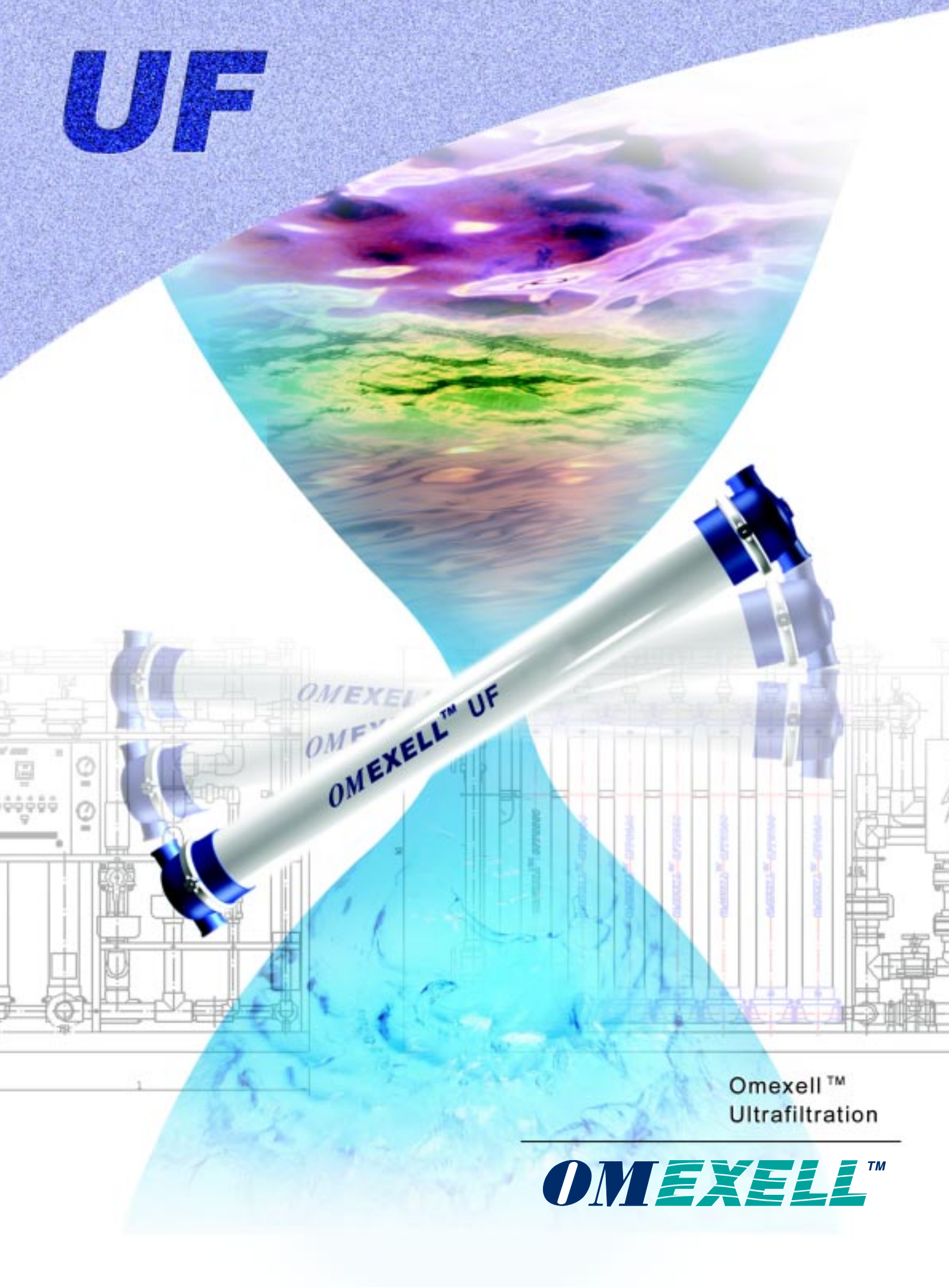
UF



Omexell™
Ultrafiltration

OMEXELL™

UF

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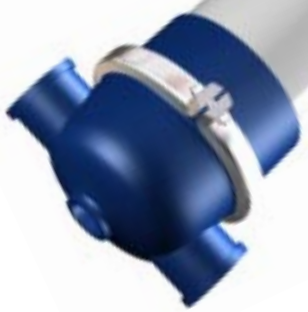
Ultrafiltration or UF is a pressure driven membrane separation process that separates particulate matter from soluble components in the carrier fluid (such as water). UF membranes typically have pore sizes in the range of 0.01 - 0.10 µm and have a high removal efficiency for bacteria and most viruses, colloids and silt (SDI), the smaller the nominal pore size, the higher the removal efficiency. Most materials that are used in UF are polymeric and are naturally hydrophobic. Common polymeric materials used in UF include: Polysulfone (PS), Polyethersulfone (PES), Polypropylene (PP), or Polyvinylidenefluoride (PVDF). Although these materials can be blended with hydrophilic agents, the hydrophilic additives can reduce the membranes ability to be cleaned with strong levels of disinfectants such as peroxide or hypochlorite to sufficiently remove bacterial growth.

The Omexell™ UF system utilizes a double-walled hollow fiber (capillary) membrane using either PS or PVDF based materials. The Omexell UF PVDF membrane has the smallest nominal pore diameter in the industry (for PVDF material) allowing for the removal of all particulate matter, bacteria (9-log reduction) and most viruses and colloids. Despite the small pore diameter, the membrane has a very high porosity resulting in a flux similar to that of microfiltration (MF) and can effectively replace MF in most cases.

The Omexell UF system is designed with an outside/in flow configuration which allows for less plugging, higher solids loading , higher flow area and easy cleaning. The primary flow design is deadend filtration but the module can easily be adapted to a crossflow mode. Deadend filtration uses less energy and has a lower operating pressure then crossflow therefore reducing operating costs. Alternatively, crossflow can handle higher solids loading. The solids handling requirement will dictate the flow design.

Typically, Omexell UF is operated at a constant permeate flow. The transmembrane pressure (TMP) will naturally increase over time and the module can be periodically back flushed or air scrubbed to remove the fouling layer. Disinfectants and other cleaning agents can be used to fully remove and prevent biological growth as well as other foulants.



Operating Specifications

Configuration (fluid flow)	Hollow Fiber (Outside/in)
Base Polymer	PVDF
Nominal Pore Diameter	0.01 µm
Nominal MWCO	20,000 Daltons
H_2O Bubble Point	143 psi (9.8 bar)
Hollow Fiber ID	0.026" (0.65mm)
Hollow Fiber OD	0.049" (1.25mm)

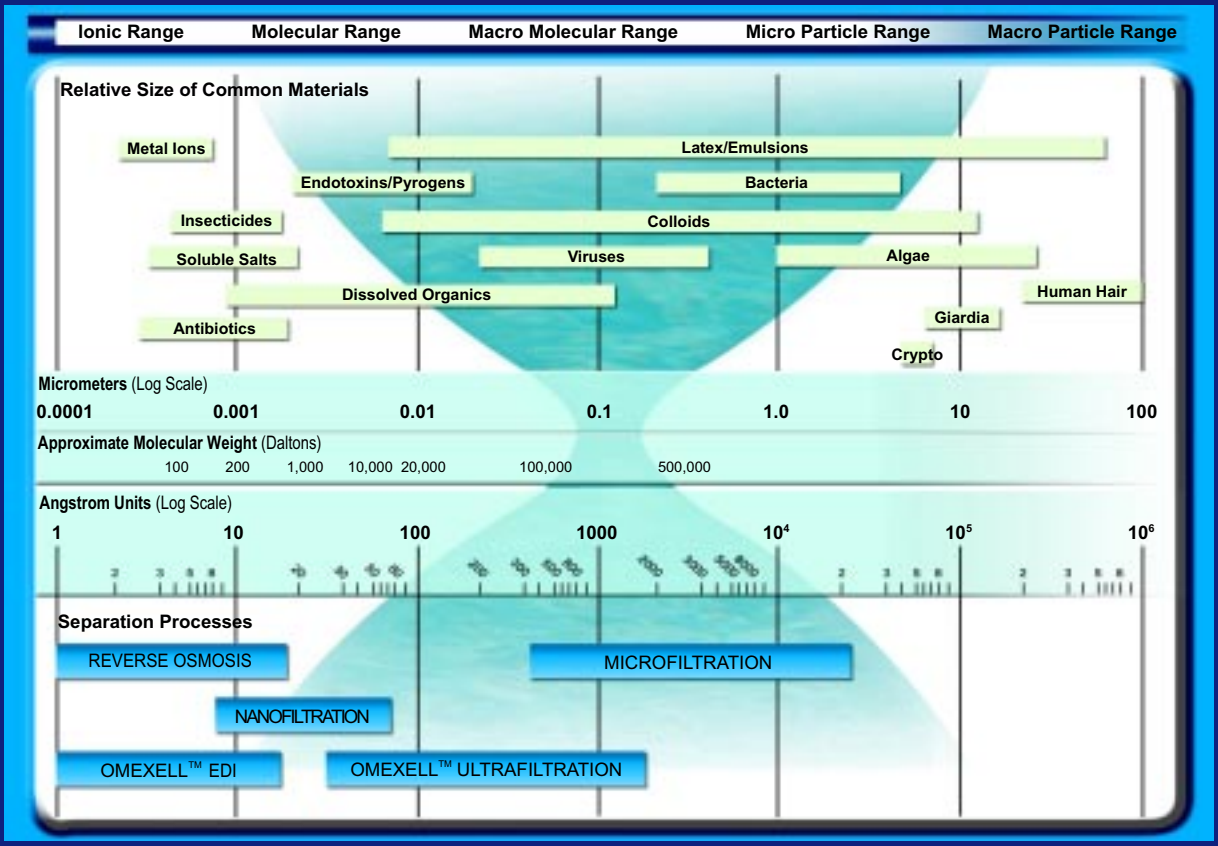
Typical Filtrate Flux Range	32 – 98 gfd (54 – 166 lmh)
pH	2 - 11
Temperature (limited by UPVC)	34 - 104°F (1 - 40°C)
Feed Pressure, Maximum	87 psi (6.0 bar)
Pure Water Permeability	15.1 gfd/psi (371 lmh/bar)
NaOCl, Cleaning Maximum	2,000 ppm

Typical Process Conditions	
Max. Operating Transmembrane Pressure (TMP)	30 psi (2.1 bar)
Max. Total Suspended Solids (TSS) Typical TSS Maximum Sized Particles	100 ppm 50 ppm 250 µm
Max. Total Fibrous Material Typical Total Fibrous Material	50 ppm 5 ppm
Max. Backwash Pressure	44 psi (3.0 bar)
Backwash Flux	59-118 gfd (100-200 lmh)
Backwash Frequency	Once every 15 - 60 seconds
Backwash Duration	30 - 60 seconds
Chemically Enhanced Backwash Frequency	As needed with 10-100 ppm NaOCl or 100-500 ppm H_2O_2
Typical Cleaning Frequency	4 – 12 times per year
Cleaning Chemicals	NaOH/NaOCl, NaOH/ H_2O_2 1-2% Citric Acid
Air Scrubbing Frequency	1-2 times per day

Module Properties	SFP-2640	SFP-2660	SFP-2680
Housing	UPVC	UPVC	UPVC
Length - L	47.64" (1210mm)	67.32" (1710mm)	87.01" (2210mm)
Length - L_1	43.70" (1110mm)	63.39" (1610mm)	83.07" (2110mm)
Diameter - D	6.50" (165mm)	6.50" (165mm)	6.50" (165mm)
Width - W	9.84"(250mm)	9.84" (250mm)	9.84"(250mm)
Fibers per Module	6,000	6,000	6,000
Module Surface Area	254 ft^2 (23.6 m^2)	380 ft^2 (35.3 m^2)	507 ft^2 (47.1 m^2)

UF

MEMBRANE FILTRATION SPECTRUM



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OMEXELL™

An Omex Group Company

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Omexell™ UF Advantages

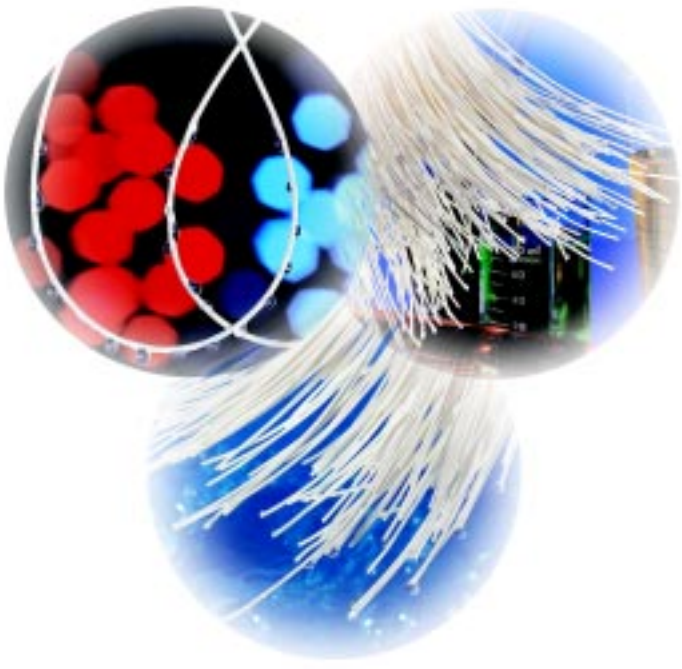
- Low fouling Polyvinylidenefluoride (PVDF) membrane
- High flux
- Durable and break resistant double-walled fiber structure
- Resistant to strong levels of disinfectants such as peroxide or hypochlorite to sufficiently remove bacterial growth
- Smallest PVDF nominal pore diameter in the industry (0.01 µm)
- 9-log removal efficiency of bacteria
- Deadend or Crossflow capabilities
- Outside/in flow configuration which allows for less plugging and higher solids loading, higher flow area and easy cleaning
- Can be periodically back flushed or air scrubbed to remove the fouling layer

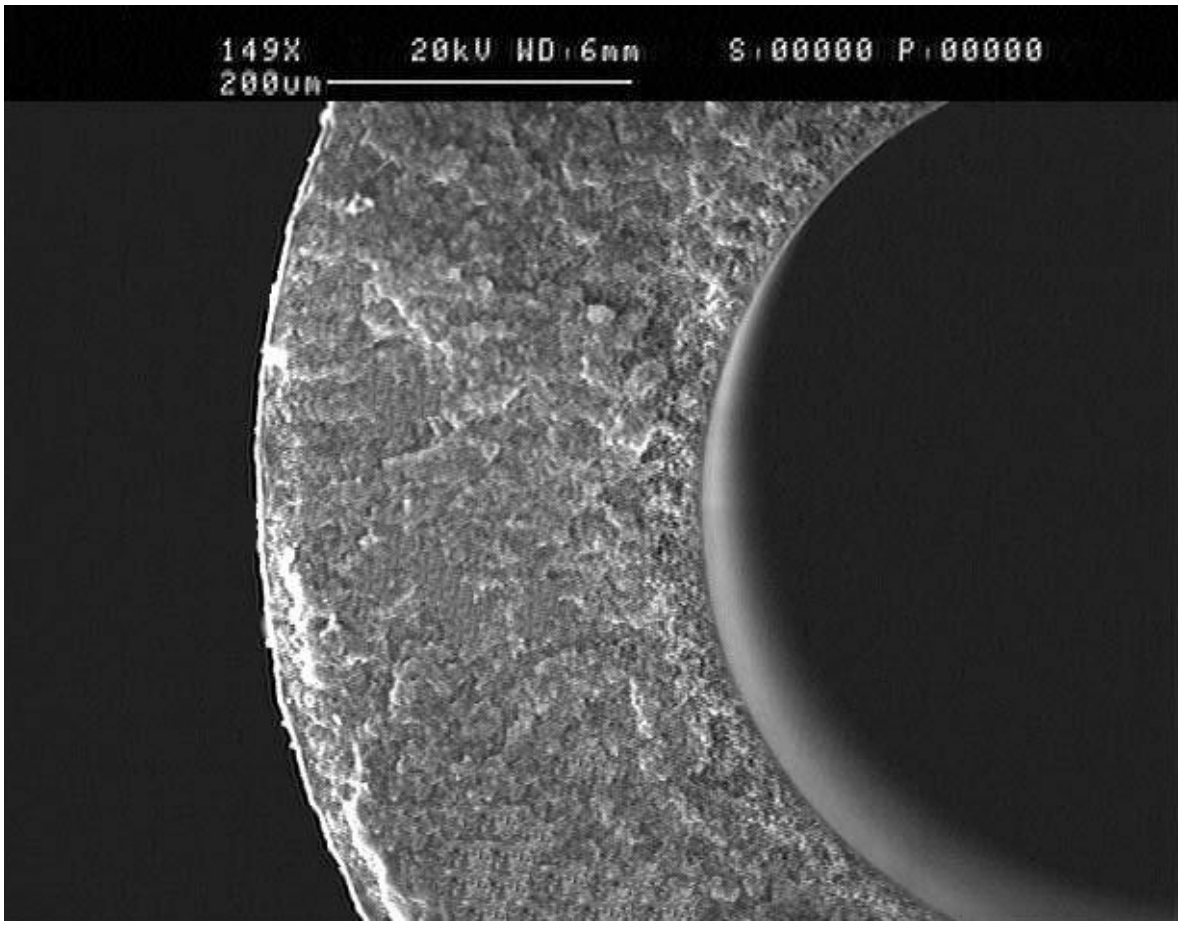
Modular System Design

- Pre-engineered designs
- Can be double stacked and easily expanded
- Small Footprint
- Easy access
- Custom designs available

Hollow Fiber Technology From Omexell

The Omexell UF double-walled hollow fiber ultrafiltration membrane is formed from high grade polymeric chemicals. The defect-free, double-walled fiber membrane is much more robust and less prone to breakage then single-wall hollow fibers but due to the high pore distribution, does not compromise flux. The uniformity of pore size and outside/in flow ensures the Omexell UF membrane creates the perfect barrier without sacrificing performance.





149X SEM OF OMEXELL PVDF CROSS-SECTIONAL AREA