



**Ranhill**  
TECHNOLOGIES

Resource Preservation Through Efficient Systemization

**INDUSTRIAL WASTEWATER RECLAMATION  
OCTOBER 2024**

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# INTRODUCTION

## Reclaimed Wastewater

### What is wastewater reclamation?

- Reclaiming treated wastewater and reuse instead of discharging it to the environment.

### What is the usage for?

- Irrigation (urban, agriculture & landscape)
- Industrial
- Potable

### What is the purpose of reclaimed wastewater?

- Conserve fresh water for potable use
- Minimise wastewater discharge
- Reduce the use of potable water for industry purpose

# GUIDELINES TO WASTEWATER RECLAMATION

## Regulations & Guidelines

What factor determine the treatment process?

- Usage (treated quality)
- Local regulation

Example of guidelines?

- Malaysia - DOE Standard A&B, MOH (drinking water)
- China – Reuse of recycling water for miscellaneous use (GB/T1890 -2002)  
Toilet flushing, road cleaning and hydrant, city cleaning, vehicle washing & construction use.
- China – Reuse for Landscaping  
Lake, River & Recreational
- China – Reuse for industry  
Cooling, boiler, process
- Thailand  
Thailand industrial effluent discharge quality (IEAT) & Industrial water supply quality

# TREATMENT PROCESS DESIGN

## Typical Process for reclaimed water

PRE TREATMENT

MEMBRANE FILTRATION

ULTRA FILTRATION (UF)

REVERSE OSMOSIS (RO)

# TREATMENT PROCESS DESIGN

## Pre treatment

### Why pre treatment

- Longer membrane life, reducing downtime & cleaning, maintenance cost;
- Improve membrane performance
- Decrease corrosion, fouling and scaling

### Monitoring parameters

- Turbidity, Suspended solids, Oil and grease & COD & BOD

### Type of pre treatment

- Clarification ( Dissolved air floatation)
- Filtration ( Sand, multimedia, cartridge , activated carbon)

### What?

- Separation (solid-liquid) by membrane
- Anything larger than membrane pore size will be rejected (0.02 – 0.05 micron)

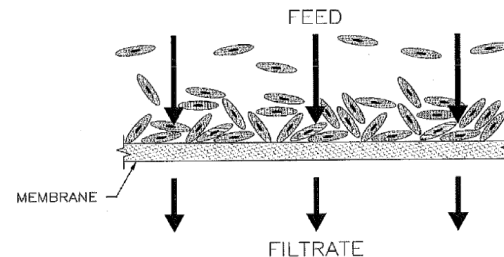
### Why do we need UF?

- To remove particles which unable to be removed by physical pre treatment
- To reduce silt density index (SDI) of water less than 5 ( 3 for good RO performance)
- To reduce turbidity less than 1NTU

Note: SDI is measurement of the fouling potential of suspended solids, it based on the time required to filter a volume of water through filter pad.  $SDI = 1000 * (t_2 - t_1) / (t_1 * V)$

### Type of UF

- Pressurised
- Submerged

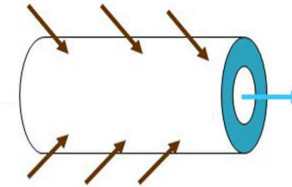
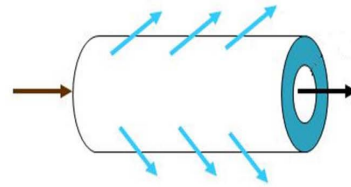
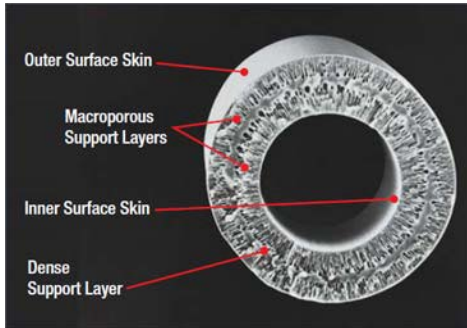


# TREATMENT PROCES DESIGN

## Ultra Filtration

Hollow fibre type

Operate inside out or outside in



Permeate  
Feed

Legend for flow directions:  
Blue arrow: Permeate  
Brown arrow: Feed

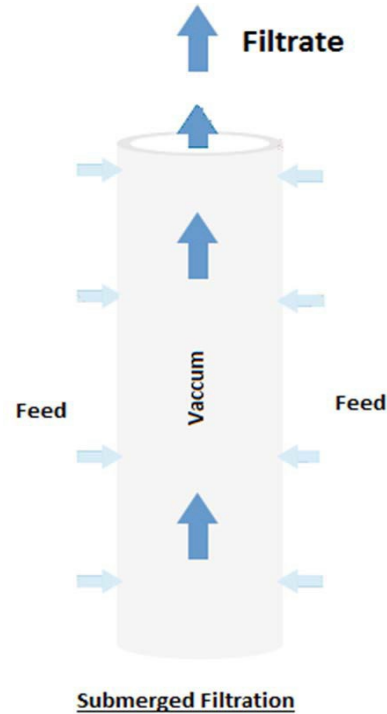


# TREATMENT PROCES DESIGN

## Ultra Filtration

### Submerged type

- Submerged in wastewater
- Filtration perform from the outside to the inside of the membrane
- A flow of air bubble is required to create sheer forces along membrane surface to prevent contaminant attached to membrane surface
- A vacuum is applied on the inner side of membrane in order to withdrawn filtrate out from the membrane

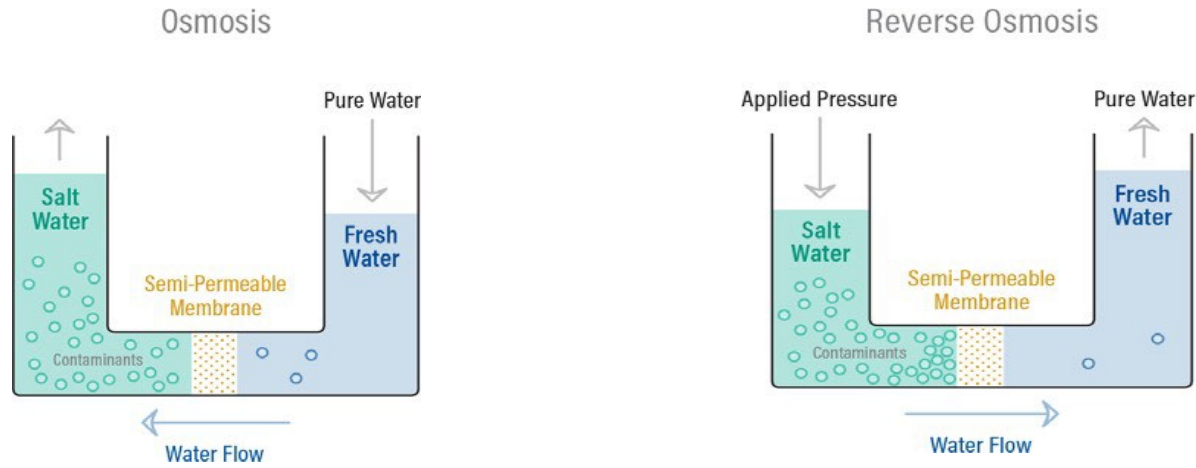


# TREATMENT PROCESS DESIGN

## Reverse osmosis

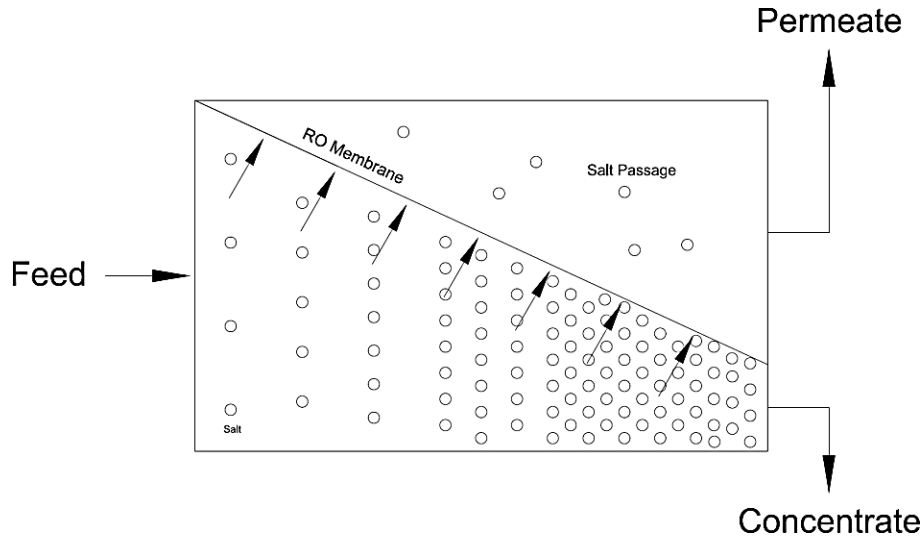
What?

- Process to remove salt/dissolve solid by pushing salt water under pressure ( $>$ osmotic pressure) through semi permeable membrane



Why do we need RO?

- Remove dissolve organic solids (TDS) in water which the removal can be up to 99%



# CASE STUDY 1

## 10 MLD Water Reclamation Plant Amata City Chonburi, Thailand

### Treatment Capacity

- Feed Water : 16,000 m<sup>3</sup>/day
- Treated water (RO): 10,00 m<sup>3</sup>/day
- Recovery rate : 63%

### Water source characteristic

- High organic load into the plant
- FOG found in incoming wastewater

### Design Consideration

- DAF is applied as pre treatment to remove suspended matters and FOG
- Sand filtration for further polishing
- Membrane for TDS/inorganic matter

Feed water from 24  
MLD Amata City  
phase 1 & 2 WWTP



Pre treatment  
Revo Plus  
(DAF Clarifier +  
Filter)



RO membrane



UF membrane



# CASE STUDY 1

## 10 MLD Water Reclamation Plant Amata City Chonburi, Thailand

PARAMETER	INFLUENT	UF FEED	RO FEED	TREATED
pH	6.5 -8.5	6.5 -8.5	6.5 -8.5	6.5 -8.5
COD, ppm	≤ 60	≤ 60	≤ 60	Nil
FOG, ppm	≤ 5	Nil	Nil	Nil
Total Dissolved Solid, mg/L	≤ 1200	≤ 1200	≤ 1200	≤ 300*
Total Suspend Solid	≤ 50	≤ 10	nil	Nil
Turbidity, NTU	≤ 50	≤ 10	≤ 0.1	Nil
SDI	-	-	≤ 3	-

# CASE STUDY 1

## 10 MLD Water Reclamation Plant Amata City Chonburi, Thailand



## CASE STUDY 2

7 MLD Water Reclamation Plant Amata City Chonburi, Thailand

VIDEO [PRESENTATION](#)

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**Thank You**