

Impurities in water

Common contaminants in tap water fall into seven major categories:

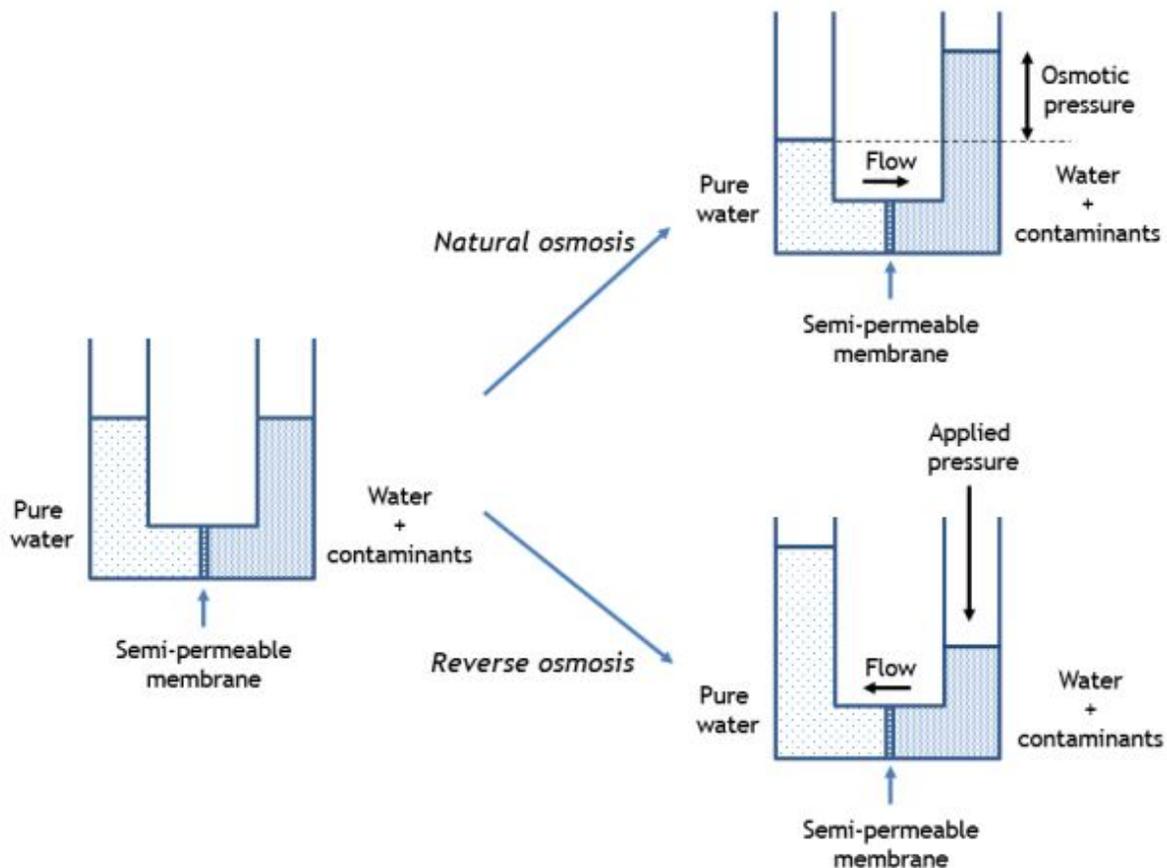
| Contamination | Characteristics |
|-----------------------------|--|
| Suspended solid particles | silt and pipework debris, cause turbidity (cloudiness), Particle size is usually greater than 1 micron |
| Dissolved inorganic salts | most prevalent contamination in raw water, Carbonates and bicarbonates of calcium and magnesium, Nitrates, Sulphates, Phosphates |
| Colloids | sub-micron particles of matter that are neither truly in solution or truly solid, Particle size ranges from 0.01-1.0 μ m |
| Dissolved organic compounds | include proteins, chloramines, alcohols, aldehydes, ketones and the organic residues from detergents, pesticides and herbicides. |
| Micro-organisms Pyrogens | Bacteria, viruses, fungi and algae are found in most surface waters and can also multiply in the pipes delivering water to its point of use. |
| Dissolved gasses | Carbon dioxide readily dissolves in water to form weakly acidic carbonic acid, H ₂ CO ₃ . |

Most common method of purifying water : Reverse Osmosis (RO)

Osmosis

If a dilute solution and a concentrated solution, prepared using the same solvent, are separated by a semi-permeable membrane osmosis will occur. Solvent (base liquid) molecules migrate through the membrane from the **more dilute** solution in order to try to equalize the concentrations of the two solutions. This will continue until the two concentrations are equal or the limit of the solvent's osmotic pressure is reached and stops any further migration.

This can be graphically illustrated by putting the two solutions in a U-tube where the level in the side of the concentrated solution will rise. When equilibrium is achieved the difference in the levels is said to be the osmotic pressure of the solvent.



If a pressure greater than the osmotic pressure is applied to the concentrated solution the solvent can be forced to migrate in the opposite direction – this is known as reverse osmosis (RO). In an RO system the concentrated solution is the raw water supply. It is passed at high pressure (usually >60psi) over the membrane and pure water passes through but the impurities are trapped by the membrane and discharged to drain. The purified water produced is known as permeate.

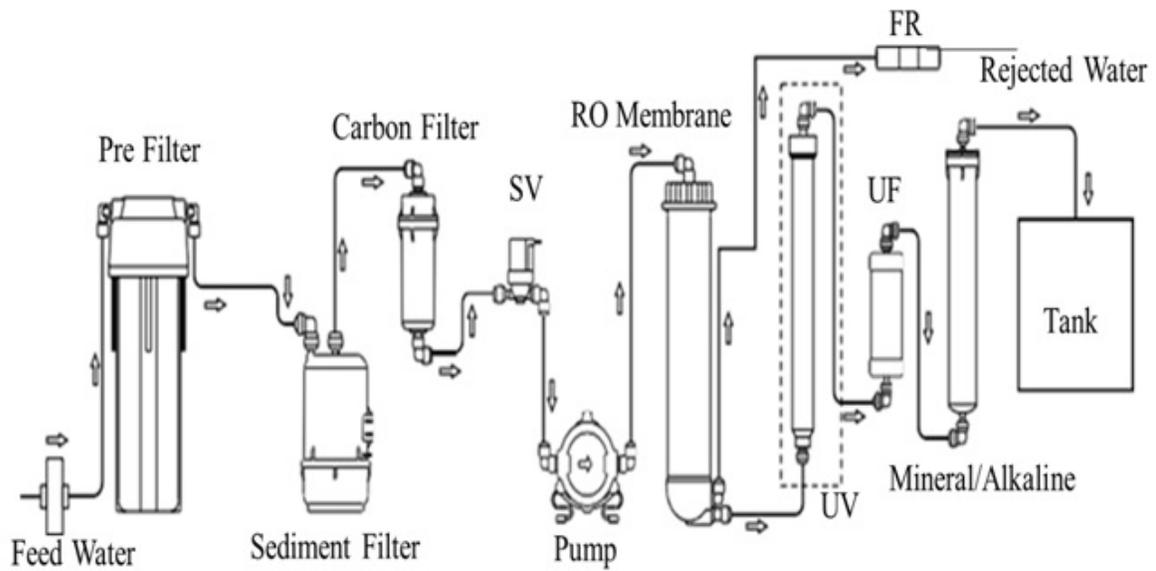
Pound force per square inch

Filtration

Three types of filtration are commonly used in water purification:

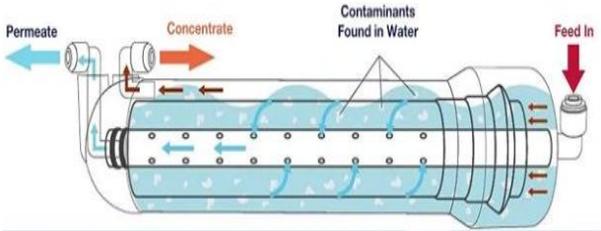
1. **Microporous filtration** uses a membrane of 0.2µm pore size which is capable of removing bacteria and particulate matter such as resin fragments from ion exchange columns.
2. **Ultrafiltration** uses a membrane of typically 1-10 nm. This is capable of removing pyrogens and other organic molecules with a molecular weight of >10,000Da such as proteins.

3. **Activated carbon** filters remove chlorine and chloramine by adsorption and are also capable of removing some dissolved organics.



General parts of water purifier

| | | |
|----------------------------------|---|--|
| Flow Restrictor |  <p>A white cylindrical component with a black arrow pointing to the right and the text "FLOW 450" printed on it.</p> | To restrict the water flow |
| Sediment Filter |  <p>A white cylindrical filter with a pink label that reads "INLINE SEDIMENT FILTER".</p> | Dirt and sand particles |
| Carbon Filter (Activated Carbon) |  <p>A white cylindrical filter with a pink label that reads "INLINE CARBON FILTER".</p> | Chlorine, Organic matters And bad odor |
| Solenoid Valve |  <p>A brass and plastic solenoid valve with two white plastic ports and electrical terminals on top. A label on the valve reads "7P-4F100 1/2\"/> </p> | Allows water flow if it is ON 12 Volt DC |
| Booster Pump |  <p>A cylindrical booster pump with a silver and blue body, mounted on four black feet. It has two ports on the side.</p> | Sends water to RO membrane 24 Volt DC |
| TDS Adjuster |  <p>A white plastic TDS adjuster with a blue top and two blue adjustment knobs on the sides. It has a brass fitting on top.</p> | To add minerals back pump to UV via TDS adjuster |

| | | |
|--------------------|---|---|
| RO membrane |  | <p>Pump to membrane</p> <p>Membrane to UV</p> <p>Membrane to drain</p> |
| Post Carbon Filter |  | |
| UV filtration | <p>How To Assemble UV Water Sterilizer</p>  <p>Stainless Steel Chamber UV Lamp Quartz Sleeve</p> | <p>240 Volt 11 watt Pump to UV</p> <p>Pump to UV via TDS adjuster</p> <p>RO to UV</p> |
| Ultrafiltration |  | <p>Ultra filtration carbon filter</p> <p>UV to UF</p> |
| Alkaline filter |  | <p>To add minerals</p> |