

The Sparkle^{filter}™ System

A powerful ultrafiltration solution



Sparkle filtration unit

Introduction

Sparkle^{filter}™ is a proprietary drinking water system* with automatic backflush capability. Hollow fiber membranes are configured in a module that achieves high packing density and provides excellent water quality. The unique dual non-resilient collapsible chamber (DNC²), or “floating pressure cup,” allows the module to be easily cleaned where filtered water is sent through the fiber in reverse, flushing away all solids and biological contaminants.

While Sparkle will remove all bacteria and suspended solids that are very small in size, the performance of the filter is enhanced by an integral pre-filter for solids removal. In addition, other filters or absorbers can be easily added for specific contaminant removal such as arsenic, chlorine, mercury, etc. depending upon location and feed water make-up.

*Patent Pending

Anti-Fouling Technology

A most effective way to clean a membrane system is to backflush the filter by sending the clean filtrate produced by the filter back through the membrane layer at a higher pressure than the feed pressure.

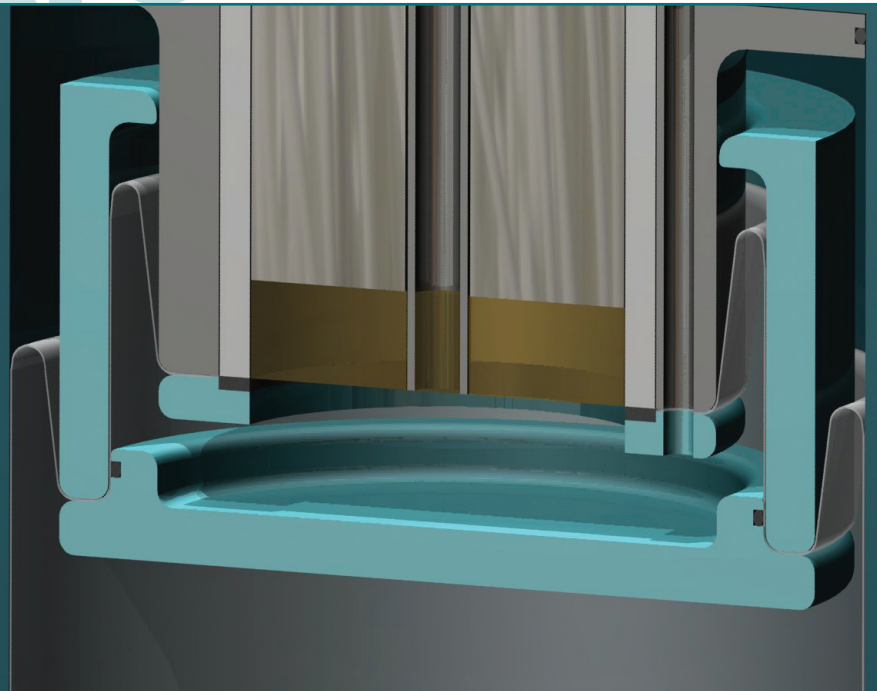
Sparkle’s unique “floating pressure cup,” attached to the membrane module, accomplishes this. Sparkle’s anti-fouling technology creates reverse flow pressure that remains constant during the cleaning cycle because it is at a higher pressure than the feed pressure. This constant backflush pressure created by proprietary dual non-resilient collapsible chambers (DNC²), or floating pressure cup, gives Sparkle a distinct advantage over conventional resilient bladder filters.

Additionally, the integral prefilter reduces fouling, simplifying the system and eliminating additional plumbing. For additional water storage a pressurized bladder can easily be added.

Sparkle

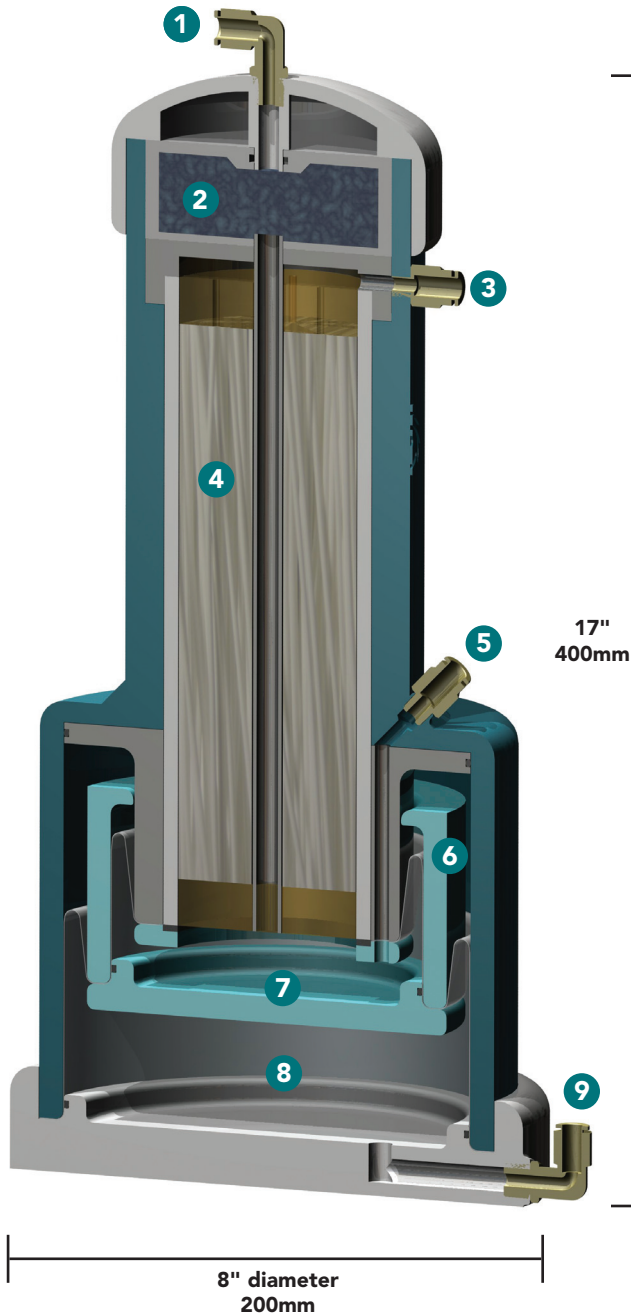
KEY BENEFITS

- Hollow Fiber Membrane Module
- Outside-In Hollow Fibers
- Automatic or Manual Cleaning
- Dual Non-Resilient Collapsible Chambers
- Backflush Pressure Constant
- Virtually No Wasted Water
- Small Footprint – High Flux
- Stand Alone Capability
- External Power Not Required
- No Extra Tanks, Pumps Necessary
- Pre-Filter Modules Easily Added
- Scalable to Larger Systems
- Affordable; Price Competitive



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- | | |
|-------------------------|-----------------------------------|
| 1. Feed water | 6. Floating pressure cup |
| 2. Prefilter | 7. Filtrate chamber |
| 3. Backflush valve | 8. Backflush pressure chamber |
| 4. Hollow fiber modules | 9. Feed water inlet for backflush |
| 5. Filtered water | |

Unique Features

Sparkle^{filter}™ is a high flux yet compact drinking water system with innovative anti-fouling technology. The hollow fiber membranes are “outside-in” fibers manufactured by SpinTek for durability and burst strength, allowing rigorous backflushing.

• Innovative Cleaning System

- Hollow fiber membranes are UltraFiltration (UF)
- Removal of essentially all bacteria and bio-solids
- Hollow fiber membranes are unsupported and backflushable
 - Automatic backflushing capability
 - Virtually no water wasted during cleaning

• Constant Backflush Pressure

- Dual non-resilient collapsible chambers
- “Floating pressure cup”
- Backflush pressure greater than feed pressure during cleaning

• Versatility

- Under the sink filter or as a whole house filter system
- Can fit in any household configuration
- “Pressure cup” can be a built-in feature or stand-alone

It is well documented that when the reverse flow pressure is greater than feed pressure, membrane backflush cleaning is better for contaminant removal. Conventional filters use a resilient bladder configuration and the collapsible, or resilient, bladder can never produce more pressure than the feed pressure. This limiting factor prevents the constant pressure necessary for continual cleaning of bio-solids. In the case of Sparkle, the dual non-resilient collapsible chambers, or “floating pressure cup” design allows for constant backflush pressure and thus consistent and efficient backflushing every time.

Flexibility of Sparkle

The essential feature of Sparkle is the hollow fiber membrane module. While these fibers provide high flux in a compact system, there is flexibility built in to conveniently add other filtration cartridges or absorption techniques for specific needs such as:

- Carbon for chlorine removal
- Activated alumina for arsenic removal
- Specialty ion exchange for mercury

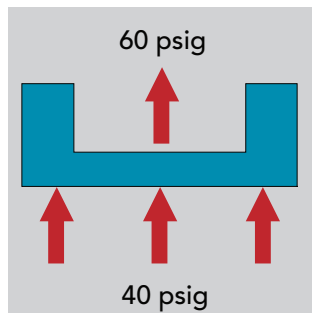
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Sparkle floating pressure cup

Principle of Sparkle DNC²

The diagram at left shows that the backflush side of the floating cup has a larger area than the filtrate side.

Sparkle Floating Cup

The area of the backflush cup side is 150% greater than the filtrate side chamber so when a water pressure of 40 psig is applied to the backflush side it creates a backflush pressure of 60 psig. The ratio in the cup areas can be tailored to specific membranes and specific applications.

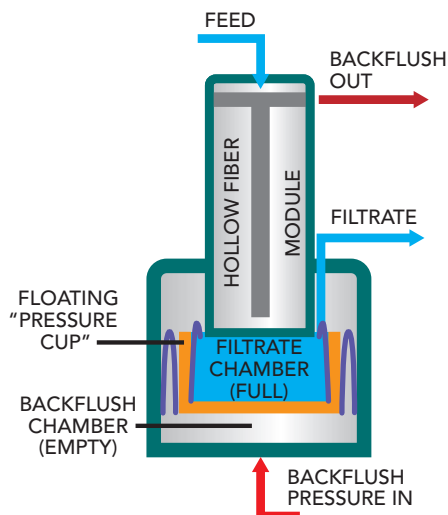
Sparkle is driven by a continuous force (the feed water pressure) applied to the backflush side of the cup and stays constant hence the pressure of the water being driven backwards through the membrane stays constant. This continues until the entire volume of backflush water has been completely used and the feed chamber is completely collapsed or the cycle is stopped.

Sparkle's floating pressure cup design takes into account that even when there are feed water pressure variances, the membrane is continually provided with backflush pressure greater than the feed pressure. The backflush pressure will always be at a fixed ratio greater than the feed water based upon the sizing of the filtrate and backflush areas of the cup.

The floating pressure cup is designed to provide specific amounts of backflush water each time. If some applications require additional backflush water, this can be easily accommodated.

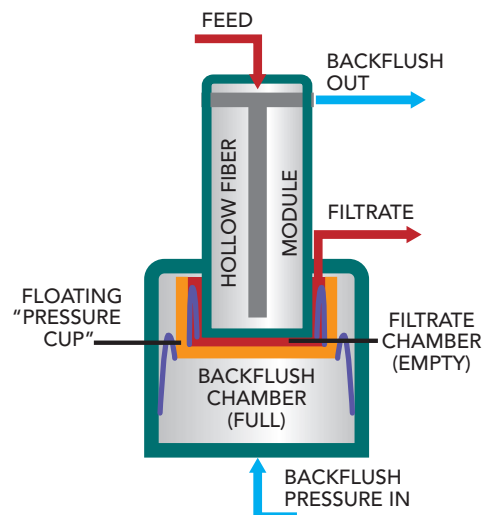
SERVICE MODE

Feed water enters the Sparkle system and passes through the prefilter, the hollow fibers, fills the filtrate side of the cup and exits as clean fresh drinking water.



BACKFLUSH MODE

The feed water pushes up the filtrate cup and with the backflush open and cleans the membrane module by reversing flow through it.



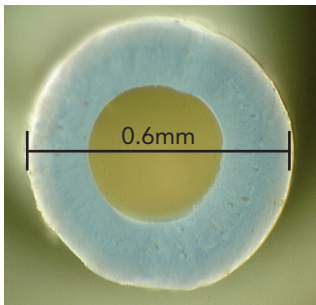
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Hollow fibers



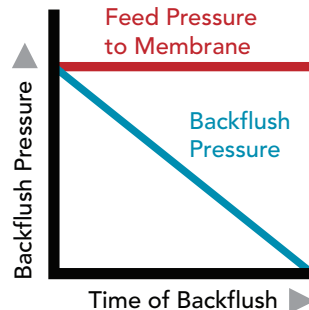
Enlarged end view of the hollow fiber membrane

Advantages of the Sparkle design

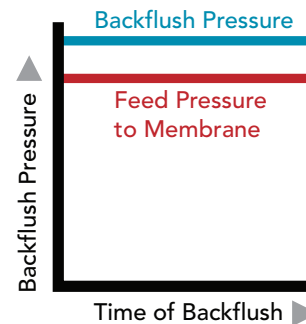
Conventional systems commonly use a resilient bladder to provide backflush water for membrane cleaning. Sparkle uses an innovative dual non-resilient collapsible chamber (DNC) called a “floating pressure cup” which provides many advantages over other systems as outlined below:

- **Greater Backflush Pressure Than Feed Pressure** It is well documented that when the reverse backflush pressure is greater than the feed pressure membrane filters clean much more efficiently and effectively. In the conventional resilient bladder configuration, this collapsed bladder can never produce more backflush pressure than the feed pressure. Sparkle achieves this by the Backflush Chamber having a larger surface area than the Filtrate Chamber in the cup design.
- **Backpressure Decrease During the Backflushing Cycle** When a conventional resilient bladder expands to force clean water back through the membrane, the backpressure continually decreases immediately upon backflushing, causing loss of driving force and poor cleaning of the membrane surface. This reduction of constant pressure reduces cleaning effectiveness of the membrane surface significantly. Sparkle’s floating pressure cup is designed for backflush pressure to remain constant during the entire cleaning cycle which provides constant and steady contaminant removal.

RESILIENT BLADDER FOR BACKFLUSHING



SPARKLE DUAL CHAMBER BACKFLUSHING



- **Consistency of Backflush Water Volume** Water pressure varies significantly from area to area and even in different parts of the same house or building. Conventional resilient bladders are a fixed force so they are compressed further when the feed pressure is high and less when it is low. When the feed pressure is low there is less backflush water available to clean the membrane than when the feed pressure is higher. Sparkle’s floating cup design provides the same amount of backflush water every time regardless of varying feed pressures.

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