

### Pressured Type Module Specifications

Series	HFU Series		HFS Series	
	HFU-2020	HFU-1020	HFS-2020	HFS-1020
MWCO or Pore Size	150,000 Da		0.02 micrometer	
Membrane Surface Area [Outer Surface]	72 m <sup>2</sup> (775 ft <sup>2</sup> )	29 m <sup>2</sup> (312 ft <sup>2</sup> )	72 m <sup>2</sup> (775 ft <sup>2</sup> )	29 m <sup>2</sup> (312 ft <sup>2</sup> )
Design Flux (m <sup>3</sup> /hour)	8.0 - 2.6	3.2 - 1.1	11.0 - 2.4	4.3 - 1.0
Dimensions	Diameter	216 mm (8.50 inches)	216 mm (8.50 inches)	216 mm (8.50 inches)
	Length	2,160 mm (7.087 ft.)	1,120 mm (3.675 ft.)	2,160 mm (7.087 ft.)
Weight	Full of water	110 kg	60 kg	110 kg
	After draining	67 kg	40 kg	67 kg
Material	Membrane	PVDF (Polyvinylidene fluoride)		
	Casing	Polyvinylchloride		
	Potting	Epoxy Resin or equivalent		
Max. Inlet Pressure	300 kPa (44 psi)			
Operating Temperature Range	0 - 40 degree C			
pH Range	1 - 10 at Filtration, 0 - 12 at Chemical Cleaning			

- Other modules with smaller membrane areas are also available upon request.
- Specifications subject to change without notice.

**Note:**  
Product exports may need security control and government regulatory clearances. Exporters are required to obtain such clearances.

#### TORAY satisfies global water treatment needs.

Global Website: <http://www.toraywater.com/>

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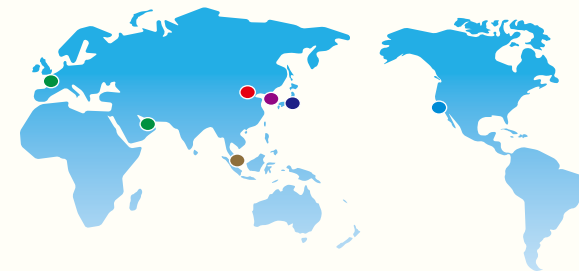
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#### About Toray

Established in 1926, Toray is a worldwide leader in chemical manufacturing and related products. Leveraging decades of experience in synthetic fibers and textiles, Toray has expanded into many other fields such as carbon fiber and its composites, plastics, fine chemicals and innovative water treatment technologies.

Toray is committed to achieving sustainable growth and environmental preservation, while meeting the diverse needs of its customers worldwide. Toray constantly strives to contribute to the countries and communities in which it operates, not only through superior products and services, but by acting as a concerned corporate citizen. In this way, Toray seeks to play its part in building a better society for all the people of the world.

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**TORAY**  
Innovation by Chemistry

**TORAYFIL**® HFU/HFS Series  
PVDF Hollow Fiber UF Membrane  
Pressured Type Module



Toray Industries, Inc.

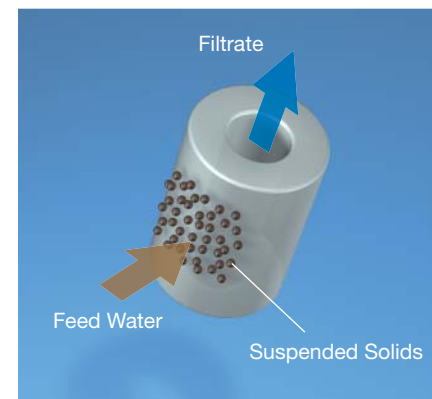
# Toray's Innovative Separation Technology Offers Competitive Solutions.

Toray's PVDF hollow fiber membrane module, a pressured type hollow fiber UF (ultra filtration) membrane module, effectively removes suspended solids and microorganisms such as pathogens, when used for various types of water treatment. This innovative membrane module was developed with polymer science and the membrane fabrication technologies accumulated in Toray Industries, Inc. for more than 30 years.

## Toray PVDF Hollow Fiber Membrane

### Outside-to-Inside Flow Direction

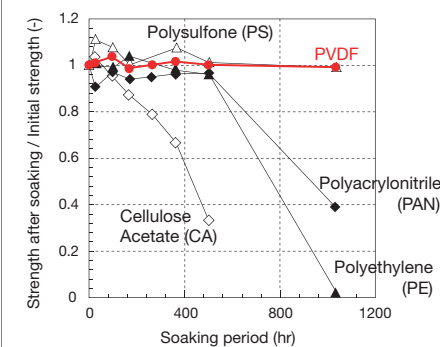
The flow direction is outside-to-inside, which is suitable for high turbidity water treatment, because an air-scrubbing method can be adopted to remove suspended solids effectively.



Flow Direction

### High Chemical Resistance with Polyvinylidene Fluoride (PVDF)

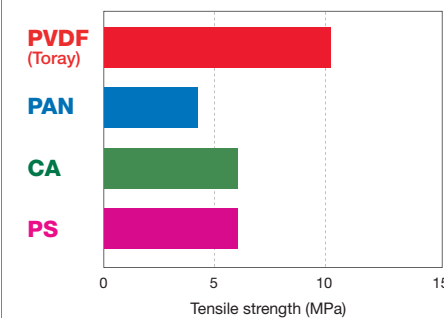
PVDF is one of the best membrane materials that allows using chlorine and strong acid for chemical cleaning of the membrane, resulting in better cleaning effect and longer sustainable flux rates.



Test Conditions  
Sodium hypochlorite 1,000 ppm, pH=10  
Soaking Test Results in Chlorine

### High Mechanical Strength with High Filtration Flux

Toray's special spinning method with PVDF enables high mechanical strength without reinforcement and high filtration flux at the same time. Additionally, the spinning method achieves high-precision small pore size control with uniform diameter distribution, providing high fouling resistance.



Test Conditions  
Sample Length: 50mm  
Pulling Speed: 50mm/min, Temp.: 25?  
Tensile Strength Test Results

## Two Membrane Types for Various Applications

Toray provides two types of PVDF hollow fiber membranes to meet the requirements on various applications with many kinds of untreated water.

Membrane Module Type	HFU series	HFS series
MWCO or Nominal Pore Size	150,000 Da (UF)	0.02 micrometer (UF)
Pure Water Flux [m/h at 100 kPa]	0.8	1.6
Recommended Applications	Drinking Water Production	✓✓
	Industrial Water Treatment	✓✓
	Seawater Desalination (for RO pretreatment)	✓✓
	Wastewater Tertiary Treatment	✓✓

✓✓: Recommended ✓: Suitable

## Advantages of Toray PVDF Hollow Fiber Membrane Modules

### Safe Water Provided

Toray membrane modules are made of reliable materials and manufactured under our rigorous quality control.

Model HFS-2020 is certified for drinking water production.

- ANSI/NSF 61
- AMST (Association of Membrane Separation Technology of Japan)
- CDPH (California Department of Public Health)

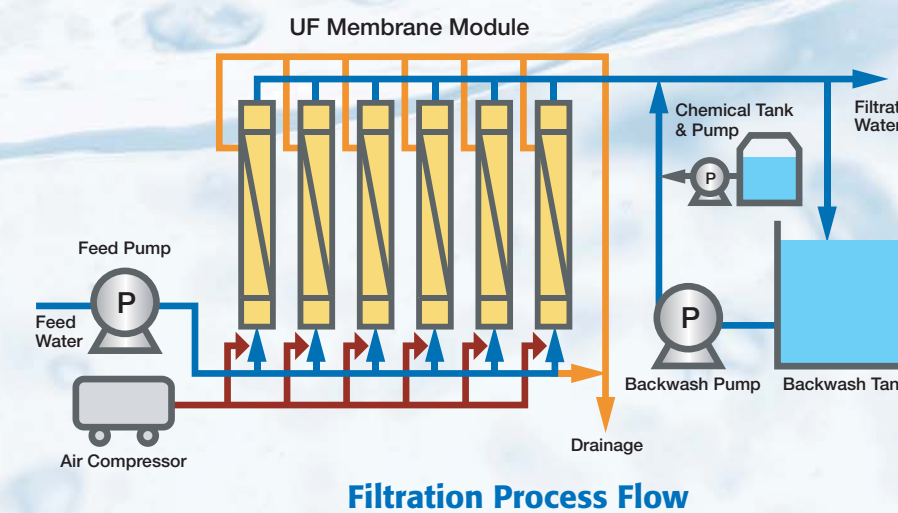


### Large Size Module with Large Membrane Area

Module Type 2020 has 72m<sup>2</sup> of membrane area that provides large amount of filtration flow continuously. Such a large size module is suitable for large-scale water treatment plants.



Cutaway View



Filtration Process Flow

## Examples of Actual Plants

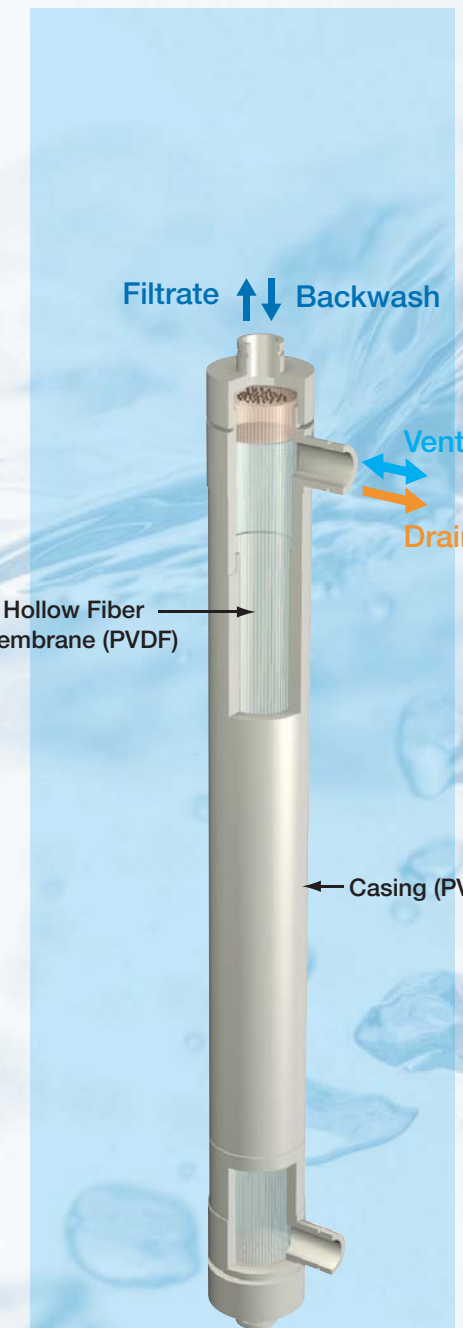
Toray's membrane modules provide high-quality water on a daily basis for drinking, RO pretreatment, water reuse and other applications.



Drinking Water Production  
Capacity: 44,000m<sup>3</sup>/d x 2 plants  
Location: Tokyo, Japan  
Operation start: Mar. 2007



Seawater Desalination (for RO pretreatment)  
Capacity: 2,700m<sup>3</sup>/d  
Location: Ehime, Japan  
Operation start: Sept. 2003



Feed Water ↑ ↓ Drain  
Air  
Module Figure