

Presentation

On

RO Type

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RO Type

Water Impurities

Water has some Impurities on to it

Ionic Type Impurity

Non-Ionic Type Impurity

Gas Type Impurity

Particulate Type Impurity

**Impurities
Present in Water**



Water Impurity – Ionic Type

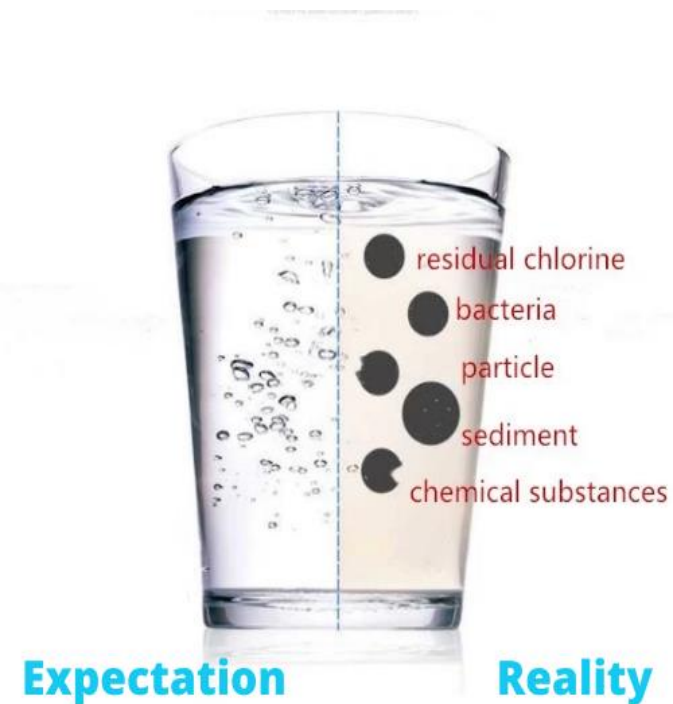
Water Impurity – Ionic Type

Cations Type

Ca ion
Mg ion
Na ion
K ion
Fe ion
Mn ion
Al ion
NH₄ ion

Anions Type

Cl ion
NO₃ ion
SO₄ ion
HCO₃ ion
CO₃ ion
SiO₃ ion
PO₄ ion



Water Impurity – Non-Ionic Type

Water Impurity – Non-Ionic Type

Colloid Type Material

Suspended Solids

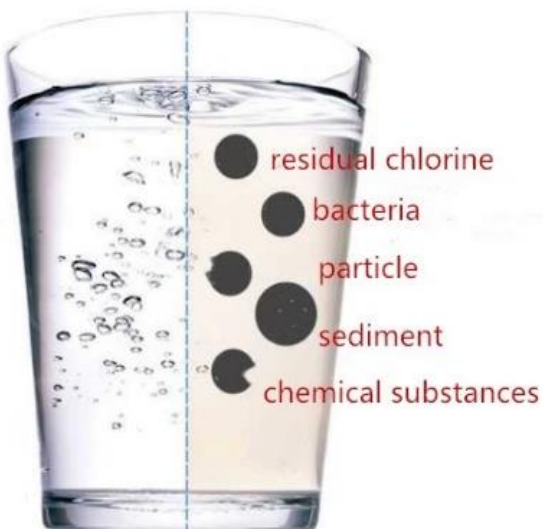
Microbiological Type

Bacterial Type

Viral Type

Algal Type

Pyrogenic Type



Expectation

Reality

Water Impurity – Gas Type

Water Impurity – Gas Type

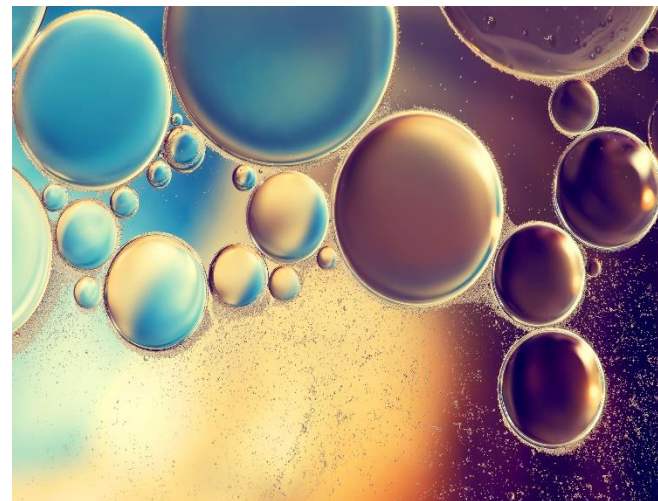
Carbon Di-Oxide [CO₂]

Oxygen[O₂]

Chlorine [Cl]

Nitrogen [N₂]

Hydrogen Sulfide [H₂S]



Water Impurities & Removal System

Water Impurities & Removal System

Ionic Impurity

RO, Nano Filtration

Non-Ionic Impurity

RO, Nano Filtration

Particulate Impurity

RO, Nano Filtration

Gas Type Impurity

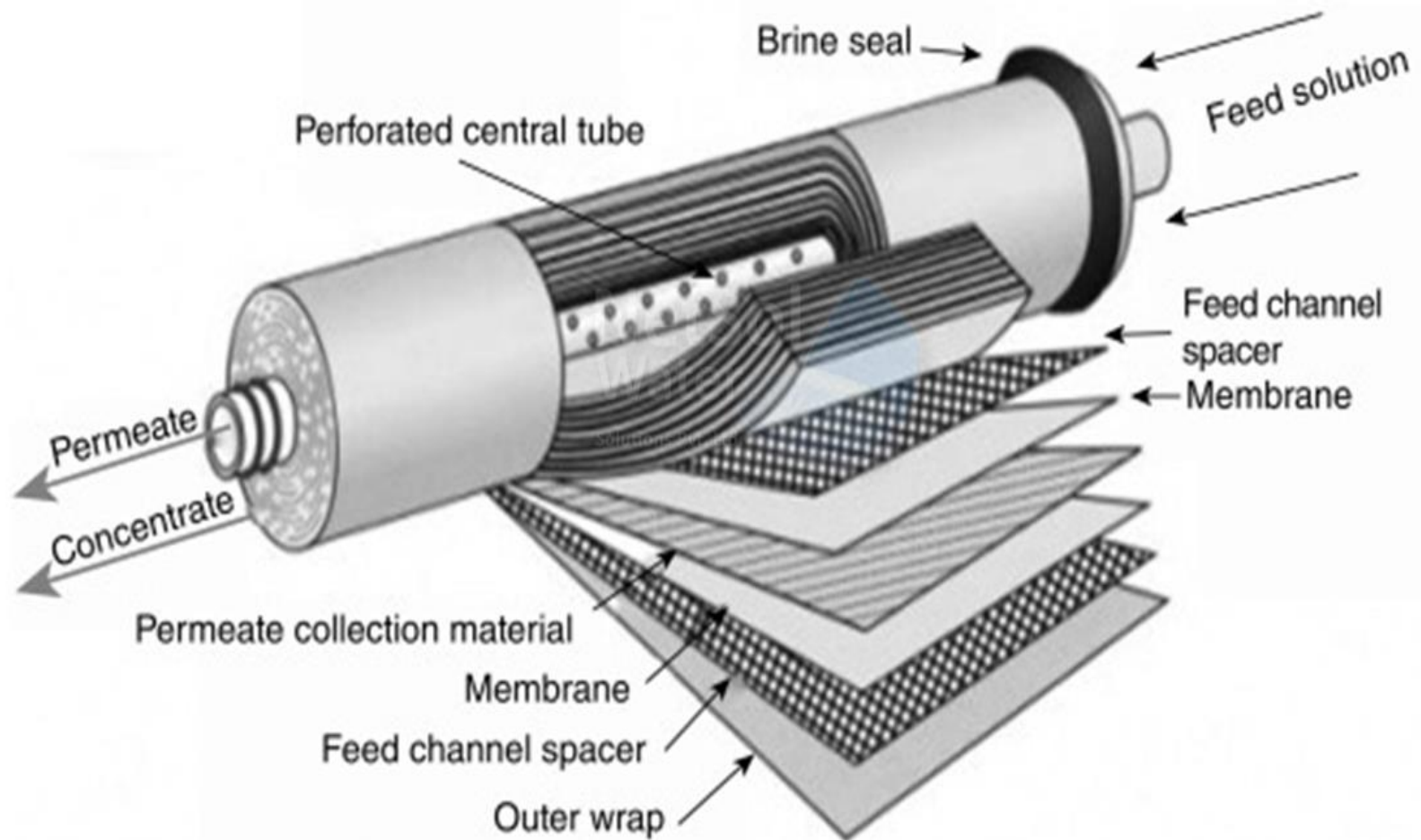
De-Gasifier

Industrial RO System

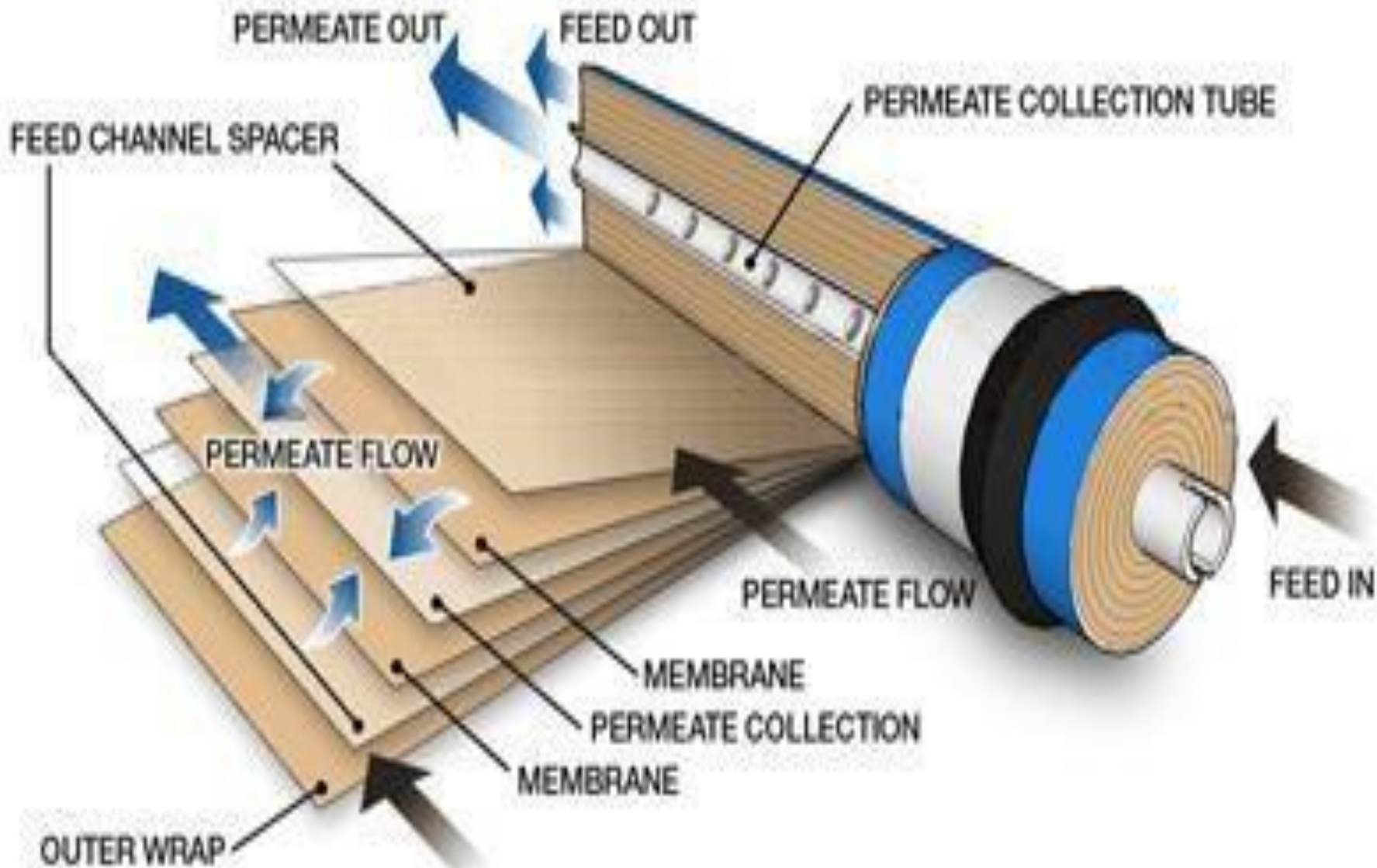
Industrial RO System



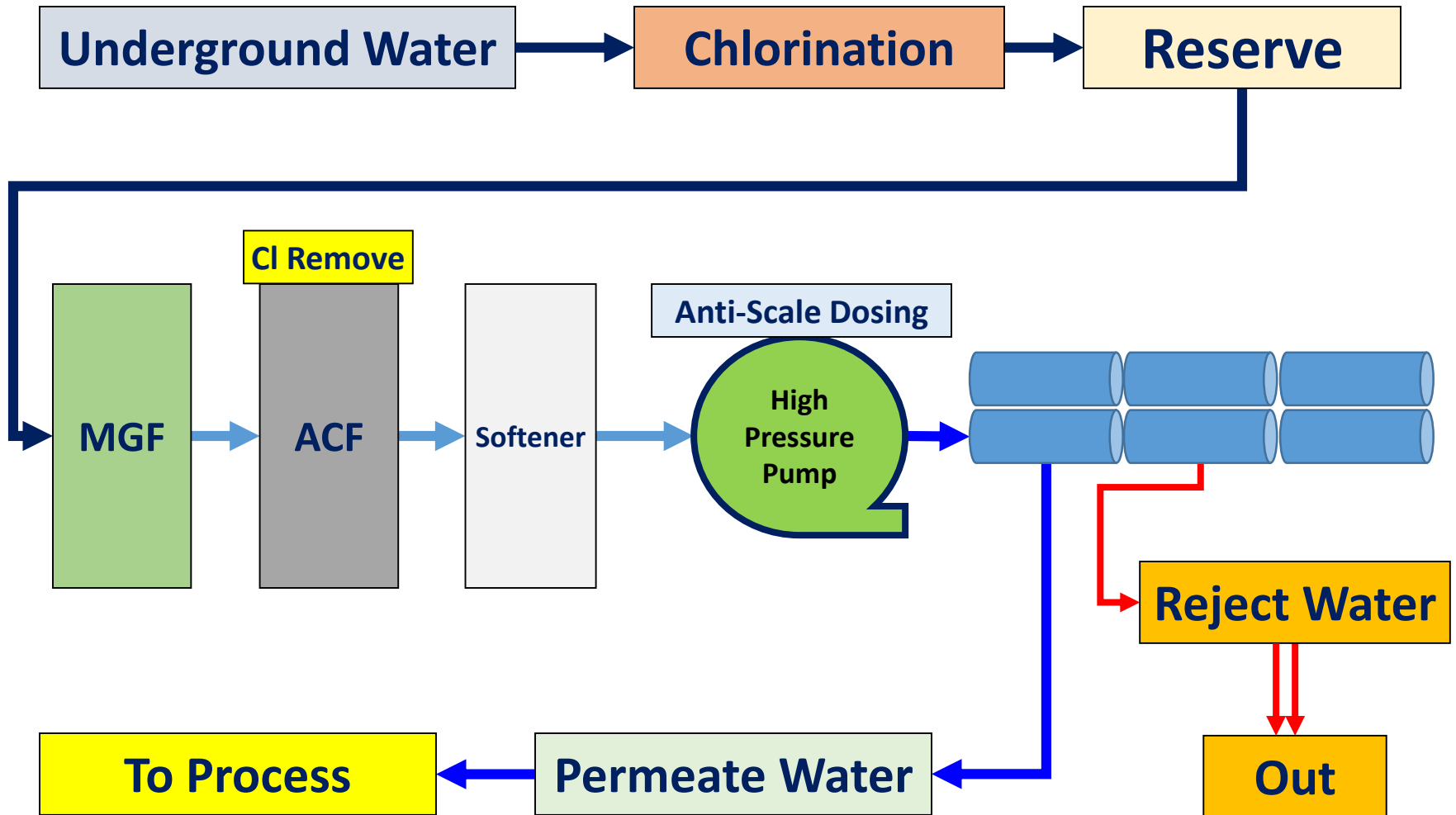
RO Membrane



RO Membrane

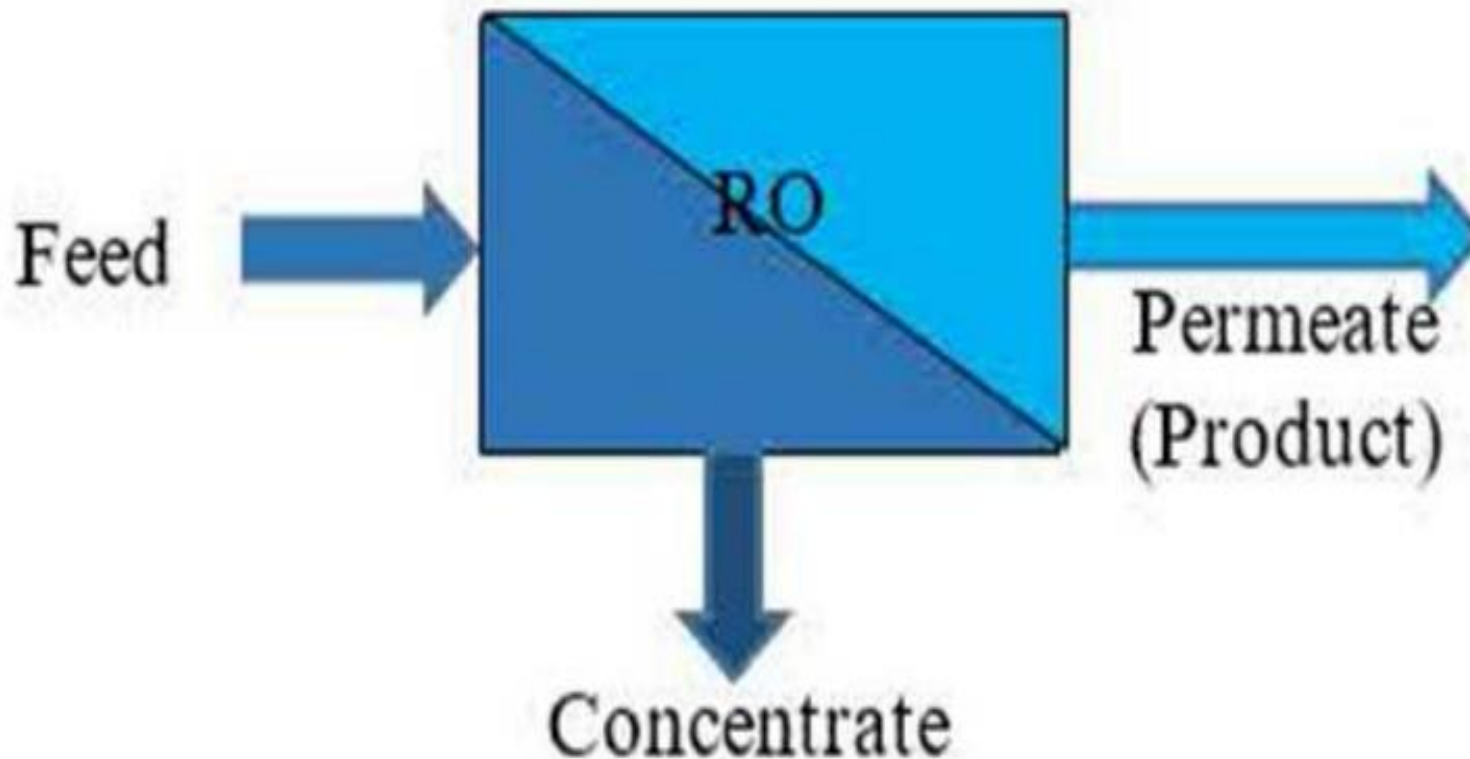


Basic Components of RO Plant



RO Type – Single Pass

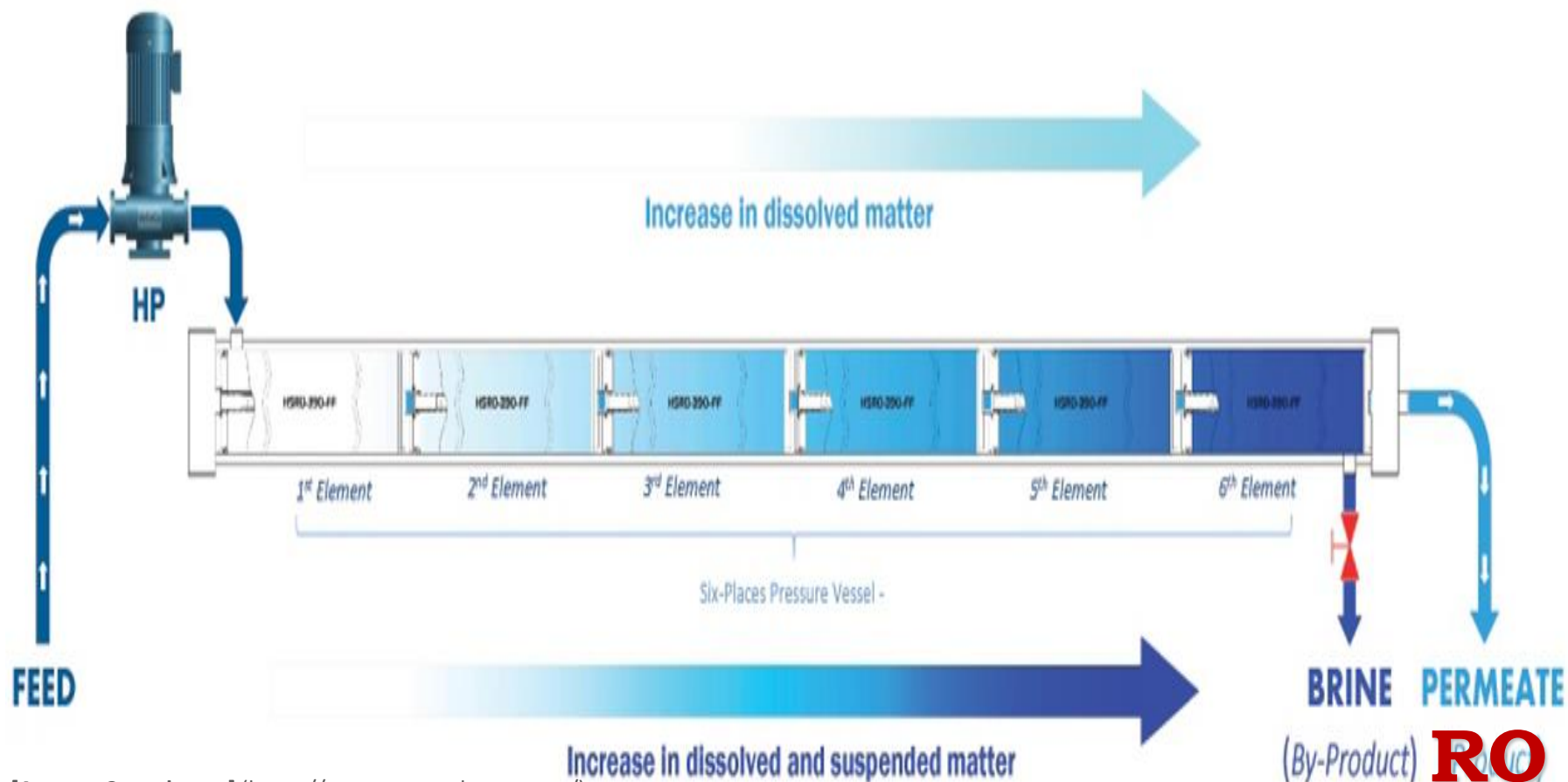
Reverse Osmosis – Single Pass



RO Type – Single Pass

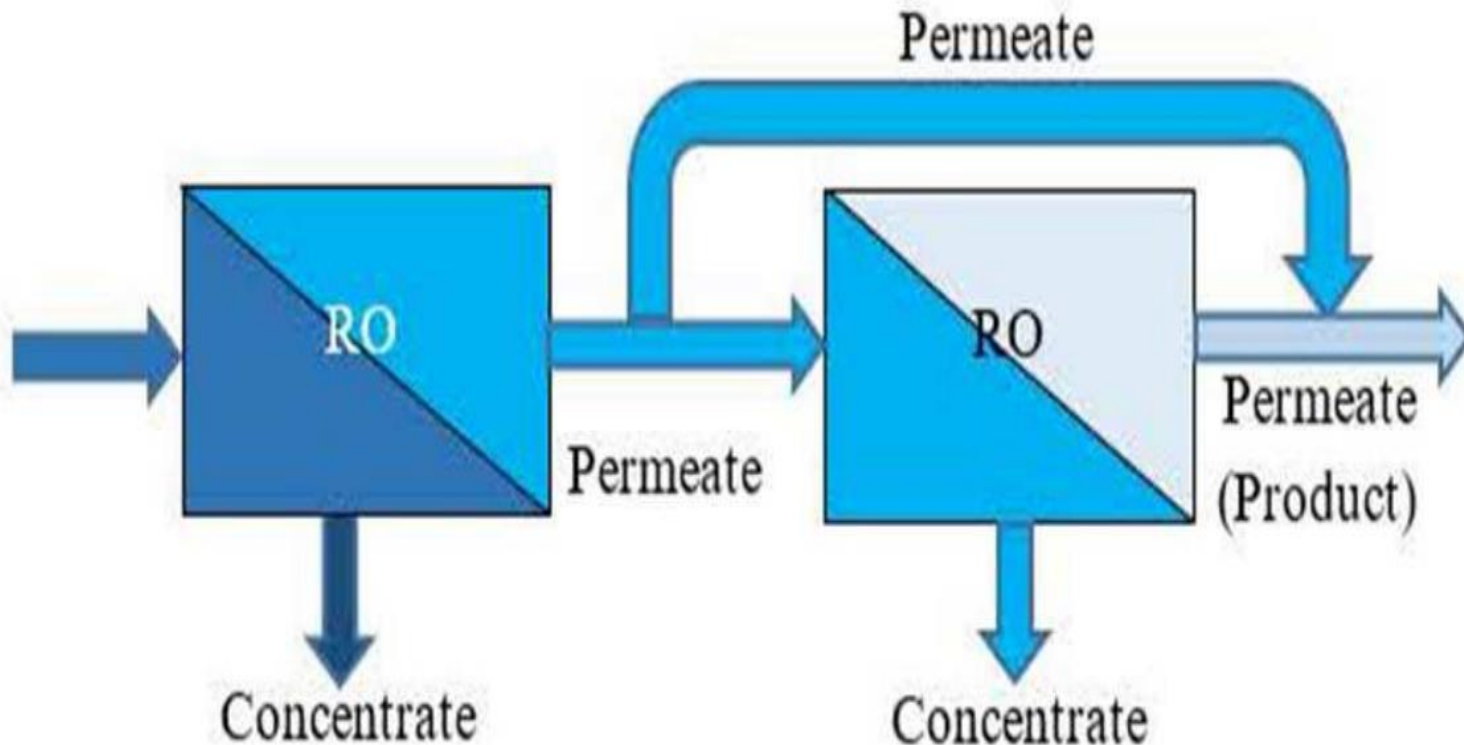
Reverse Osmosis – Single Pass

Conventional Single-Pass Reverse Osmosis



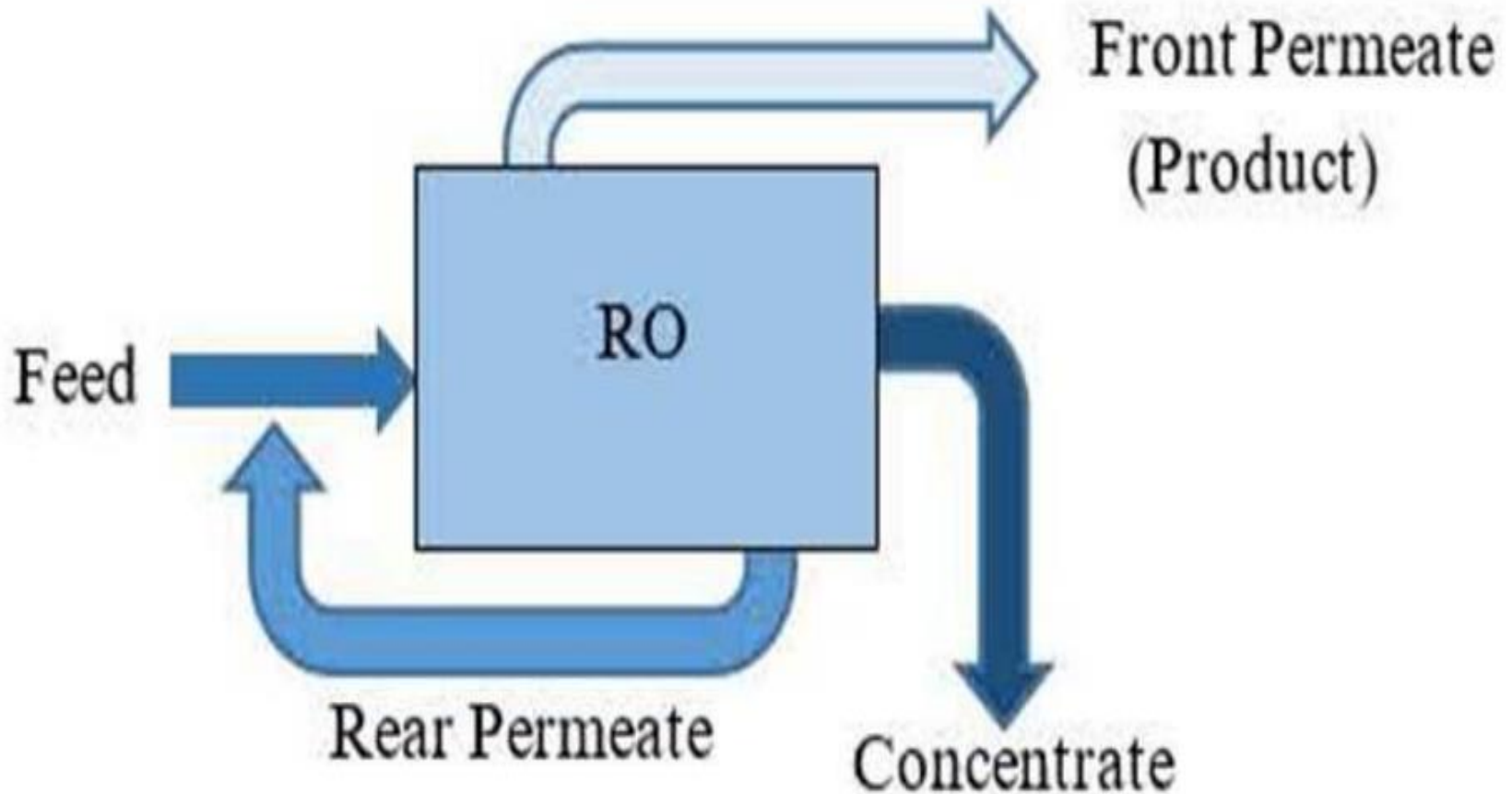
RO Type – Partial Two Pass

Reverse Osmosis – Partial Two Pass



RO Type – Split Partial Single Pass [SSP]

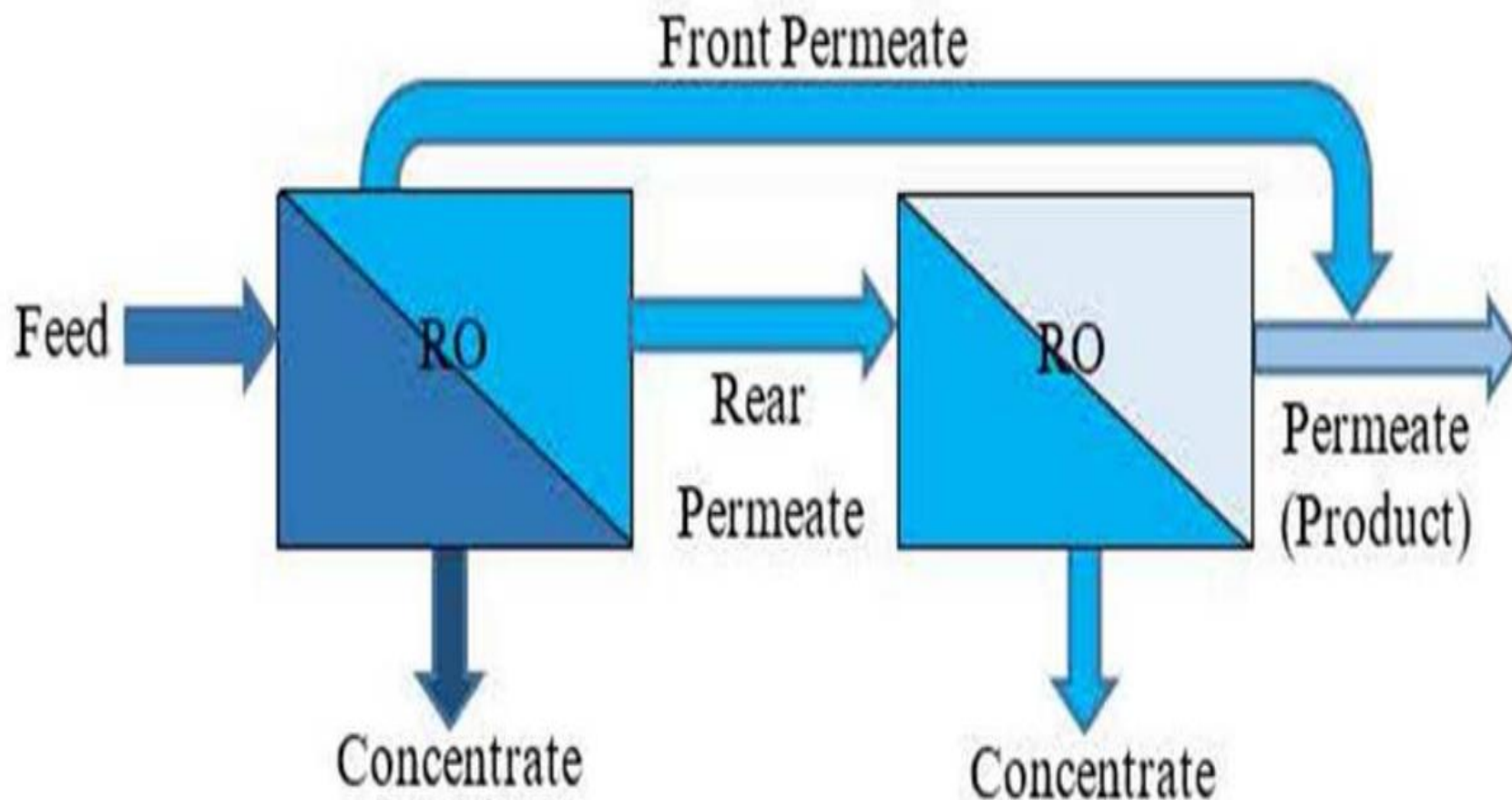
Reverse Osmosis – Split Partial Single Pass [SSP]



RO

RO Type – Split Partial Second Pass [SPSP]

Reverse Osmosis – Split Partial Second Pass [SPSP]



RO

RO Type – Split Partial Second Pass [SPSP]

Reverse Osmosis – Split Partial Second Pass [SPSP]

Split partial Second-Pass Reverse Osmosis

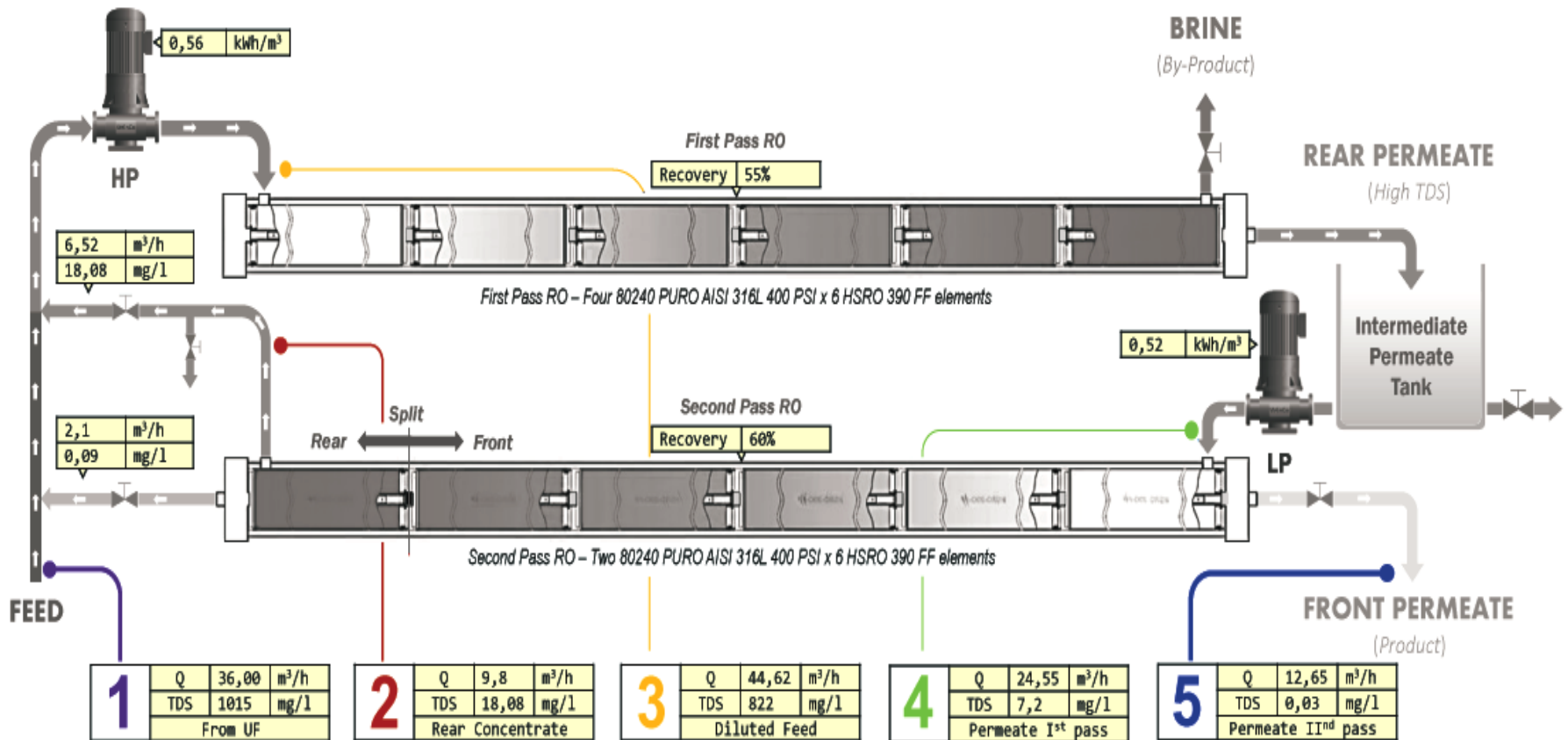
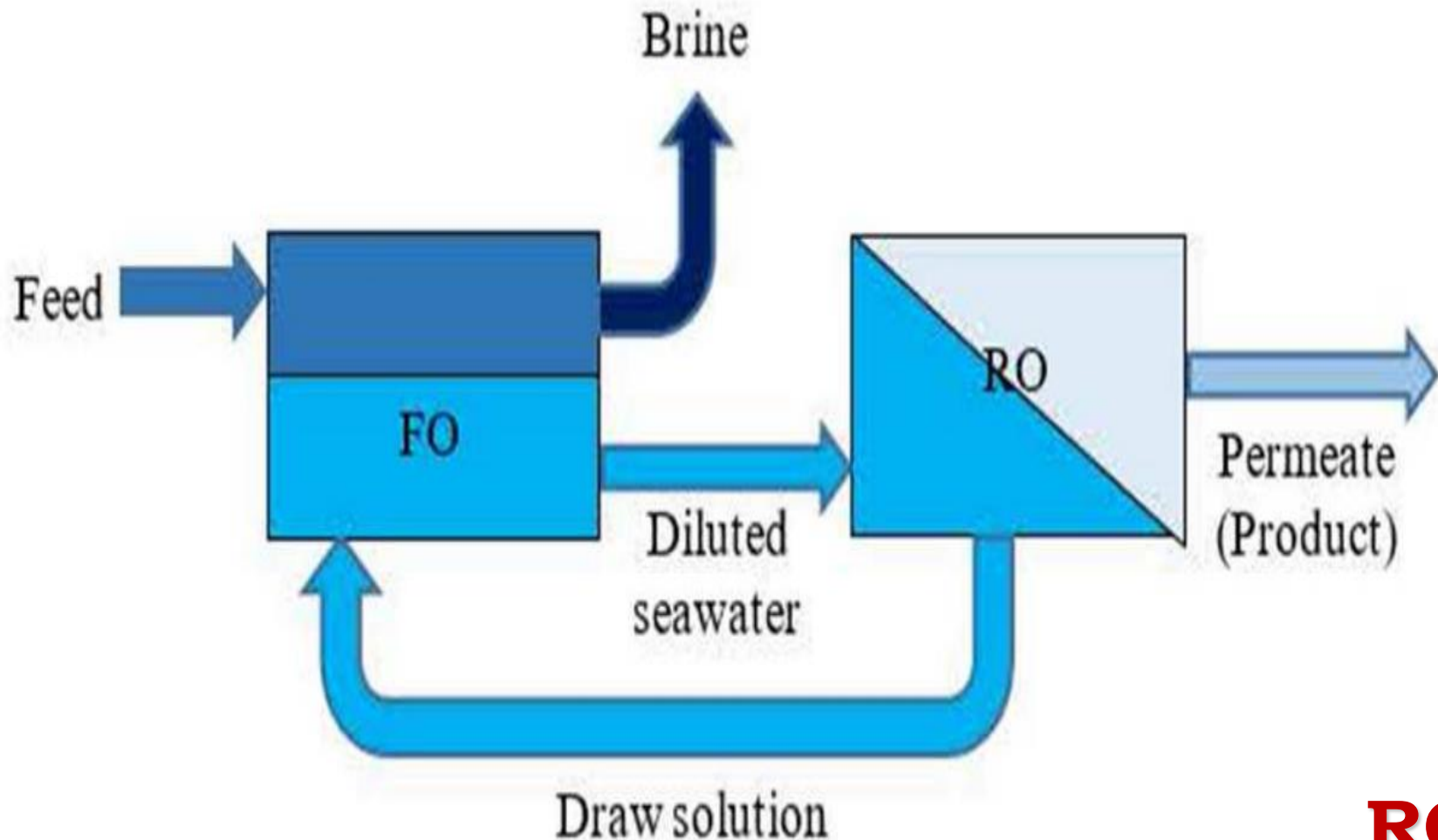


Fig.2 : Flow Diagram of SSP-RO for production of Highly Purified Water - HPW

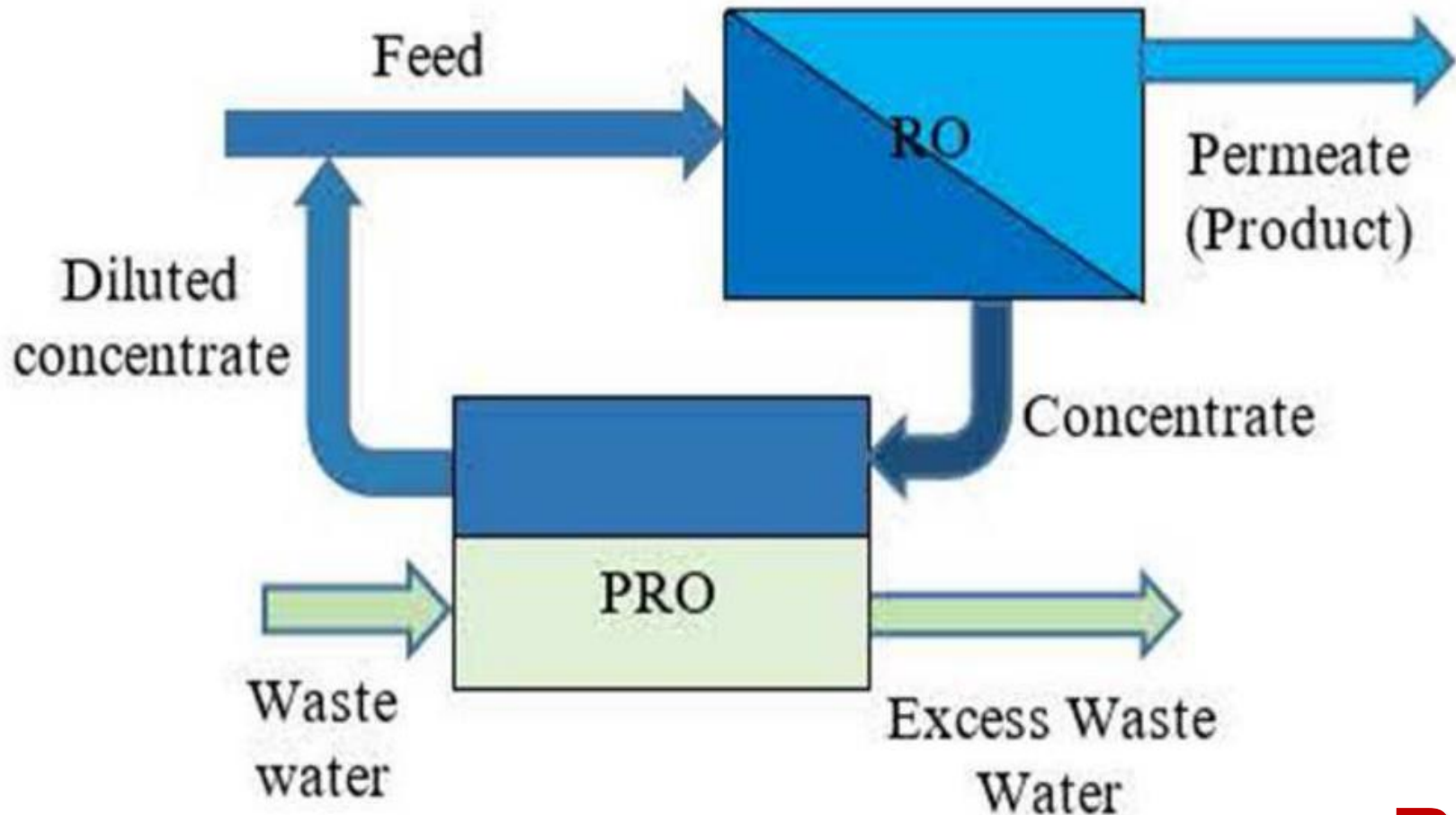
RO Type – Forward Osmosis [FO RO]

Reverse Osmosis – Forward Osmosis [FO RO]



RO Type – Pressure Related Osmosis [RO PRO]

Reverse Osmosis – Pressure Related Osmosis [PRO RO]



RO - Monitoring

RO Monitoring is very much Important Thing

Entire RO is a Costly Item

RO Fouling tends to be the Change of Membrane

Pretreatment: 90% of Operational Problems are found here

System: 90% of Operational Problems are found here



RO – Monitoring [Pretreatment]

RO Pretreatment Monitoring

Silt Density Index [SDI]

pH

Chlorination

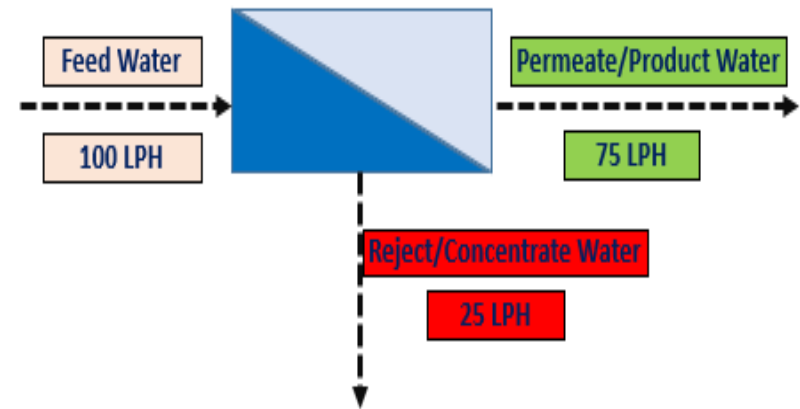
Turbidity

Temperature

Pressure

Conductivity

Microbiological Foulants [Bacteria, Silica, Hardness]



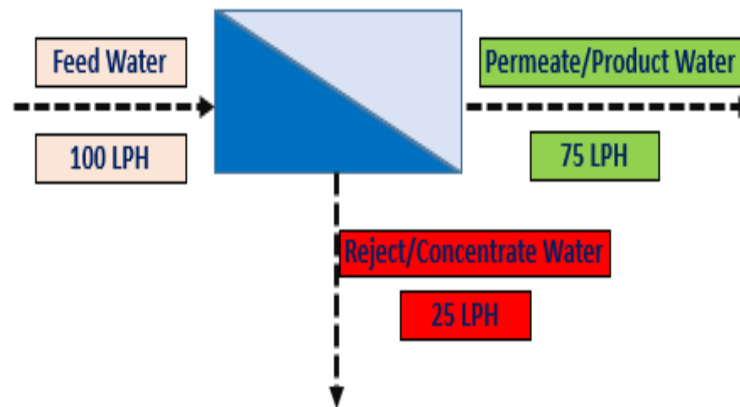
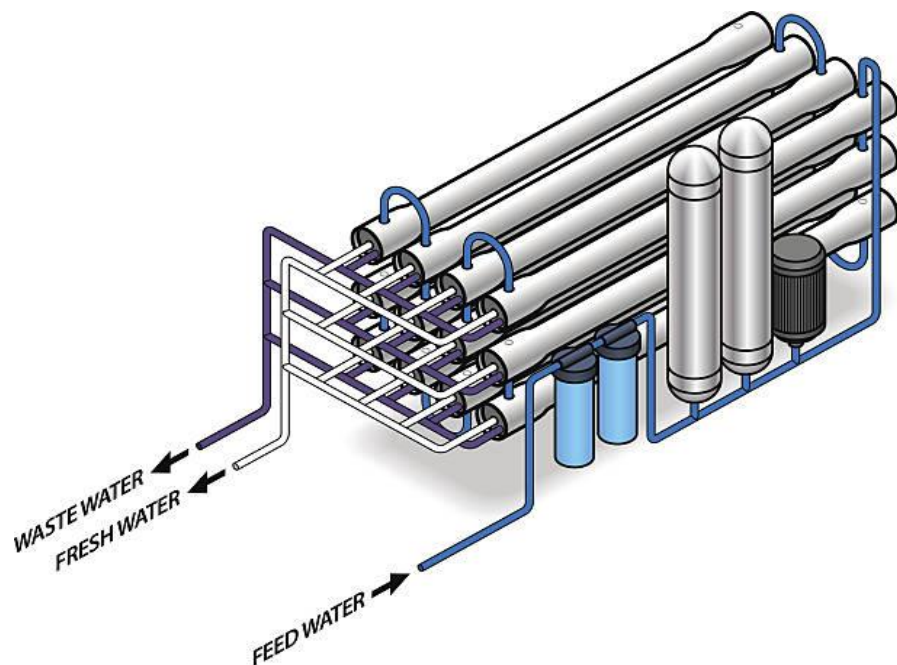
RO – Monitoring [System]

RO System Monitoring

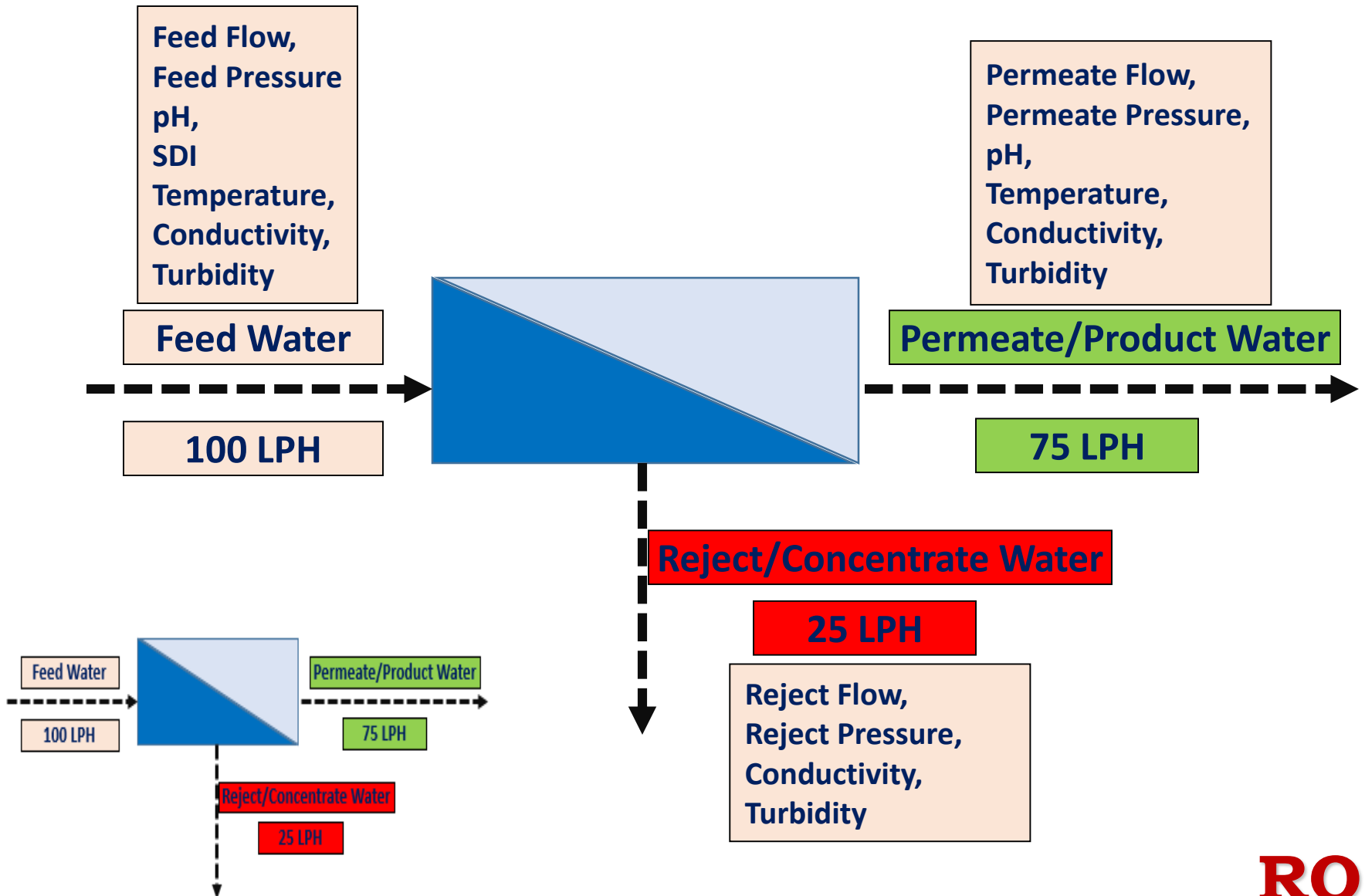
Present Salt Rejection

Differential Pressure

Percent Recovery



RO – Important Parameter Location



RO – Daily Operation & Performance Data

RO – Daily Operation & Performance Data

Feed Water pH	Permeate Water pH, Temp.
Feed Water Temperature	Permeate Water Conductivity, Turbidity
Feed Water Conductivity	Permeate Water Flow, Pressure
Feed Water Turbidity	Reject Water Flow, Pressure
Feed Water SDI	Reject Water Conductivity, Turbidity
Feed Water Flow	Percent Salt Rejection [Calculated]
Feed Water Pressure	Differential Pressure [Calculated]
Daily Graphical Trend	Percent Recovery [Calculated]

Any Question...!?



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