



## Ultrafiltration as a whole-house machine

*Water quality, scarcity issues bring a technology to the fore.*

Over the last five years, we have seen greatly increased concern over biological contaminants in drinking water – both from the threats of bioterrorism and from recent natural disasters such as Hurricane Katrina. Other concerns include widely reported deaths and illnesses caused by *E. coli*, *Cryptosporidium* and other waterborne pathogens.

Environmental groups, public safety organizations and regulatory agencies also have become concerned with the hazards posed by disinfection byproducts and other unwanted chemicals in our water supplies.

Today more than half of all new homes are being built in areas without municipal water and sewage infrastructure, leaving them especially vulnerable to biological contamination from source groundwater and surface water used for drinking. Increasingly common breaks in municipal water delivery lines raise the possibility of contamination of centrally treated water as it travels to homes.

Ultrafiltration is a constant-flow point-of-entry (POE) technology that arrests impurities as small as 0.02 microns, including 99.9999 percent of bacteria and cysts, plus 99.95 percent of viruses.

Point-of-entry (POE) systems using hollow-fibre Ultrafiltration membrane technology (HF UF) are capable of producing a steady flow of microbiologically pure water throughout the house. Systems range in cost from \$3,000 to \$5,000 depending on size and supplemental pretreatment.

Ultrafiltration disinfects biologically contaminated water originating from wells, surface water and often-compromised municipal delivery systems – using no chemicals or maintenance-intensive devices, except where backup protection is chosen.

### **Minimal pressure drop**

Until recent times, the only way to effectively protect an entire home from waterborne contaminants was whole-house reverse osmosis. In this day of water shortages and mandated water rationing, reverse osmosis is not always a practical solution.



Like RO systems, Ultrafiltration works on available water pressure and requires no electricity to deliver high-quality drinking water. The technology is the same as with industrial-grade membranes, proven in water treatment plants worldwide.

Unlike the flat membranes used in reverse osmosis, some hollow-fibre membranes resemble strands of spaghetti that are hollow inside. Others are strands with capillaries in every fibre, which can make them stronger and more efficient at dealing with impurities trapped on the surfaces of the walls.

The multi-bore walls of the membrane strands have billions of pores that filter out particles, turbidity and pathogens, while allowing water to flow through with minimal pressure drop.

Ultrafiltration membranes filter down to approximately 0.02 microns nominal (less than one millionth of an inch). The nominal pore size is the primary determinant of the particle/pathogen rejection characteristics of the membrane. For UF membranes to be capable of bacteria and virus rejection, the membrane pore distribution must be very tight.

### **Achieving a flow rate**

A membrane's permeability represents the pressure necessary to achieve a specified flow rate. The higher the permeability of a membrane, the more efficient the membrane is. Hollow-fibre systems feature maximum flow rates of between 9.0 and 11.0 gallons per minute (gpm).

Surface area is another key factor in membrane performance and represents the amount of available membrane area for water to pass through. A generous surface area, combined with higher permeability, will result in larger water output, necessary to satisfy total household needs, without requiring a holding tank.

### **Water efficiency**

Some UF systems use as little as 2 gallons of water per day (gpd) to flush the module clean.

A meter/controller determines when to flush the module and how much water to use in the process. Microprocessor technology in these systems can initiate flushing, only as needed. A flush cycle is triggered only when a preset number of gallons pass through the membrane filter.



Frequency and duration of the flush setting will depend on the quality of the incoming water. A controller can also sense when water has not been used in a 24-hour period and will initiate a brief maintenance flush that keeps the system fresh while using minimal water. System status can be indicated by LED lights.

### **Rural areas benefit**

Hollow-fibre Ultrafiltration is quite suitable for homeowners and builders in rural areas. The technology is capable of handling the following biological contaminant:

Bacteria	up to 6-log reduction (99.9999%)
Giardia	up to 4-log reduction (99.99%)
Cryptosporidium	up to 4-log reduction (99.99%)
Viruses	up to 3.5-log reduction (99.95%)

### **Ultrafiltration components**

The average installation begins with a standard 50-micron (or lower) fibrous prefilter cartridge, plumbed to the point of entry of water into the home. Next comes the module, attached to the same board as the prefilter, with the meter/control attached to the module and an electric power source.

For reducing organic chemicals including chlorine and its byproducts, an optional GAC carbon post-filter is recommended, an optional UV and / or Ozone system can be used for ideal system design. The system should be installed near the water meter (if municipal water), or near the pressure tank if the source is well water. Outside hose bibs should not be connected to the filter system. One-inch fittings would be typical and should meet most plumbing codes.

### **UF system maintenance**

The hollow fibre membrane module should have a life expectancy of five years or more, but many variables can affect this. Turbidity, particle size, pressure, and volume of water used can affect filter life.

The unit should be sanitized at least annually with chlorine bleach.

### **Quantity issues and quality**

While the green building and healthy home movements place great importance on home water conservation, the issue of water *quality* is also of growing concern to builders and home owners in every part of the country. In fact, the two issues – water quality and quantity – intersect.

As water becomes scarcer, the quality decreases proportionately. Ultrafiltration provides biologically safe water to every tap in the home, without wasting water. That's a plentiful supply of healthy water, coming from a “green” whole house system.

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