



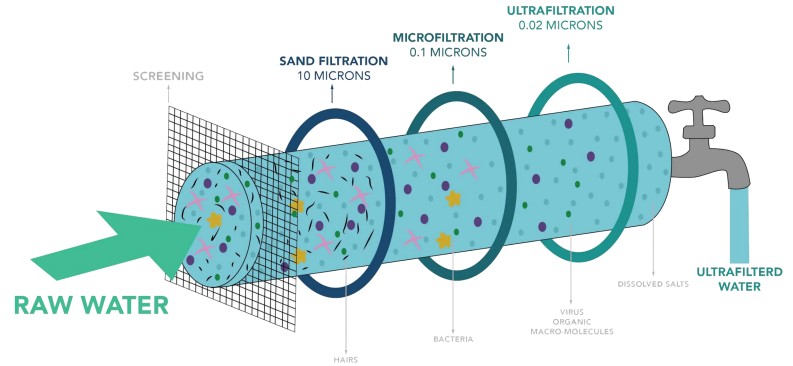
ROCKERHILL

Ultrafiltration System

Maximizing Flexibility, Reliability and Efficiency

What is Ultrafiltration

Ultrafiltration (UF) is a membrane filtration process similar to Reverse Osmosis, using hydrostatic pressure to force water through a semi-permeable membrane. The pore size of the ultrafiltration membrane is usually 103 - 106 Daltons. Ultrafiltration (UF) is a pressure-driven barrier to suspended solids, bacteria, viruses, endotoxins and other pathogens to produce water with very high purity and low silt density.



The benefits of using Ultrafiltration

1. High-Efficiency Removal of Contaminants

- Removes **bacteria, viruses, colloids, proteins, and microplastics** (0.01–0.1 micron pore size).
- **Does not require chemicals** like chlorine, avoiding disinfection byproducts (e.g., THMs).

2. Superior Water Quality

- Produces **turbidity-free water** (<0.1 NTU).
- Acts as a **barrier against pathogens** (e.g., *Cryptosporidium*, *Giardia*).

3. Energy & Cost Savings

- **Lower operating pressure** (1–5 bar) vs. Reverse Osmosis (RO) (15–80 bar), reducing energy costs.
- Minimal chemical consumption (only periodic cleaning).

4. Compact & Scalable Design

- Modular systems fit small labs or large industrial plants.
- Integrates easily with **pretreatment** (e.g., **activated carbon**) or **post-treatment** (e.g., RO).

5. Environmental & Safety Advantages

- **No chemical waste** (unlike coagulation/flocculation).
- Safe for **temperature-sensitive fluids** (e.g., dairy, juices) due to ambient-temperature operation.

Ultrafiltration Membrane System



How Ultrafiltration Works

Ultrafiltration (UF) uses a membrane with tiny pores (0.01–0.1 microns) to filter water or liquids. Under low pressure, it traps particles like bacteria, viruses, proteins, and microplastics while letting water and small molecules (salts, sugars) pass through. No chemicals are needed—it works like a microscopic sieve. UF cleans drinking water, treats wastewater, and concentrates liquids in food/pharma industries. It’s energy-efficient but doesn’t remove dissolved salts. Regular backwashing keeps the membrane clean. Compared to methods like reverse osmosis, UF is cheaper and operates at lower pressure.

Key Components of UF System

Membrane Modules:

- **Hollow fibers** (thin tubes with porous walls) or **spiral-wound sheets**.
- **Material:** Polyethersulfone (PES), polyvinylidene fluoride (PVDF).
- **Pore size:** 0.01–0.1 μm .

Feed Pump:

- Generates **low pressure (1–5 bar)** to push liquid through membranes.

Tanks:

- **Feed tank:** Holds untreated liquid.
- **Permeate tank:** Collects filtered water.
- **Backwash tank:** Stores clean water for membrane cleaning.

Valves & Piping:

- Control flow direction (feed, permeate, retentate).
- Enable **backwashing** and **cleaning cycles**.

Backwash System:

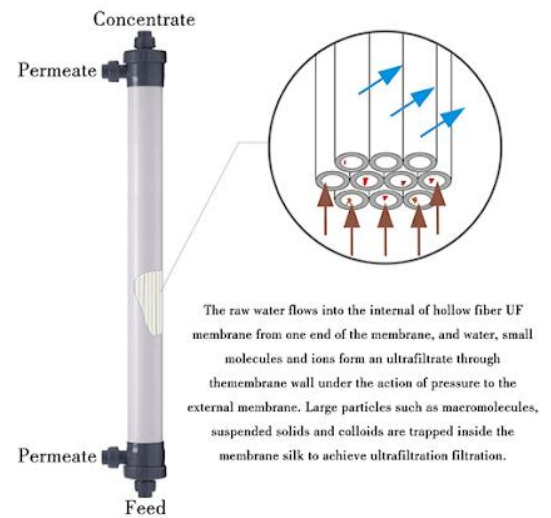
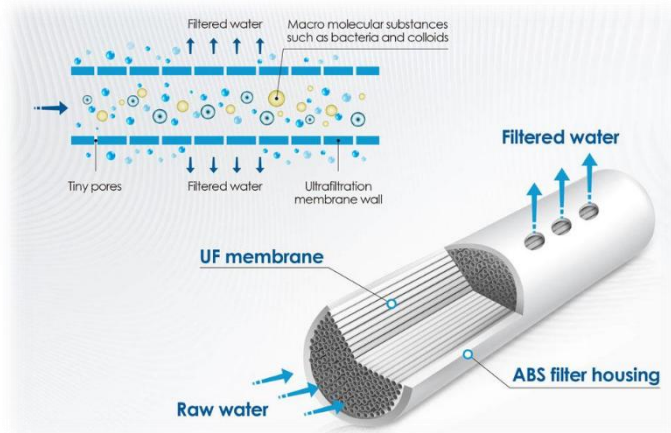
- Reverses flow periodically to flush trapped particles off membranes.

Chemical Cleaning System:

- Uses acids (e.g., citric) or bases (e.g., NaOH) to dissolve fouling.
- **Pre-filters:**
- Remove large debris (>5–100 μm) to protect UF membranes.

Sensors & Controls:

- **Pressure gauges:** Monitor transmembrane pressure.
- **Flow meters:** Track permeate/reject flow rates.
- **Automated controllers:** Manage cycles and alarms.



Applications of UF System

- Drinking Water Treatment
- Wastewater Reclamation
- Dairy & Beverage:
- Pharmaceuticals
- Oil & Gas
- Biotech



Choosing the Right UF System

1. **Feed Quality:** Test turbidity, organics, and contaminants. High solids? Add pre-filters (e.g., 50µm screen).
2. **Flow Rate:** Calculate required permeate volume (e.g., 10 m³/h for industrial use).
3. **Pore Size:** Pick 0.01–0.1µm pores to target specific contaminants (e.g., viruses → 0.03µm).
4. **Membrane Material:** Use PVDF for chlorine resistance; PES for low-fouling feeds.
5. **Configuration:** Hollow fibers for municipal water; spiral-wound for high-solids (e.g., food waste).
6. **Automation:** Opt for auto-backwash/cleaning if operational simplicity is critical.
7. **Cost:** Balance capital expense vs. energy/cleaning savings.

Customization of UF Systems

1. Membrane Specifications:

- **Pore size** (0.01–0.1 µm) tailored to remove target contaminants (e.g., 0.03 µm for viruses).
- **Material choice:** PVDF for chemical/chlorine resistance; PES for low-fouling applications.

2. System Design:

- **Configuration:** Hollow fiber for municipal water; spiral-wound for high-viscosity fluids (e.g., dairy, biopharma).
- **Skid-mounted vs. containerized:** Modular setups for space-constrained sites.
- **Material compatibility:** Stainless steel for food/medical; FRP for corrosive environments.

3. Flow & Pressure:

- Adjustable **feed pumps** and **valve controls** to handle specific flow rates (1–1,000+ m³/day).
- Optimized **transmembrane pressure** (TMP) for energy efficiency.

4. Automation & Integration:

- **PLC/SCADA controls** for auto-backwash, chemical cleaning, and remote monitoring.
- Integration with **pre-treatment** (e.g., activated carbon) or **post-treatment** (e.g., RO).

5. Compliance & Certifications:

- Meet industry standards (e.g., NSF/ANSI 61 for drinking water, FDA for food).



Project Reference



Tibet Lhasa Power plant make up water system Project

- Owner: Tibet Lhasa Power plant
- Commissioning by: 2013
- Capacity: 600 t/day
- Process: UF+RO
- Application: Power plant



Handan I&S group Power plant make up water system Project

- Owner: Handan steel group
- Commissioning by: 2013
- Capacity: 12,000 t/day
- Process: UF+RO +mixed bed
- Application: Power plant

Project Reference



Huangdao Sea water desalination Project

- Owner: Huangdao Sea water desalination
- Commissioning by: 2021
- Capacity: 10,000 t/day
- Process: UF+RO +EDI
- Application: Sea water desalination



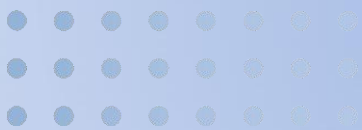
Morocco Sea water desalination Project

- Owner: Morocco Sea water desalination
- Commissioning by: 2020
- Capacity: 6,000 t/day
- Process: UF+RO
- Application: Sea water desalination



Ultrafiltration

Advanced water treatment solutions



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