

Dynamic Duo

UV & RO combine to provide pathogen-free water for homes

By John Vastyan

It is just unfair to be a germ these days. I hear they have protested on the White House lawn for years, but news crews—citing employer refusal to buy expensive, new magnification lenses—gave no coverage to the microscopic events.

The germs' issue is that manufacturers have made it way too simple to purify household water, making just about any liquid slurry drinkable. Oh, to be a germ.

Unfortunately, few homeowners know how easy and inexpensive it can be to get the right gear installed. The protective, effective dynamic duo of water treatment equipment is the combination of ultraviolet (UV) light and reverse osmosis (RO). In fact, the cost of bottled water for a year could pay for the installations at many homes.

Filtration First

To perform well, UV and RO need the support of basic filtration. To ensure that these technologies work properly (and to lengthen the life of RO systems), one or two sediment filters should be in place—even when incoming water appears to be relatively clear. As water enters the home—whether from a private well or municipal source—it should be directed through the backflow device, then onto sediment filtration. Those filters play an essential role. Many professionals prefer the combination of a 10- or 20- μ filter, followed by a 5- μ filter to sweep out anything that might remain in the water stream.

For a UV system to work effectively, water must be pre-filtered to exclude any particles larger than 5 μ in size. This prefiltration ensures that particles large enough to block the UV light are not given a chance to pass through. UV system manufacturers strongly recommend replacement of any pre- and post-filters at specified periods and replacement of the UV lamp annually.



UV systems render pathogens harmless by eliminating their ability to reproduce.

UV Stands Guard

UV light deservedly gets first crack at waterborne germs, effectively destroying 99.99% of harmful microorganisms without adding chemicals to the water or changing the water's taste. It is one of the four methods of disinfection approved by the U.S. Food & Drug Administration.

UV is a quick, reliable and cost-effective method of disinfecting water for both point-of-use and point-of-entry applications. The technology offers a safe, clean, easy-to-maintain method of ensuring that water is free of bacteria.

UV water purification uses UV rays to sterilize microorganisms that may be in the water. The proven technology has no significant drawbacks. UV systems

are environmentally friendly and low maintenance. Most of them require only an annual lamp change, combined with wiping the clear tube in which the lamp is housed.

UV & Onsite Systems

Approximately 25 million U.S. households, cottages and vacation properties rely on private wells for water. Many thousands more rely on lakes, streams and other surface

water sources. Unfortunately, many of these homes do not have adequate water purification systems, such as UV, protecting residents from harmful microorganisms.

Studies indicate that about 40% to 50% of wells in any given region contain *E. coli* and/or coliform bacteria at any given time, not to mention the countless other microorganisms or impurities like nitrates that may be in a water supply.

Not Just for Rural Well Water

A growing trend, especially in small- and medium-sized communities, is the application of UV (and RO) for homes and businesses that receive water from municipal sources. After all, this technology is a relatively inexpensive and effective way to ensure water quality, regardless of its source.

Just last year, thousands of communities issued boil water alerts in response to water infrastructure issues stemming from severe weather patterns. Another key source of problems was improperly maintained backflow assemblies.

In one Midwestern city, polluted water was delivered to thousands of homes and businesses before the problem was resolved. Those with sediment filters and a UV system were protected from the worst of the contamination issues.

How UV Works

UV is a type of energy found in the electromagnetic spectrum, lying between X-rays and visible light. Although humans cannot see UV light, we are exposed to it daily—in fact, too much exposure to UV light causes sunburn.

UV systems use special lamps that emit UV light of a particular wavelength that essentially attacks the genetic core of a microorganism and rearranges its DNA and RNA, eliminating the microorganism's ability to function and reproduce. When microorganisms can no longer reproduce, they are unable to infect other organisms with which they have contact.

The quality of both the UV light and the contact it has with pathogens are crucial to accomplishing disinfection. It is important to properly size the UV unit based on anticipated water use; 15- to 20-gal-per-minute systems are ideal for many homes.

There are several advantages to using UV. First, it is highly effective and is endorsed by the U.S. Environmental Protection Agency. It is also free of chemicals, tastes and odors, and is more effective at neutralizing germs than chlorine. UV systems are also relatively inexpensive and easy to maintain.

When water leaves the UV gear, it makes its way toward the water softener (if one is applied), and then

RO systems range in size from municipal water treatment plants to residential under-sink models.



to faucets and showers. An RO system also may be installed as an additional step for treating water.

RO Takes the Stage

RO is a process that decreases waterborne particles down to the molecular level to produce clean water. The process is more widespread than many people realize. Most of the “pure” drinking water that is bottled and sold worldwide is simply public-sourced water squeezed through RO filtration. Coca-Cola’s Dasani and Pepsi’s Aquafina bottled water brands are produced this way. Salt, chlorine and other impurities are removed, rendering high-quality, “polished” water.

Initially, the RO process was used for large-scale operations. Many public water treatment facilities use some form of the technology. Large RO systems also are used to desalinate seawater.

It’s All in the Details

RO uses osmotic pressure to push water through a semipermeable membrane, removing salts and contaminants. It removes an array of substances, as shown in Table 1.

The process can easily be scaled to a residential level. RO units are relatively inexpensive and easy to maintain. Many are installed under the kitchen sink, with a small spigot mounted on the countertop.

Coupled with UV light, an RO system removes essentially all pathogenic bacteria. If the UV light fails, RO can go it alone, as long as the homeowners realize that it protects only water sourced from the RO spigot, and the system is properly maintained. **WQP**

John Vastyan, owner of Common Ground, is a journalist whose work focuses on the plumbing and mechanical, HVAC, water quality, geothermal and solar industries. Vastyan can be reached at cground@ptd.net or 717.664.0535.

Table 1. RO Contaminant Removal Efficiency

Sodium	85% – 94%
Sulfate	96% – 98%
Calcium	94% – 98%
Potassium	85% – 95%
Nitrate	60% – 75%
Iron	94% – 98%
Zinc	95% – 98%
Mercury	95% – 98%
Selenium	94% – 96%
Phosphate	96% – 98%
Lead	95% – 98%
Arsenic	92% – 96%
Magnesium	94% – 98%
Nickel	96% – 98%
Fluoride	85% – 92%
Manganese	94% – 98%
Cadmium	95% – 98%
Barium	95% – 98%
Cyanide	84% – 92%
Chloride	85% – 92%