Getting Smart With

REVERSE OSMOSIS SYSTEMS

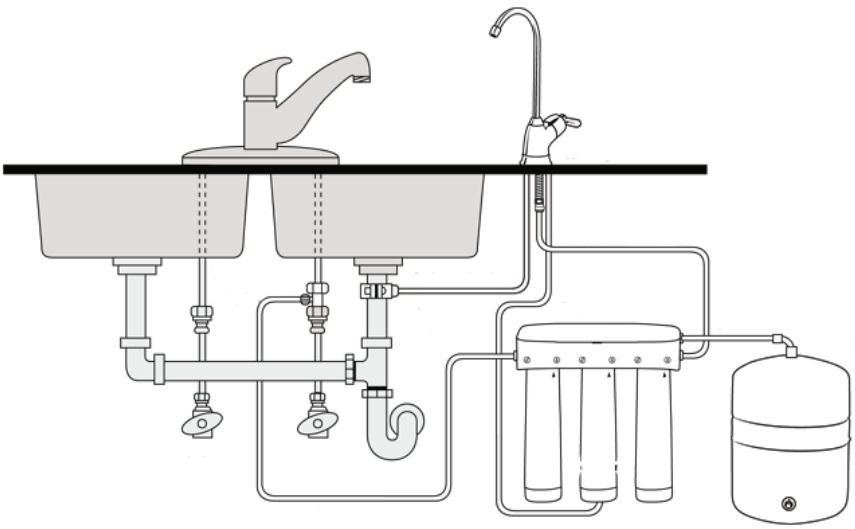
Best Practices for Industry Professionals
& Tips for Consumers

Water Quality Association

Prepared on behalf of the water quality improvement industry by the Water Quality Association

The Water Quality Association (WQA) provides technical information as a service to its members, policymakers and the general public. WQA's intent is to promote discussion on key issues related to water quality through verifiable facts and data.

This booklet is intended for those who manufacture, sell, install, and maintain residential water treatment systems that employ **reverse osmosis technology**. Homeowners, regulators and legislators may also find it useful. In producing this booklet, the WQA leveraged the advice of respected industry professionals and the latest in scientific research.



The typical design of an under-the-sink reverse osmosis drinking water treatment unit.
(Courtesy: Paragon Water Systems)

Best Practices for All Water Treatment Industry Professionals:

1. Proactively educate consumers about the benefits of replacing older systems with newer, more efficient technology.
2. Promote technologies and processes that use less water. These may include atmospheric tanks, automatic shut-off mechanisms, water on water, booster pump, permeate pump, and a direct flow (without storage tank).
3. Encourage systems with the highest practical efficiency rate.
4. Provide consumers with proper maintenance to reduce water waste and maintain performance and sanitation.
5. Pursue continuing education such as WQA's voluntary professional certification program.

Best Design Practices for Reverse Osmosis System Manufacturers:

1. Carefully balance membrane durability and efficacy with overall system efficacy.
2. Optimize system efficiency with automatic shut-off mechanism and flow restriction on the reject line.
3. If you claim that the product produces zero discharge, provide adequate instructions for installers regarding how to re-route reject line for reuse applications in accordance with local plumbing codes.
4. Provide proper air-gap design.
5. Include documentation such as an owner's manual, maintenance instructions and efficacy specifications.
6. Whenever possible, certify material safety and reduction claims with an ANSI-accredited certification body.

Best Practices for Equipment Installers & Service Technicians:

1. Prior to installation, remediate any pretreatment needs, and determine the homeowner's water conditions that can affect production and quality. Such conditions may include influent (feedwater) TDS, pressure, and daily use patterns.

2. Whenever appropriate, size the equipment (by GPD capacity rating) and adjust its settings to optimize water consumption accoding to the manufacturer's recommendations.
3. Consider using the reject water line for appropriate reuse applications in accordance wtih the manufacturerer's specifications and local regulations.
4. Replace pre- and post-filters appropriately per the manufacturer's instructions.
5. Be aware that increased efficiency can decrease the life-span of membranes.

Is Reject Water Safe for Reuse?

Rerouting the reverse osmosis reject water for use in other applications is the surest way to achieve 100 percent efficiency. A common misconception is that the reject water from a point-of-use reverse osmosis system is highly concentrated with contaminants and not safe for reuse. This is far from the truth. The example below demonstrates a scenario in which a point-of-use reverse osmosis system is used to treat drinking water that contains lead at a concentration equal to the U.S. EPA Action Level.

If the water source being treated contains 15 µg/L of lead, and the RO operates at 15 percent efficiency, the reverse osmosis reject water will contain 17.6 µg/L of lead. The calculation works like this. Every ten liters of influent water containing 15 µg/L lead contains 150 µg of lead. Operating at a 15 percent efficiency, the reverse osmosis system will produce 1.5 liters of treated product water and 8.5 liters of reject water.

If we assume that no lead ends up in the treated product water, which would be a “worst case” assumption for the purpose of evaluating whether the reject water is safe for reuse applications, then all 150 μg of lead would end up in the reject water. The “worst case” concentration of the reject water is therefore 150 μg divided by 8.5 L, or 17.6 μg/L.

This example shows that even when the water being treated by the reverse osmosis system contains a contaminant at the Action Level, there is only a very slight increase in the concentration of that contaminant in the reject water. In summary, if the water being treated by the reverse osmosis system would be safe for a particular reuse application, then the reject water should also be safe for use in that same application.

In fact, reverse osmosis reject water is appropriate for use in many commercial and residential water use applications, including irrigation, flushing toilets, laundry, dishwashing, make-up water for cooling towers and water cooled condensers, evaporative cooling, decorative fountains, swimming pools, water cooled machinery, and vehicle wash.

Tips for Consumers

WQA encourages consumers to conserve water in and around the home by taking the steps listed on the pages to follow.

Key:

Look for these easy icons, which indicate that a practice is a:

QUICK FIX
A no-cost solution that works for any budget.

SMART UPGRADE
A way to save a lot while spending a little.

GREAT INVESTMENT
A larger investment that can yield a larger reward.

Whole House

1. Choose low-flow shower heads, sink faucet aerators, and high-efficiency washing machines, toilets, and other appliances.

2. Choose showers over baths whenever possible. When taking a bath, make sure the drain stopper is working properly to avoid having to refill the tub.

3. Pay attention to your water bill, an unanticipated increase could indicate a leak.

4. Don't ignore damp water spots on ceilings and walls. These leaks not only waste water but also can cause structural damage to your home. If you suspect a leak, consult with a plumber.

5. Leaks can hide, easily unnoticed, underneath the sink behind supplies or under appliances. Pay special attention to musty odors, dampness or mold under sinks and appliances.

6. Be aware of any dripping faucets, this can waste hundreds of gallons of water per month. Sink and shower faucet repairs are simple and cost effective.

In the Kitchen

1. If you wash dishes in the sink, use a stopper to allow dishes to soak rather than running the faucet continuously.

2. Instead of letting the faucet run until the water becomes cold, simply keep a container of water in the refrigerator.

In the Bathroom

1. Do not leave the water running while brushing your teeth, shaving or washing your face.

2. Shorten your time in the shower by just five minutes. Over time, this small change can save hundreds of gallons of water.

3. Make sure water from your toilet tank is not continuously leaking into the bowl. You can check by dropping some food coloring into the tank. Avoid flushing the toilet for one hour and then see if the water in the bowl has become tinted.

In the Basement

1. Avoid running the washing machine or dishwasher at less-than-full capacity, or adjust the water usage settings for smaller loads.

2. Upgrade existing water softeners and filters to achieve water and salt usage savings.

3. Replace existing water softener with ultra-efficient demand initiated water softener that regenerates only when needed using optimum salt and water.

4. The hoses bringing water to and from your washing machine can burst. Avoid potential flooding issues by turning off both the hot and cold water sources when the machine is not in use. Consider upgrading to “no-burst” hoses, and inspect the connections regularly for leaks.

In the Yard

1. Avoid watering your lawn and garden during midday or when it is raining, and take care not to overwater.

2. Use drip irrigation systems for watering yards and gardens. They can save 30-50% of the water sprinklers lose from evaporation and runoff.

In the Yard (continued)

3. If you have an automatic watering system, make sure no water is wasted on paved areas. Always remember to shut off the automatic system off during a rainfall.

4. Choose drought-resistant flowers and plants, rather than those requiring large amounts of water, for your garden.

5. Collect water in a rain barrel and use it for watering lawns and plants.

6. Add a top layer of organic mulch, or plant with a compost pile, to help your garden retain moisture.

7. Check outdoor faucets, pools, and spas on a regular basis for leaks too.

Glossary

Booster pump: An auxiliary pump which is used to boost incoming line pressure to the membrane in an RO system to increase or maintain the pressure in the system.

Daily production rate (DPR): The volume of product water produced by a system per day [NSF/ANSI 58 – 2014 Reverse Osmosis Drinking Water Treatment Systems]

Direct flow system: A reverse osmosis system in

which treated product water is fed directly to the dispensing outlet.

Efficiency rating: The percentage of the influent water to the system that is available to the user as reverse osmosis treated water under operating conditions that approximate typical daily use [NSF/ANSI 58 – 2014 Reverse Osmosis Drinking Water Treatment Systems].

Permeate pump: A pump used to force treated product water into a pressurized storage tank (PST).

Recovery rating: The percentage of the influent water to the membrane portion of the system that is available to the user as reverse osmosis treated water when the system is operated without a storage tank or when the storage tank is bypassed [NSF/ANSI 58 – 2014 Reverse Osmosis Drinking Water Treatment Systems].

Reject water: A term used in distillation, electrodialysis, reverse osmosis, and ultrafiltration to describe the portion of the incoming influent that has passed across the membrane but has not been converted to treated product water and is being sent to drain [WQA Glossary of Terms, Fourth Edition].

Water on water: A reverse osmosis system that utilizes the influent water energy to provide counter pressure in the pressurized storage tank (PST) in place of a static air charge.

Web Resources:

General information about water treatment products and professionals

1. Water Quality Association (WQA) website – www.wqa.org
   a. "Find a Certified Product" search tool
   b. Gold Seal Product Certification Program
   c. "Find a Water Treatment Professional" search tool
   d. NSF International – www.nsf.org

Water conservation

1. U.S. Environmental Protection Agency – www.epa.gov
   a. EPA WaterSense Program
   b. Water conserving products & information
   c. Water conservation tips
   d. Tips for watering wisely
   e. Tips for smart landscaping

2. Alliance for Water Efficiency - www.allianceforwaterefficiency.org
    a. Water conservation practices for process water, including food & beverage, auto repair & service, paper manufacturing, and metal finishing

Calculated Water Usage

1. Water Footprint Network - www.waterfootprint.org

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