REVERSE OSMOSIS



Reverse osmosis (RO) is a water purification technology that uses a semipermeable membrane

1. CLASSIFICATION BY USE



Drinking use

Treatment of water intended for human consumption, filtration of salts and bacteria



Industrial Use

Replenishment or discharge of process water requiring microfiltration



Purifiers

Widespread distribution through professional water dispensers

SEMIPERMEABLE MEMBRANE TECHNOLOGY

The core of the osmosis system is represented by semipermeable membranes, whose microporosity, expressed in microns, determines the degree of water filtration.

The term **"reverse osmosis"** derives from the physical principle on which the process is based: through the application of external pressure, the natural flow of osmosis is reversed, pushing water from a more concentrated solution (impure water) towards a less concentrated one (purified water), passing through a selective membrane.

The highest performing membranes can retain not only impurities but also dissolved mineral salts, which contribute to the taste of the water. For this reason, in some systems, a subsequent remineralization process may be necessary to restore the correct salt balance.

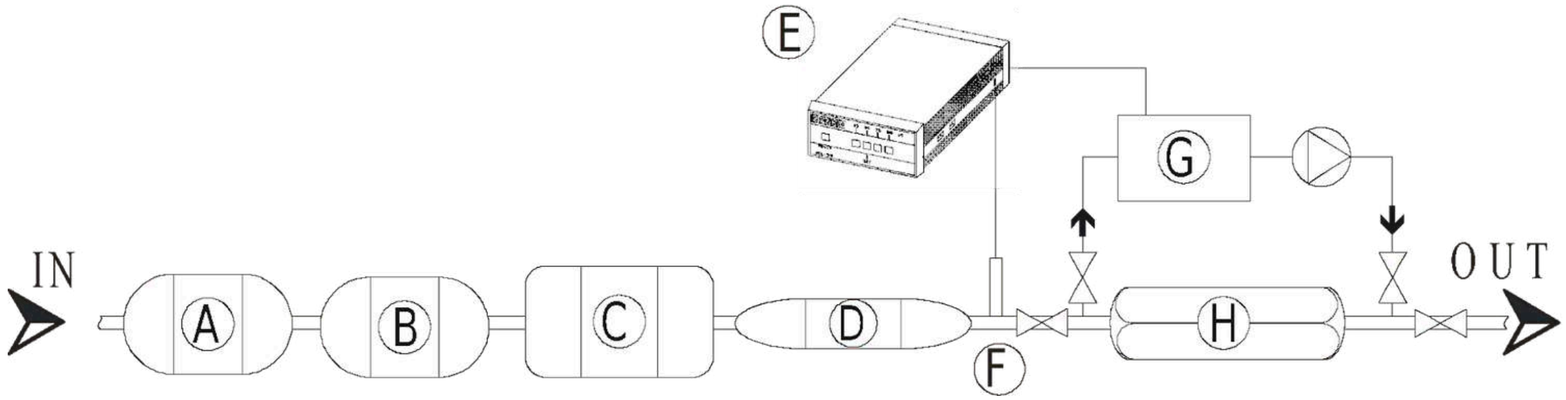
From a physical point of view, reverse osmosis is not a simple filtration, but a process that uses pressure to overcome osmotic pressure, a colligative property linked to the chemical potential of the system. This technology allows the removal of a wide range of dissolved ions and molecules and is used both in industrial settings and in the production of drinking water.

2. CLASSIFICATION BY APPLICATIONS

Reverse osmosis is a technology found virtually anywhere pure water is required. The most common uses include:

- Drinking water
- Humidification
- Ice production
- Water recycling in car washes
- Rinse water
- Biomedical applications
- Laboratory applications
- Pharmaceutical production
- Water used in chemical processes / Cosmetics
- Animal feed
- Catering
- Greenhouses
- Metal electroplating applications
- Wastewater treatment
- Boiler water
- Battery water
- Semiconductor manufacturing

WATER FLOW CLASSIFICATION & OPERATING SCHEME



Legend:

A. Active carbon filter
B. Filter
C. Water softener
D. UV lamp
E. Conductivity meter
F. Conductivity probe
G. Backwash system
H. RO Membrane

APPLICATION SECTOR

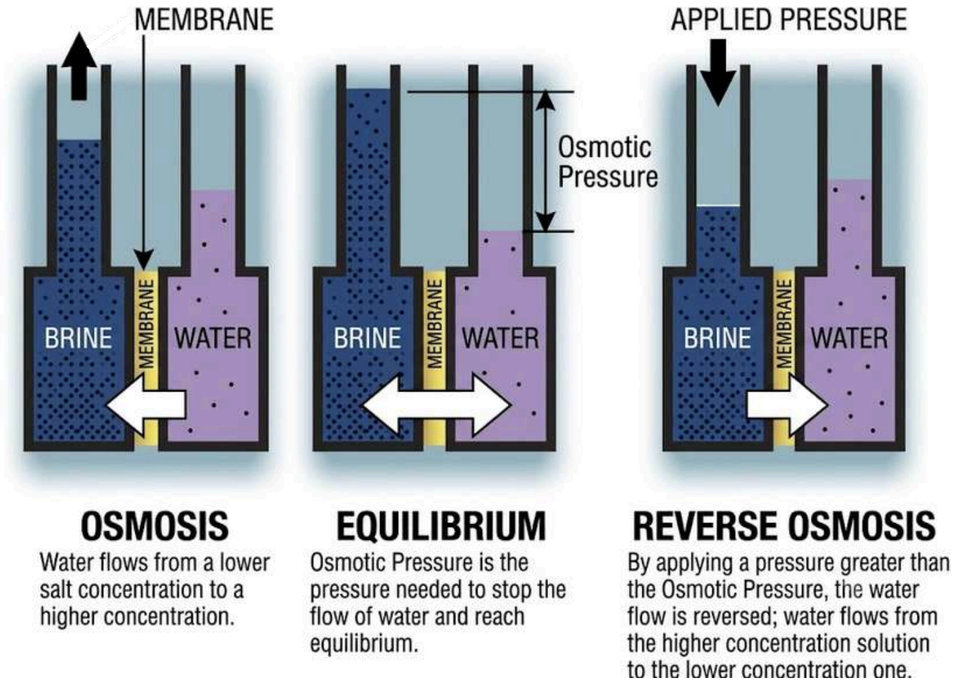
All treatment plants requiring downstream microfiltration.
Typical in water purification and industrial treatments where water replenishment or discharge requires microfiltration. The osmotic membrane is integrated with physical-chemical pre-treatments, and is also typical in purifiers for water distribution.

TREATMENT PROCESS

The plant normally consists of an initial pre-treatment system, which can include various treatments such as **flocculation, precipitation and neutralization,** sand **filtration, chlorination, UV treatment, active carbon filtration, softening**, etc., depending on the characteristics of the water to be treated.
Instruments, **dosing pumps,** and related **accessories** will be placed in this section of the plant.

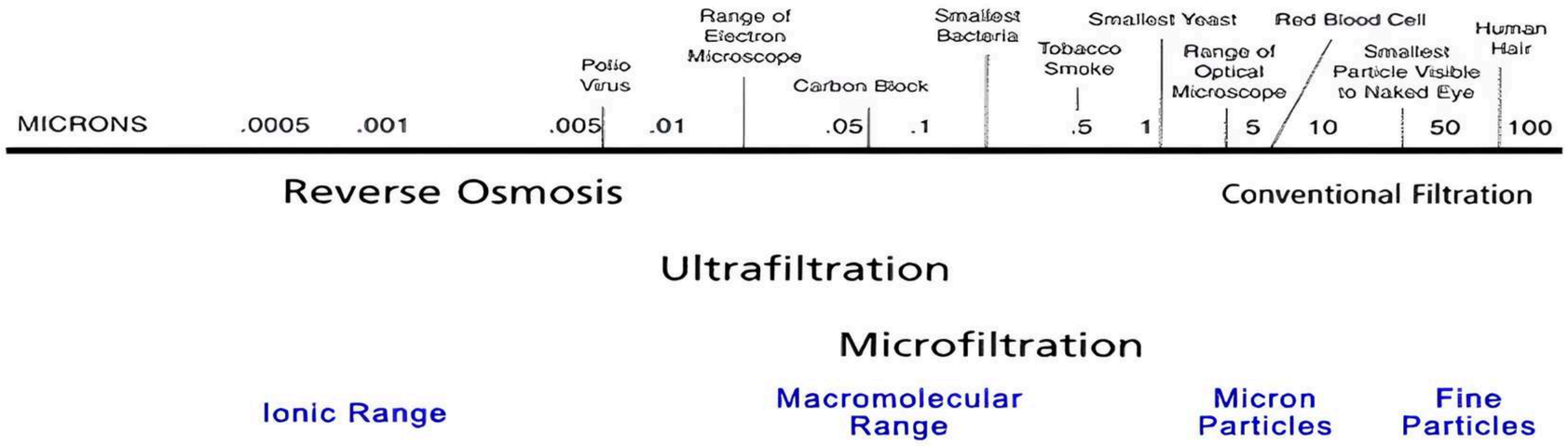
OSMOTIC PRINCIPLE

The reverse osmosis process forces water with a higher concentration of contaminants (source water) into a tank containing water with an extremely low concentration of contaminants (treated water).
High water pressure on the feed side is used to "reverse" the natural osmotic process, while the semipermeable membrane allows water to pass but retains most contaminants.
The specific process by which this happens is called ion exclusion, where a concentration of ions on the membrane surface forms a barrier that allows water molecules to pass, excluding other substances

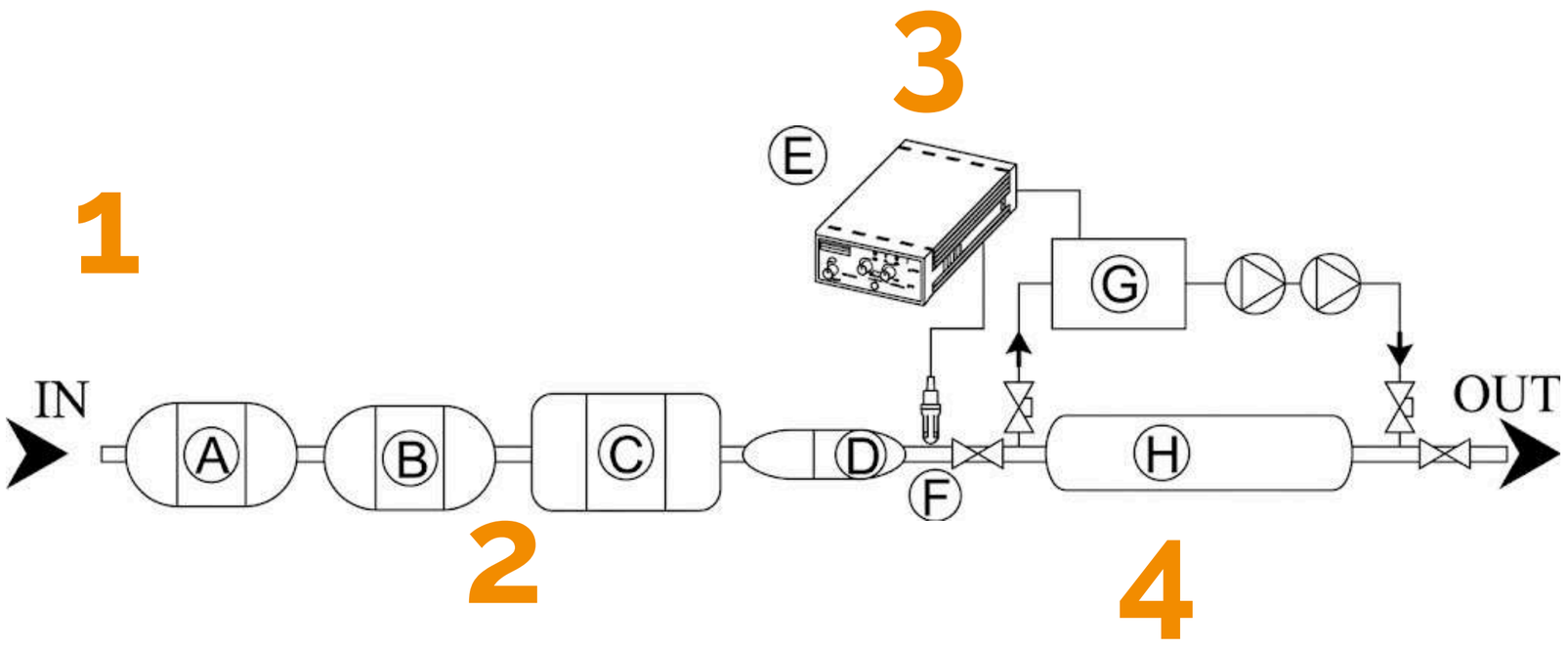


RO REMOVES IMPURITIES

A reverse osmosis membrane removes impurities and particles larger than 0.001 microns.



OPERATING SCHEME



Legend:

Installation point layout

1. Antiscalant dosing at the inlet via digital pump
2. Chlorine concentration control via ORP measurement
3. Conductivity level and membrane backwashing action
4. Flow rate regulated by flow controller

TREATMENT PROCESS

- The cost of a semipermeable membrane requires at least the dosing of a downstream stabilizer (usually a flocculant) to prevent rapid clogging of the membrane and its consequent deterioration. This dosing is carried out with a **dosing pump**, which can be driven by a **pulse-emitting water meter.**

- When the membrane gets clogged, the system requires backwashing, i.e., reversing the water flow to "wash" the membrane, freeing it from particles. Membrane clogging can be verified by a decrease in permeate flow and pressure. It can also be verified by electrical conductivity, given the membrane's inability to retain dissolved salts, which will increase their concentration in the water and thus the conductivity value. A **conductivity meter** allows the backwash phase to start automatically.

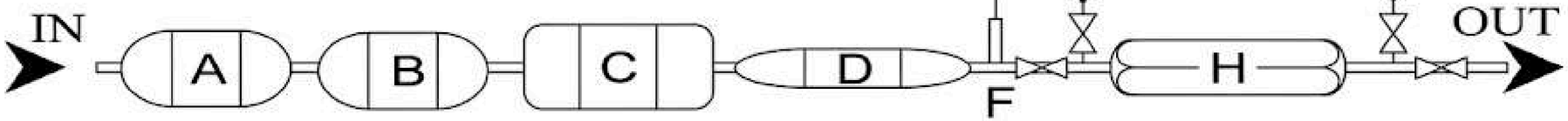
OPERATING SCHEME

Antiscalant dosing pumps



Electrical conductivity controller







Redox potential controller



Flow controller



Bisulphite dosing pumps

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A. Active carbon filter
B. Filter
C. Water softener
D. UV lamp
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F. Conductivity probe
G. Backwash system
H. RO Membrane

OPERATING SCHEME

Electrical conductivity controller



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Flow controller

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INJECTA

the perfect dosing

