

Presentation

On

WTP – 02 – Solid & Suspension

Prepared By

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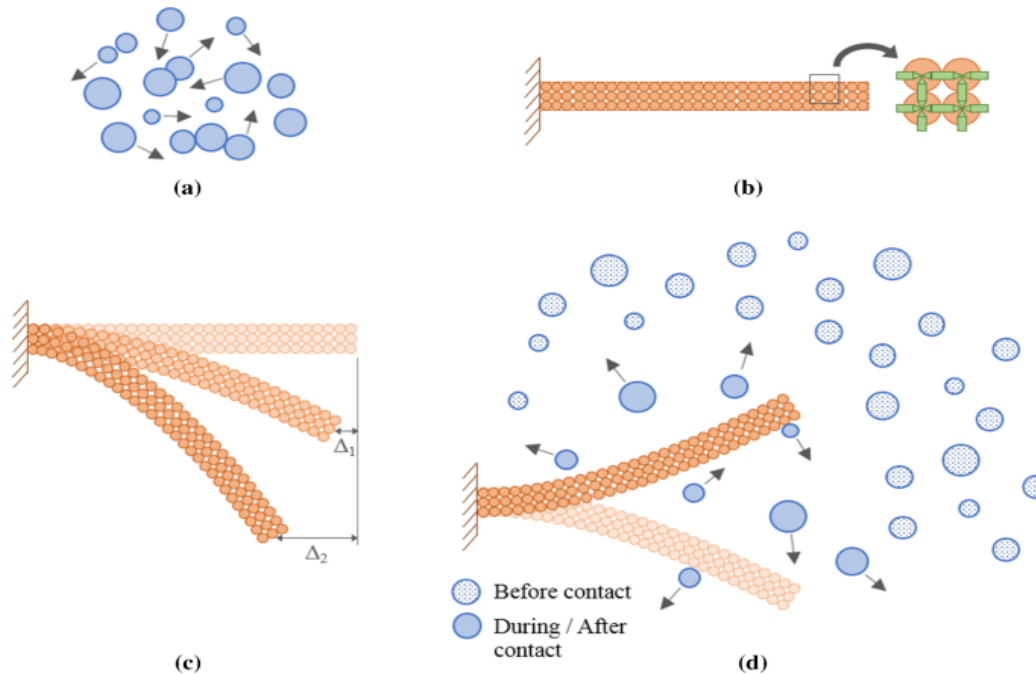
[Ameera Consultancy] (<https://ameeraconsultancy.com/>)

**WTP – 02 – Solid
& Suspension**

Solids & Suspensions

Discrete Particles

Particles do not change size, shape & SG over time



Have **Little Tendency to Flocculate/Coalesce** upon contact with each other

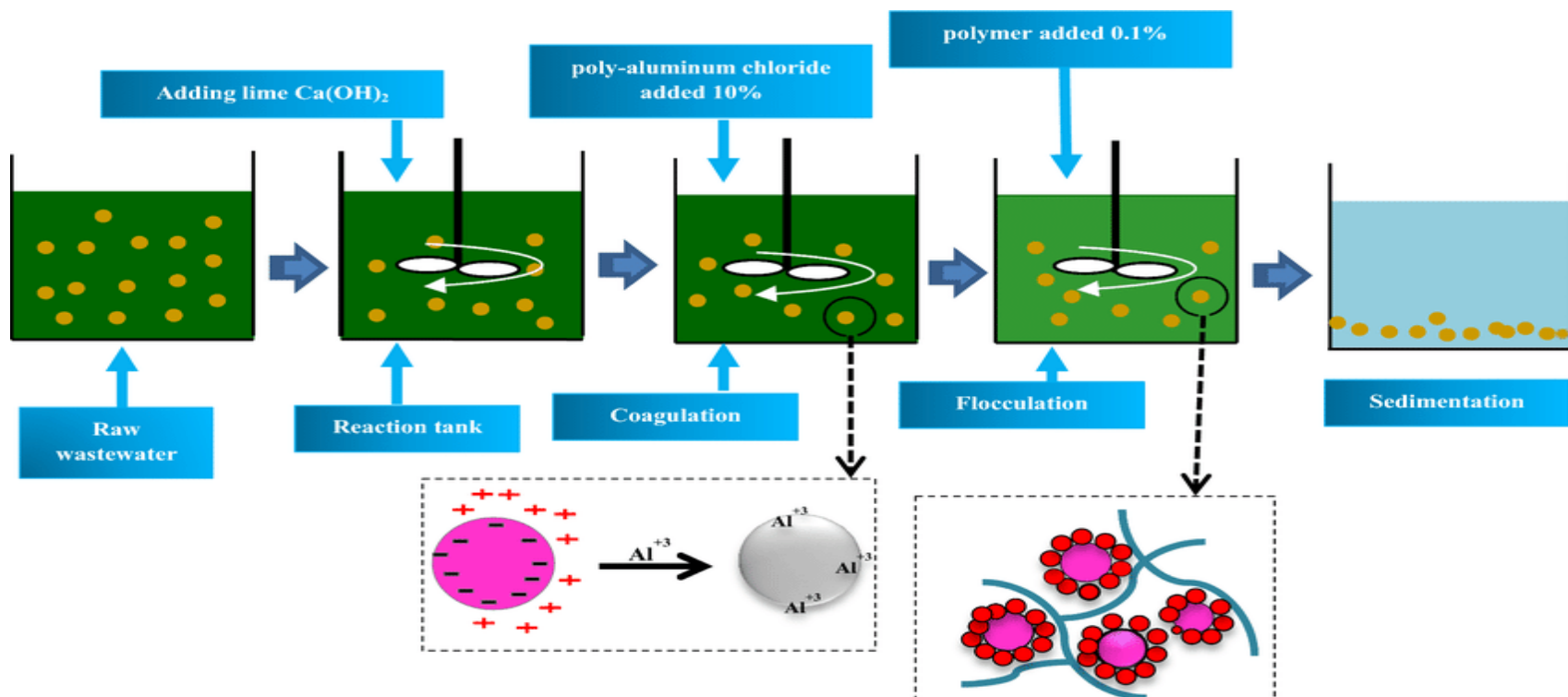
Also called **Building Blok Matters** [Atoms, Ions, Molecules etc.]

Solids & Suspensions

Flocculating Particles

Particles **Change Size, Shape & SG** over time

(as they Aggregate or Coalesce)



Solids & Suspensions

Flocculants

Flocculating Agents or Flocculants are generally **chemicals**

They **Promote Flocculation** by **Forming a Floc**.



- Aluminium Sulphate or alum (Al_2SO_4),
- Aluminium Chloride (AlCl_3)
- Aluminium Chlorohydrate
- Poly Aluminium chloride
- Ferric Chloride (FeCl_3),
- Ferric Sulphate ($\text{Fe}(\text{SO}_4)_3$)
- Sodium Aluminate

Solids & Suspensions

Flocculants

Flocculants can **Affect** the **pH level** of **Water**.

It can **Start at pH-7.0** for **best**.



Polymers are very much useful as **flocculants**.

Polymers are **Robust** molecules & sometimes they **Carry Charges**.

They are **Very Large Particles**. So, the **Small Particles** can **Get Trapped**.

in the curves of the **polymer** causing them to **accumulate** a **heavy mass**.

This can **Prevent the Retention** in **Solution**.

Solids & Suspensions

Dilute Suspensions

If conc. of Particles in Suspension is In-Sufficient to Displace Water as the Particle Settle

1-DILUTE SUSPENSIONS

“ Such suspensions in which concentration of solid particles ranges from 2 to 10% w/v solid”

- For example: cortisone acetate suspension, prednisolone acetate suspension.



Solids & Suspensions

Concentrated Suspensions

If conc. of **Particles in Suspension** is **Sufficient to Displace Water** as the **Particle Settle**

2-CONCENTRATED SUSPENSIONS

“Such suspensions in which
concentration of solid particles is 50%w/v”

- For example:
 - zinc oxide suspension

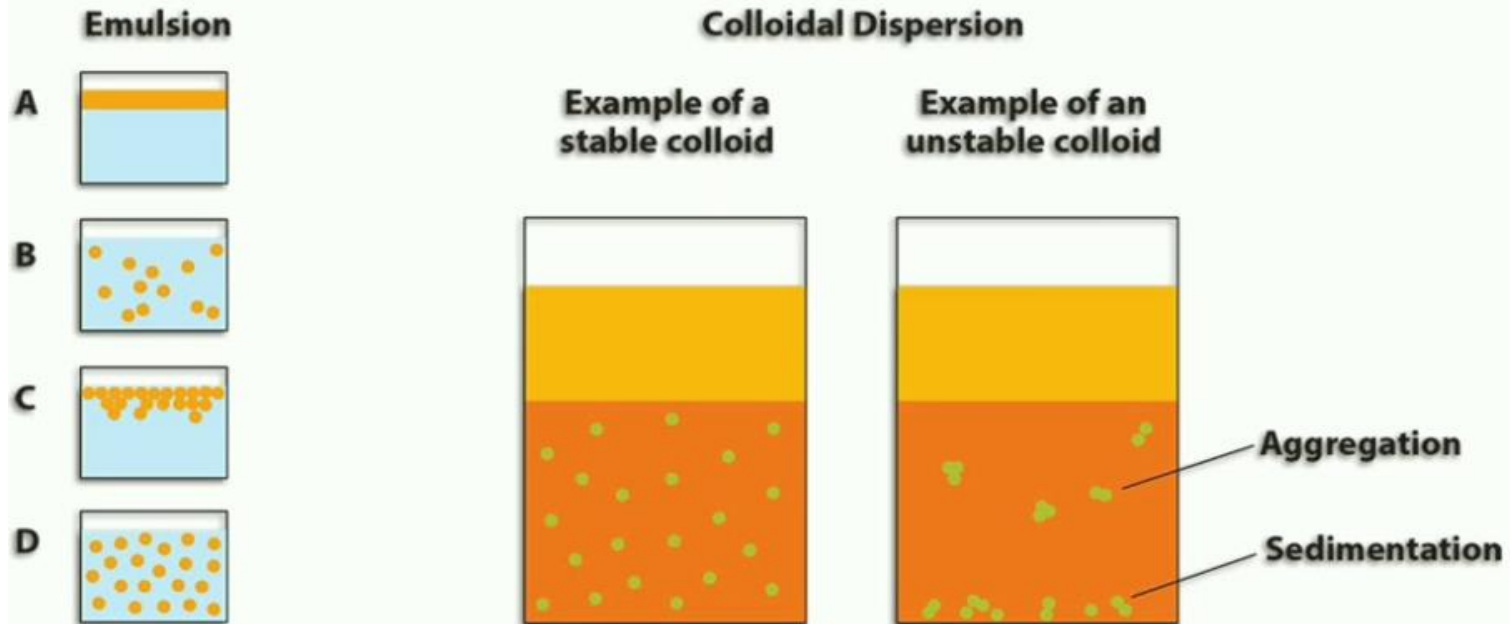
Introduction

Colloid

Which can be **Dispersed** throughout **Another Substance**

Can Pass through a **Filter Paper**

But Can Not Pass through **Semi-Permeable Membrane**



Introduction

Colloid

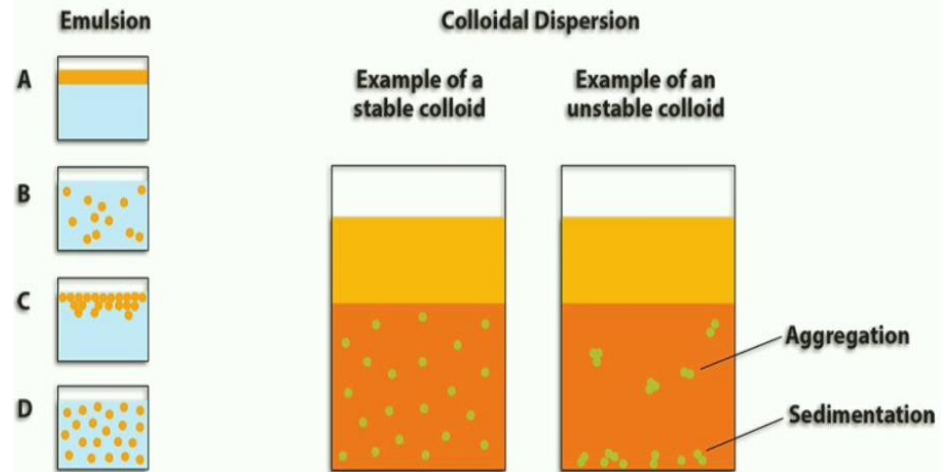
Mixture Containing **Dispersed Insoluble Particles**

Particle must be **Dispersed in Liquid**

Substances like... **Aerosol, Gels**

05 Types of colloid mixtures.

- Aerosols
- Foams
- Emulsions
- Sols
- Gels



Milk is a Colloid Substance with tiny butterfat globule suspended throughout the liquid
[also Whipped Cream]

Introduction

Diffusion

The **Movement** of **Anything** (Atoms, Ions, Molecules, Energy)

Form its **Higher Concentration** to its **Lower Concentration**

Types of Diffusion

Molecular Diffusion

Brownian Diffusion

Turbulent Diffusion



Example: Perfume Smell, Bad Odor, Tea Bag in Hot Water, CO₂ in CSD

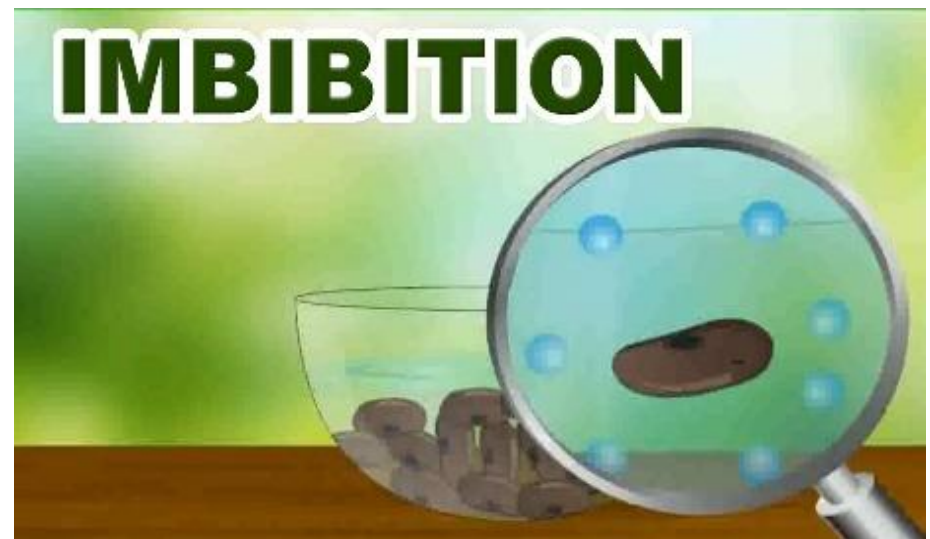
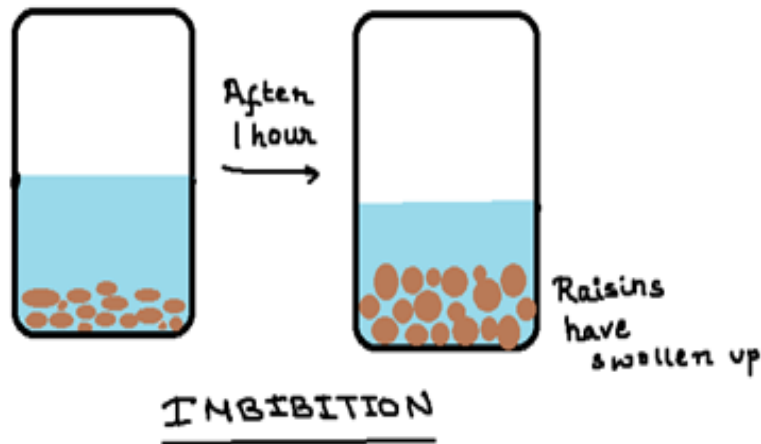
Imbibition

Imbibition

Imbibition is a type of **Diffusion**

Water is **Absorbed & the Particle** gets **Enlarged**

Liquid Absorbing for **Dry/Semi-Dry Colloid Materials**



Cellulose, Starch, Gelatin etc. are Hydrophilic Material

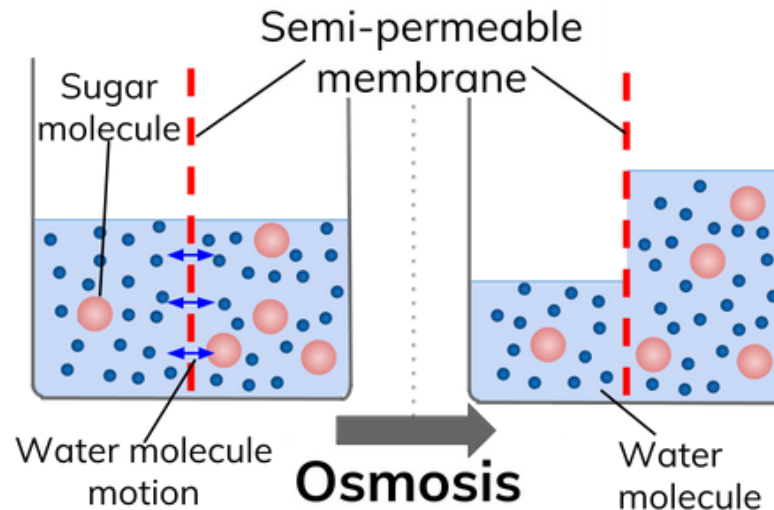
Osmosis

Osmosis

Physical process by which a liquid starts to diffuse

Through a **Semi-Permeable Membrane**

When there is a **Difference in concentration** of certain solute



A hydrostatic pressure is required for resisting the movement of solvent molecules [Osmotic Pressure]

Osmotic Pressure in an ideal solution is affected by Temp. and Volume

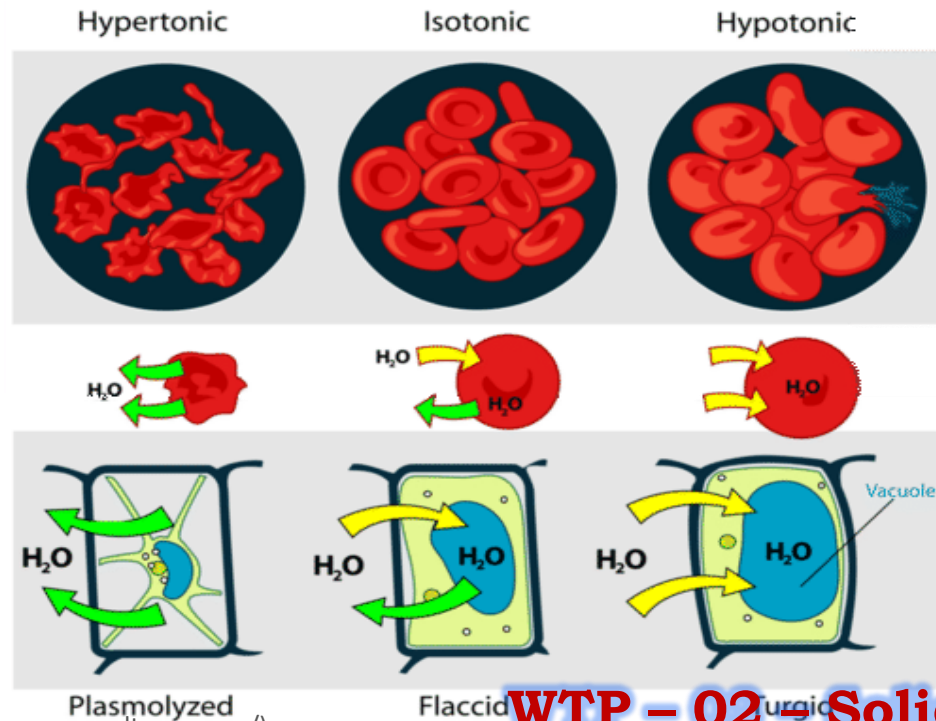
Osmosis

Types of Osmotic Condition

Hypertonic Condition a body cell will lose water from itself and finally gets squeezed

Isotonic Condition a body cell will be stable as water movement inside and outside is stable

Hypotonic Condition a body cell will gain water through osmosis & finally can blast



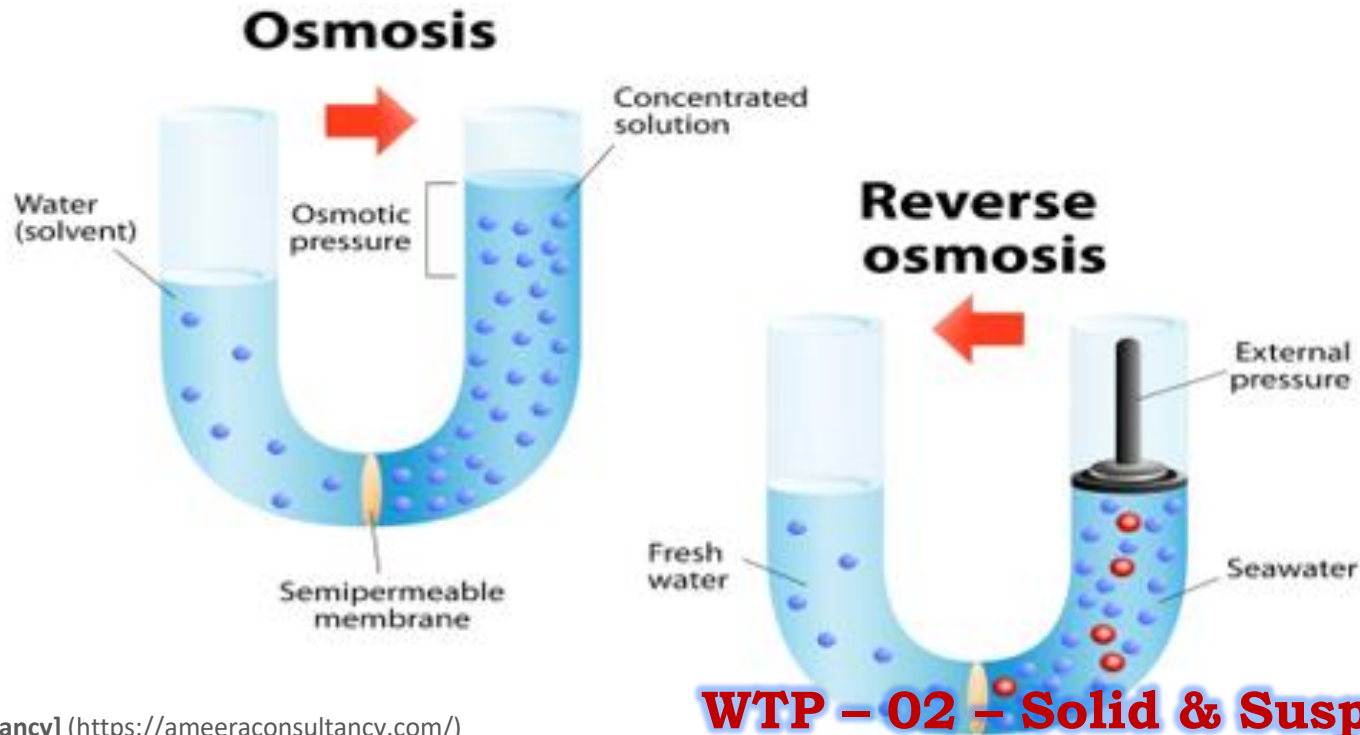
Reverse Osmosis

Reverse Osmosis

Pressure applied to take water from low conc. to its high conc.

Special type filtration with Porous/Semi-permeable membrane

Allows Pure Water to Pass [filter larger molecular impurities]

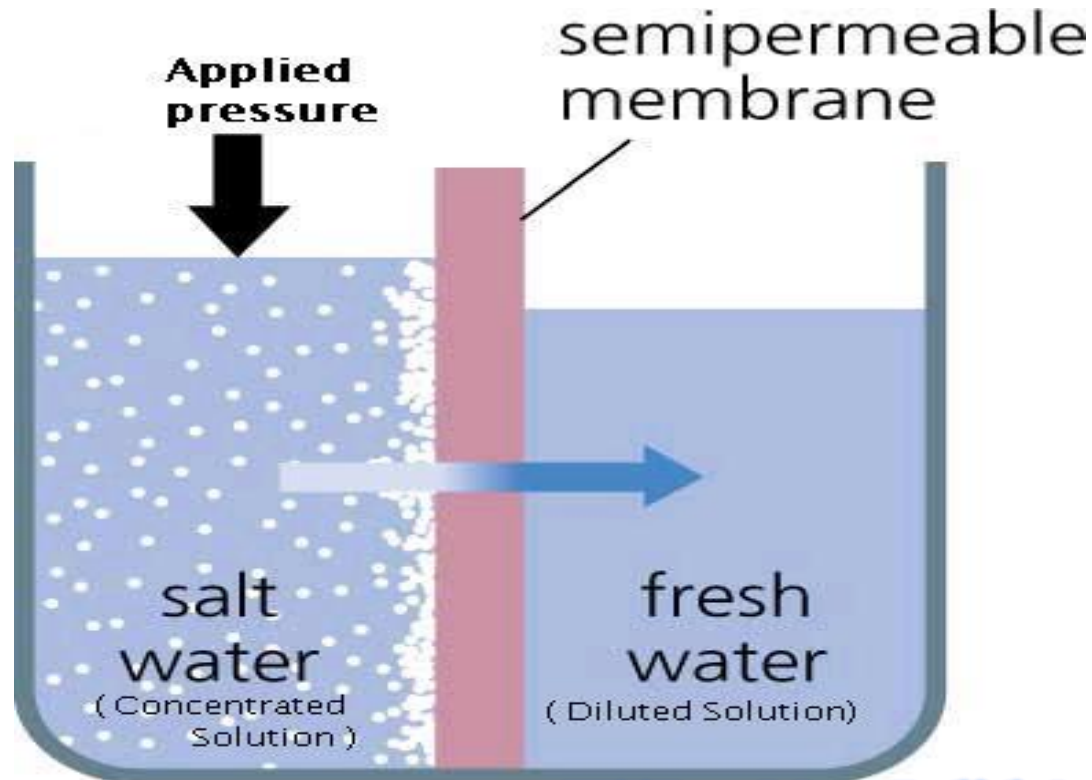


Reverse Osmosis

Reverse Osmosis Removes

99% dissolved salt particles, colloids, micro-organisms etc.

RO cant remove gases [they are not highly charged] [CO₂]



Differences in between “Osmosis & RO”

Differences in between “Osmosis & Reverse Osmosis”

Osmosis

Natural Process

Works along the Potential Gradient

Works aligning with Osmotic Pressure

Water Movement:
High Conc. ---→ Low Conc.

Reverse Osmosis

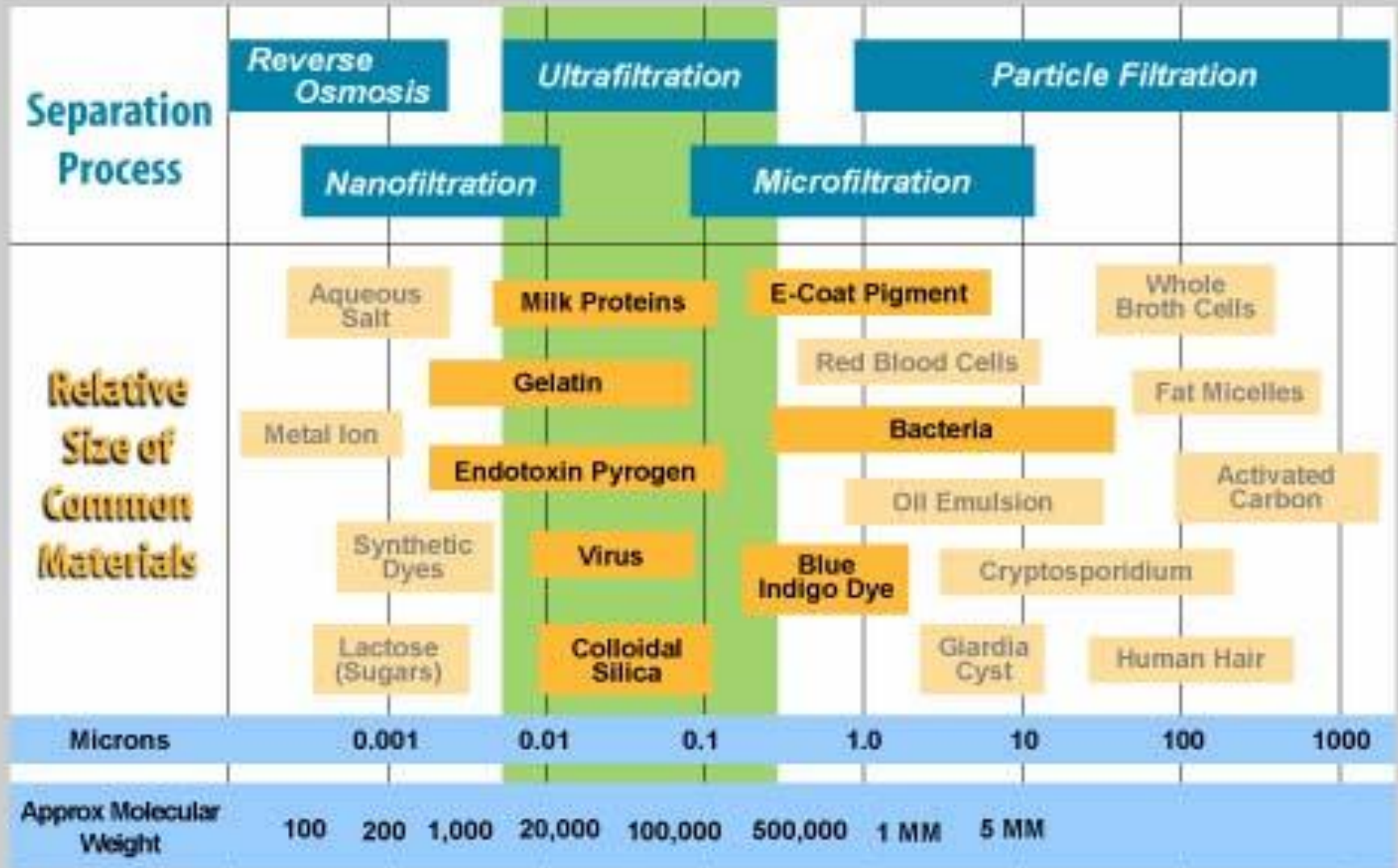
Artificial Pressurized Process

Works against the Potential Gradient

Works against the Osmotic Pressure

Water Movement:
Low Conc. ---→ High Conc.

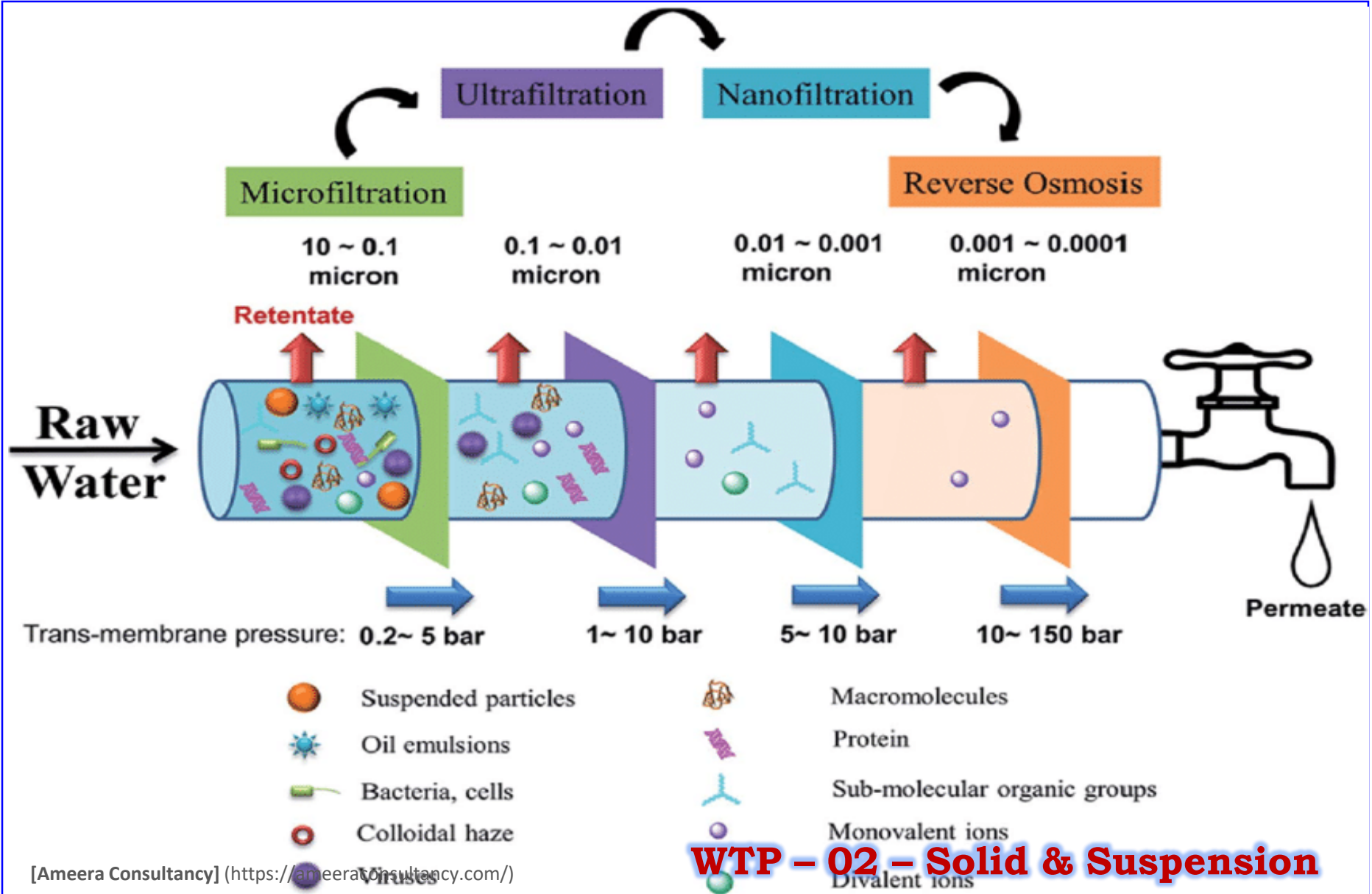
Solids & Suspensions Removal



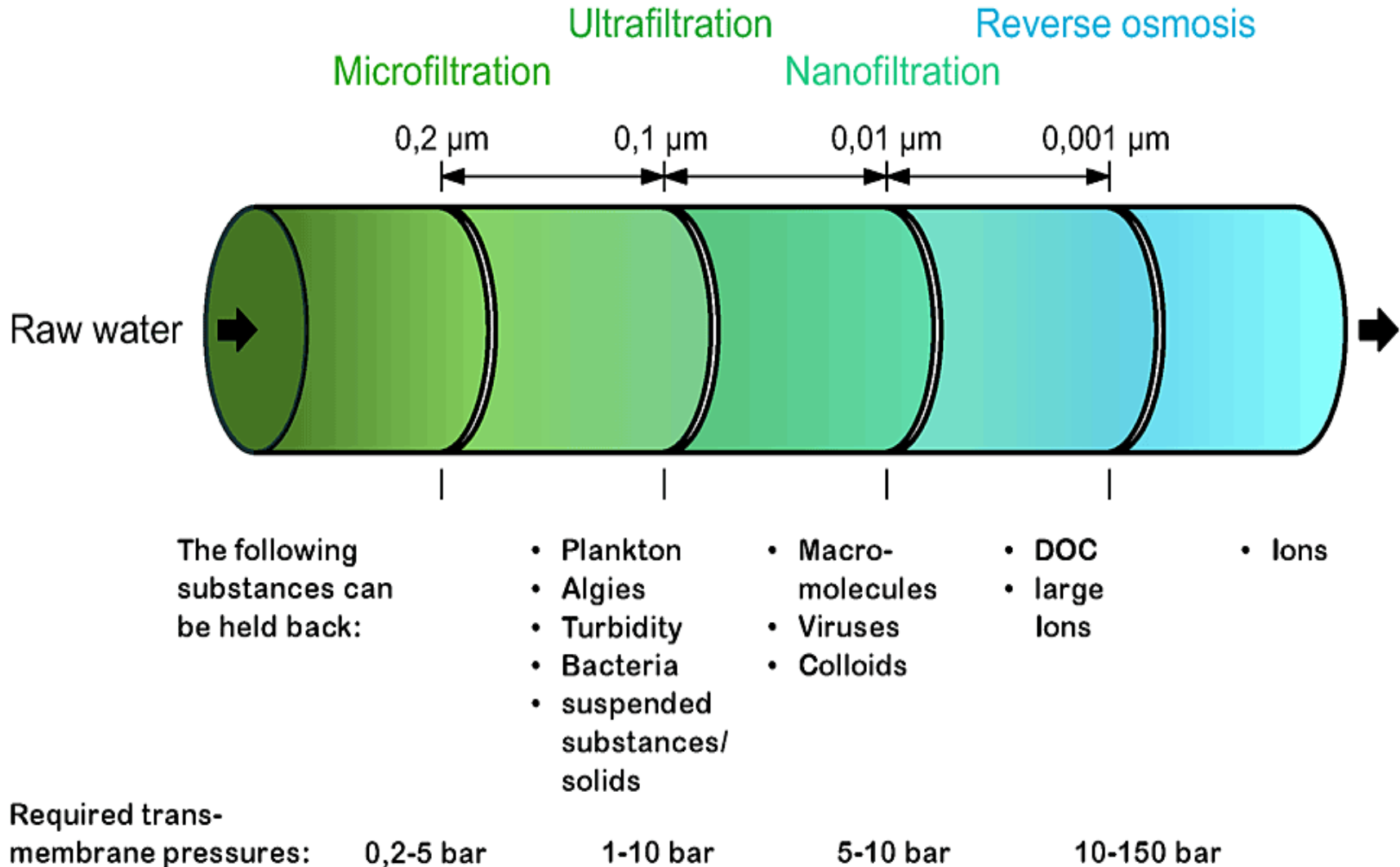
Note: 1 micron (micrometer) = 1×10^{-5} inches = 1×10^4 Angstrom units

WTP - 02 - Solid & Suspension

Solids & Suspensions Removal



Solids & Suspensions Removal



Solids & Suspensions Removal

POST-FILTER

- (Activated Carbon) Final polish to remove any objectional tastes and odors from storage tank prior to water consumption or use.

RO MEMBRANE

- Thin Film Composite design. Rejects 98% of the dissolved metals and salts, plus other harmful contaminants.

PRE-FILTER (sediment)

- Removes sediment, rust, dirt and other solid debris.

PRE-FILTER (carbon block)

- Removes chlorine and protects the RO membrane.

Second Carbon Pre-Filter (5-Stage RO only)

- Additional activated carbon pre-treatment filter.

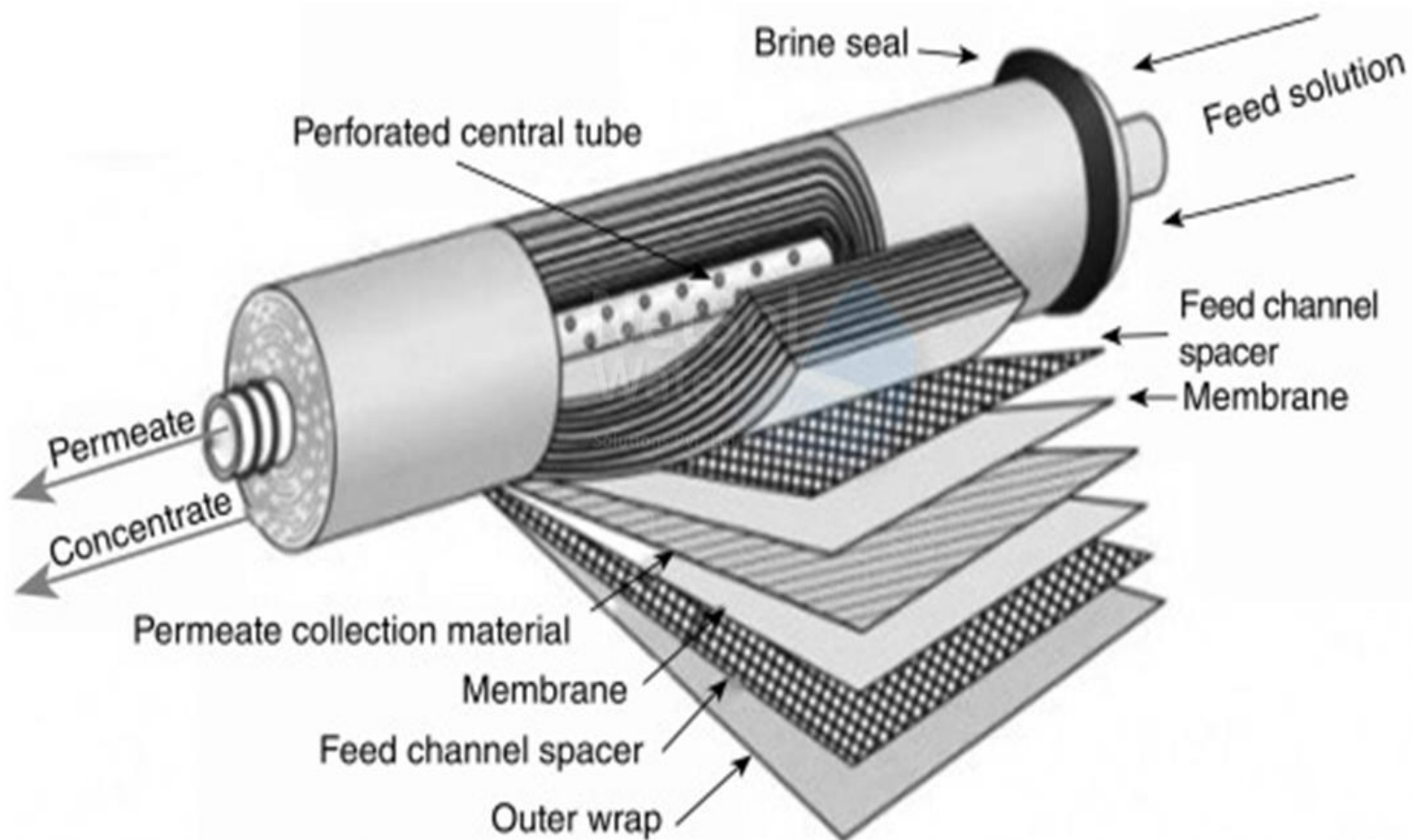


Industrial RO System

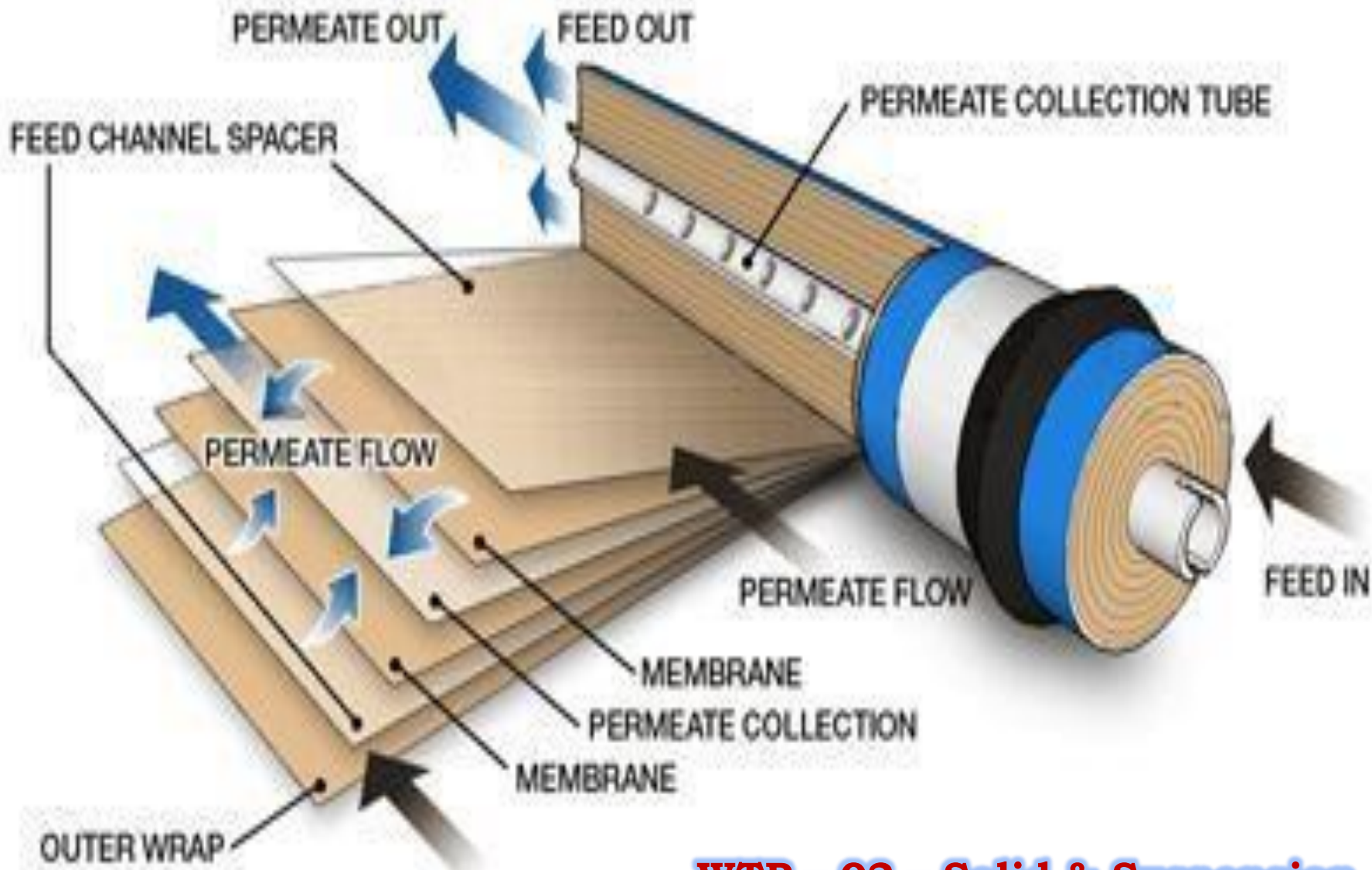
Industrial RO System



RO Membrane



RO Membrane



Any Question...!?



Any Question...!?

