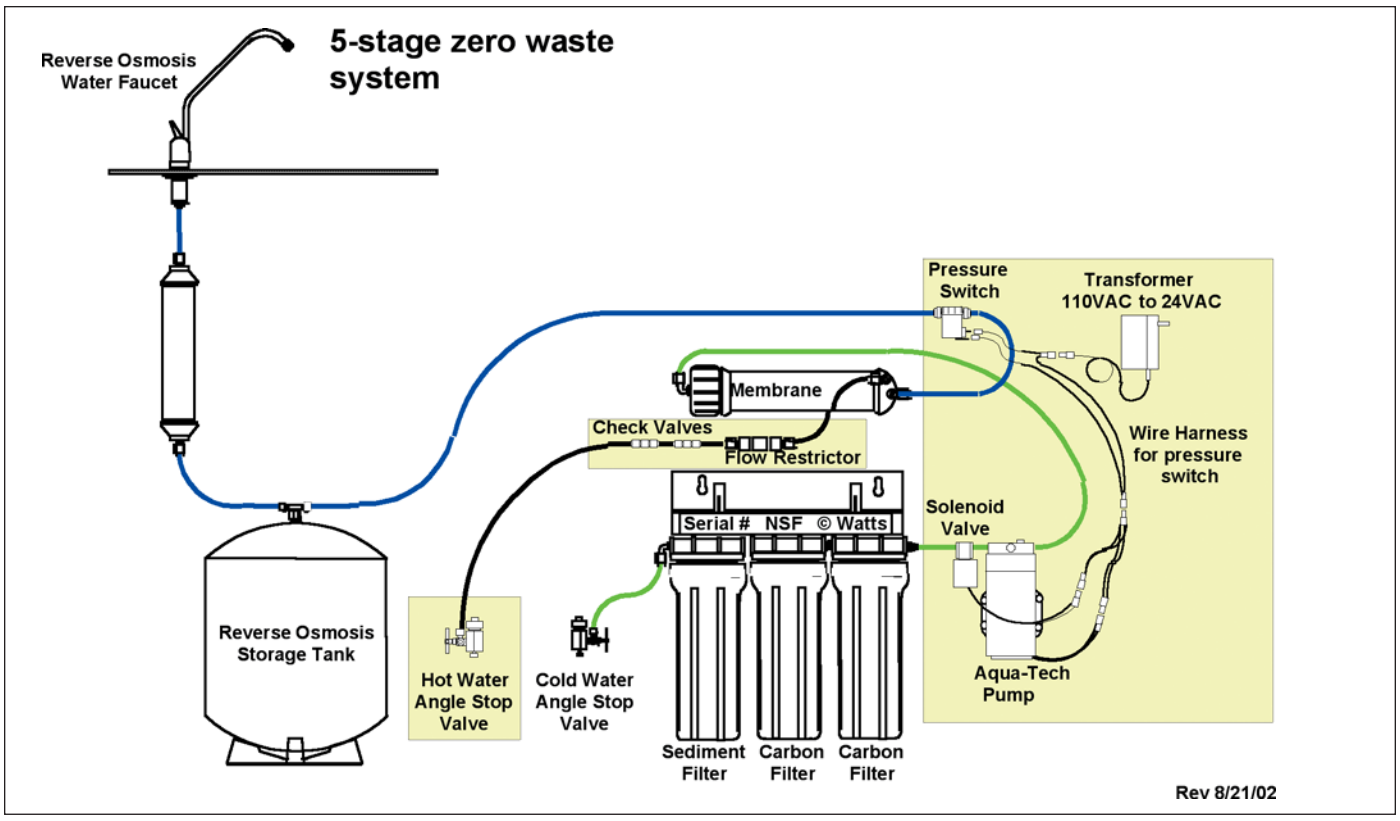

Figure 2: A zero waste system takes the water outlet of the sediment and carbon filters and routes it through a solenoid valve and pump before going to the membrane inlet.

cides. It's the main cleanser of water odor and taste.

The **carbon block filter** performs more of the same carbon filtration, yet with more much higher reduction of particulate matter.

The **RO membrane** — the heart of the system — is responsible for rejecting up to 98% of the total dissolved solids in the water. It's here where purification takes place. The RO membrane reduces cryptosporidium, viruses, ecoli bacteria, radioactive radon, arsenic, copper, iron, lead, chromium, fluoride, radium, manganese, as well as dissolved chemical solids such as bicarbonate, cyanide, nitrates and nitrites, fluoride, odor, gas additive MTBE and organic pollutants such as pesticides, PCB, benzene and other taste-and odor-causing compounds.

The impurities that were in the water are usually washed down the drain. Unlike filters, the RO membrane is self-cleaning. As the source water flows through the module, it's divided into two streams. One stream is forced through the membrane by osmonic pressure created by water pressure on each side of the membrane. The second stream drains-out the rejected salts, dissolved pollutants and contaminates.

Simple charcoal or carbon filters, on the other hand, become less efficient with each glass of water drawn through them. Carbon filters only remove a limited number of contaminants, some odors and some tastes.

Another facet to the water quality equation today is water conservation. Customers of the Los Angeles Department of Water and Power know all too well that they are dealing with worsening water supply and quality issues as water sources diminish, and the population grows.

Even the best residential RO systems use four to five gallons of water for every one gallon produced. Many systems waste as much as 20 gallons just to produce one gallon of product water. New technology on the market today known as ZeroWaste and distributed by Watts Pure Water Flowmatic Systems eliminates this problem by returning the concentrate water from the RO system back to the home's plumbing, resulting in 100% efficiency.

Unfortunately, there are already several knock-off versions of the ZeroWaste system, but most do not meet plumbing codes. The only available patented, code-compliant process is held by Watts Water

Sajdak installs a water storage tank for the RO system. Purified water can be conveniently stored underneath the sink.

Technologies. This patent allows for a 'legal' cross connection between the hot and cold water supplies, subsequently reintroducing the membrane wash water into the hot water side.

In order to show the difference between the industry standard point-of-use reverse osmosis system and one employing zero waste technology, two figures are shown. One is the current industry standard "point of use" RO system (Figure 1) and the second is the Watts Pure Water ZRO-4 system (Figure 2).

Here's how it works

The typical point-of-use system, as shown in figure 1, is a 5-stage unit with three stages of pretreatment.

A zero waste system takes the water outlet of the sediment and carbon filters and routes it through a solenoid valve and pump before going to the membrane inlet. This provides filtered water to the solenoid and pump which will keep foreign material from damaging them. Carbon block filters are preferred because they release fewer carbon fines, but GAC filters can be used if flushed with water prior to connecting them to the pump. In some systems the filter configuration allows for water to be routed through the solenoid valve and pump from the water outlet of the sediment filter and then to the water inlet of the carbon filter(s).

A pressure switch will be used to stop the system by opening the circuit to the solenoid valve and pump. When the pressure in the RO storage tank reaches a predetermined pressure indicating the tank is full, the pressure switch will open, stopping the system from producing more water.

The concentrate water is routed through a flow restrictor as before, except the flow restrictor size is larger to allow for the back pressure of the hot water line. The larger flow restrictor allows the pump to circulate water at approximately a 4-to-1 ratio of concentrate to permeate. The actual flow ratio is the same as a standard RO system.

IAPMO (International Association of Plumbing and Mechanical Officials) requires the water from the outlet of the flow restrictor to be routed through two check valves before flowing to the hot water supply line. These check valves ensure the hot water will never reach the membrane on the reverse osmosis system due to a surge or back pressure in the hot water system.

All of the concentrate water from the reverse osmosis system is routed to the hot water supply via a fitting on the angle stop valve under the sink, reintroducing the water into the hot water side of the home's plumbing system for dishwasher, shower and hand-washing uses.

In an area where there can be severe restrictions for water use, and very high cost for water, zero-waste technology has given us a strong selling point. The efficiency of traditional reverse osmosis systems is rated in the 10% to 20% range. With this new technology, the rating scores a 100%. As consumer awareness sharpens to the realities of higher water costs, and severe shortages, this new technology has set the standard. ■

With the installation of the RO faucet nearly complete, Sajdak will test the system. This new technology could set the standard for water savings.

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