

# Multi-Bores Capillary Ultrafiltration Membrane: When Selectivity meets Mechanical Stability

Ultrafiltration has gained more popularity in recent decades. More and more appreciations has endorsed ultrafiltration as one of the best option for low-cost drinking water production. Low operating power and relatively chemical-free operating process while able to remove turbidity yet disinfect water, advocates of ultrafiltration claimed it is absolutely superior than conventional filtration and disinfection technology.

## What is ultrafiltration?

Ultrafiltration (UF) is a pressure driven membrane separation process. Thanks to its nano-sized pores, UF membrane is widely known as powerful system for turbidity removal and disinfection in water treatment. Since it is operated in low pressure, which means low energy consumption, and yet relatively chemical-free, UF seems to be both economically and environmentally feasible.

The most essential advantage of ultrafiltration compared with other technologies is the independency of bacteria, virus and pathogenic substances removal from feed water quality. UF delivers high quality output for following treatment steps, e.g. reverse osmosis for industrial water purposes and sea water desalination.

## Enhancing Mechanical Stability: Aiming Break-Proof Membrane

UF membrane are most commonly available in commercial hollow fiber or capillary fiber membrane module. Given the demands of reliable long term application, in addition to chemical and biological resistance, the membrane should also has high mechanical stability. A single fiber breakage, e.g. due to water hammer, will simply cause the whole system lost disinfection and selectivity – contaminates all of the product.



19-bores ultrafiltration membranes provide higher packing density than 7-bores ultrafiltration on relatively similar mechanical strength

Widely recognized consensus regarding enhancement of mechanical stability of capillary fiber membrane is innovating with the membrane formulation to create membrane with high tensile and elongation strength while pertaining or even increasing its selectivity and permeability/flux. The scientific quest for super-formulation for high flux, super selective, yet extremely strong has been running for years.

While the super-formula are yet to be concluded, GDP Filter tried the other perspective to enhance mechanical stability. Inspired by motto “united we stand, divided we fall”, GDP Filter started to think to combine several capillary fibers into a single fiber. Eventually, in 2009, GDP Filter initiated production of multi-bores capillary ultrafiltration membrane. The first type produced were 7-Bores Capillary and subsequently 19-Bores Capillary.



7-Bores Ultrafiltration membrane has already been used widely to replace single bore membrane on water treatment application

### **Multi-Bores Capillary Membrane: Enhancing Robustness, Pertaining Selectivity and Hydrophilicity**

Interesting consequences of multi-bores capillary membrane are the facts that it successfully pertains selectivity and selectivity while having greater robustness. Break-proof seems to be not a far away dream now. Furthermore, multi-bores membrane have better packing density (higher surface area in the same volume), when compared with the conventional single bore capillary membrane.

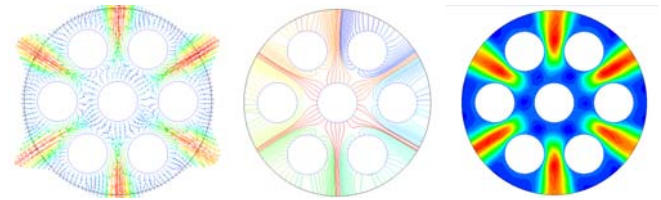
Break-proof, highly hydrophilic, plus better packing density, GDP Filter firmly believe that industrial and large scale water treatment plants will benefit much from multi-bores membrane.

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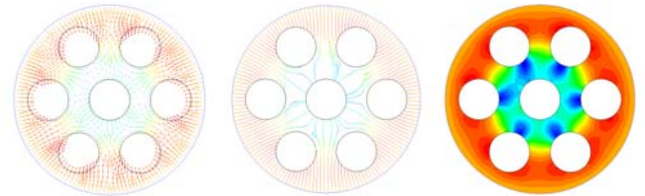
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(a) Outside – in operation



(b) Inside – out operation

CFD simulation shows evenly permeation distribution on multi-bores operation whether inside-out or outside-in configuration, as shown on the figure above.