

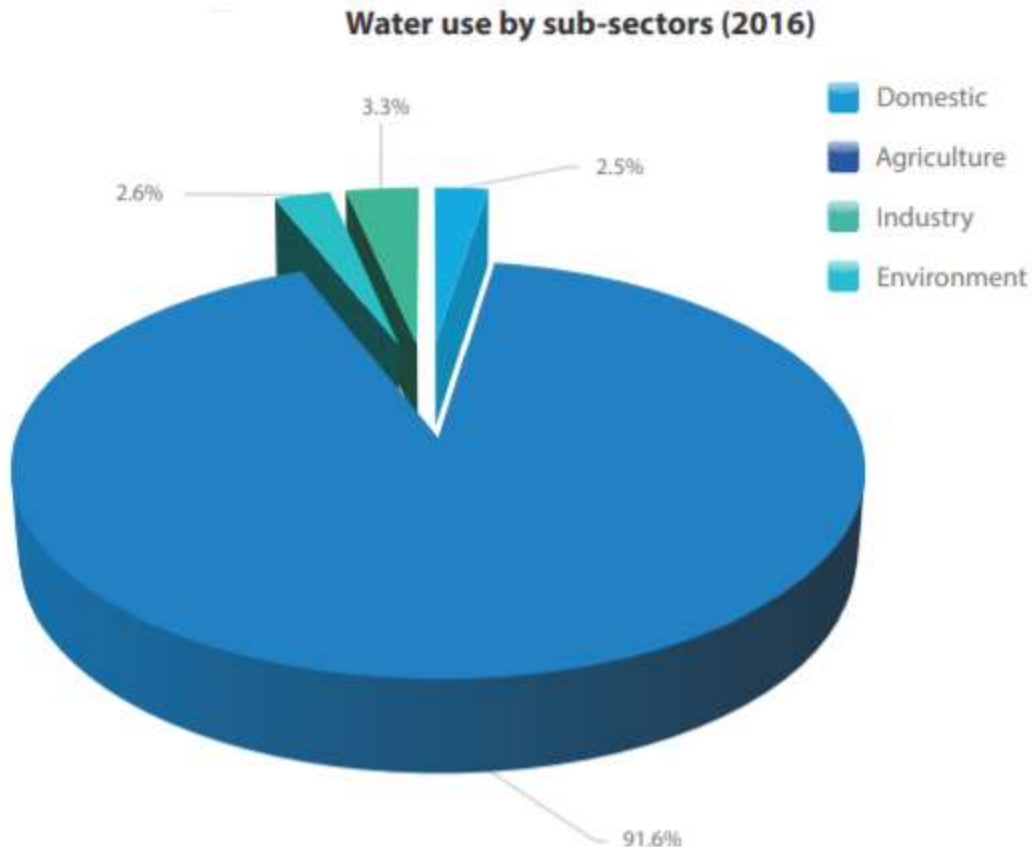
Thousands have lived without love; not one without water”
(W.H. Auden)

Why Recycling?



Industrial consumption is significant, recycling is mandatory in many countries as it is one of the significant ways of conserving water

Pakistan: Water consumption pattern



Key Statistics for Karachi

Current population	16 Million
Net Supply of water	500 MGD
Demand of Water	1100 MGD
Water currently available per Capita	25 gallons/day
Water Demand by 2025	1350 MGD

(Source: Karachi Water Supply & Sewerage Board)- Published by April 2019

Conservation Approach

- Shortfall in demand and supply → groundwater extraction
- Groundwater usage → RO (capex, opex)
- RO reject → disposal → multiple issues

- Shortfall in demand and supply → reuse
- Conventional approach → reuse of grey water → limited volume
→ reuse of black/process water → limited usage
- Innovative approach → treatment of process effluent (high volumes) for reuse within industrial process



FEASIBILITY OF WATER RECYCLING SOLUTION

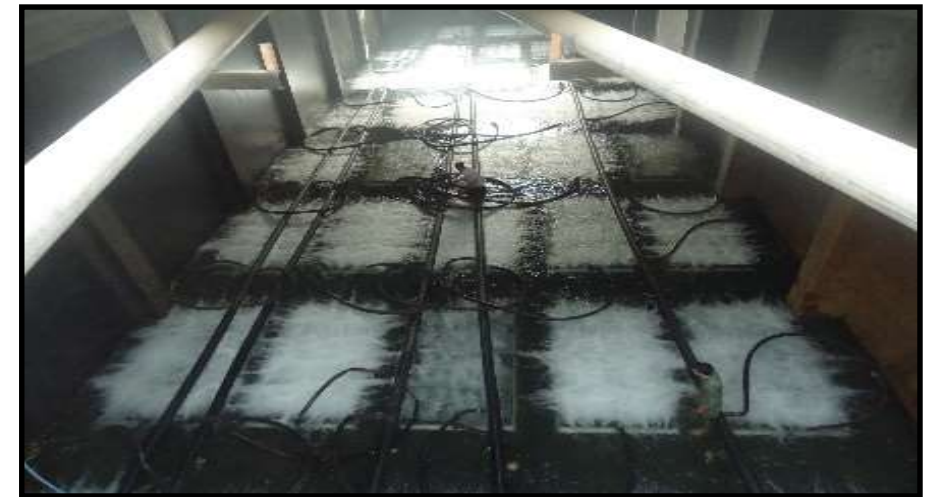
AN INNOVATIVE APPROACH FOR WASTEWATER RECYCLING

MEMBRANE BIO REACTOR

AEES has pioneered this technology in Pakistan

Key features are:

- MBR process consists of activated sludge combined with a membrane system for the separation of activated sludge (mixed liquor) from treated effluent.
- Biologically treated effluent is passed into the bioreactor tank for the activated sludge process, through which organic and inorganic suspended solids and part of the dissolved solids achieve the capability of settling. The wastewater is fed with air through an aeration system consisting of fine bubble membrane type diffusers.
- The mixed liquor is constantly pumped to the membrane and re-circulated back to the aeration tank. Permeate is drawn from the membrane module by permeate pumps and collected into the permeate tank.



Highlights/benefits of MBR Technology

MBR gives capability of recycling up to 95% of the effluent

Additional benefits are:

- 60% less Area space
- 40% less Sludge generation as compared to the conventional technology
- 60% less Civil construction - Huge savings on CAPEX
- Completely Biological Treatment Plant - Environment friendly
- Fully Automatic System, requires less manpower consequent to which high reliability on consistency in plant performance
- Less Chemical Consumption - Cheapest OPEX
- High quality treated Effluent – Legal compliance



Problem Statement

Before moving to MBR, YTM wastewater treatment plant comprised of physio-chemical followed by biological treatment process. Other than not being able to recycle the effluent using conventional methods, YTM was also faced with the following core issues:

- Huge volumes of chemical sludge was being generated
- Heavy costs on account of chemical consumption
- Inconsistent quality parameters of the treated effluent
- Incapability of recycling effluent



Diagnostics, steps and solution provided

- WOG conducted detailed survey of wastewater generation and water consumption in the manufacturing facilities.
- Evaluated possibilities of elimination of chemical use in wastewater treatment plant
- Evaluated options of recycle of wastewater after appropriate treatment.
- 95% of wastewater recycled back to process through treatment (5100 m³/day)



Highlights of Innovative Solution

- Elimination of use of ACID for pH adjustment from pH 11.5 to 7
 - Flue gas utilizes from power plant. Flue gas injection system developed to dissolve CO2 present in flue gas into wastewater. By this means reduction of pH adjustment is done from 11.5 to 7.0
- Complete elimination of use of chemical in primary treatment section
- Advanced Membrane Based Biological system is installed to produced superior quality of treated water
- No pre-treatment before RO, as water quality from MBR is superior
- Multi stages RO with pressure enhancement system is provided to optimise energy consumption

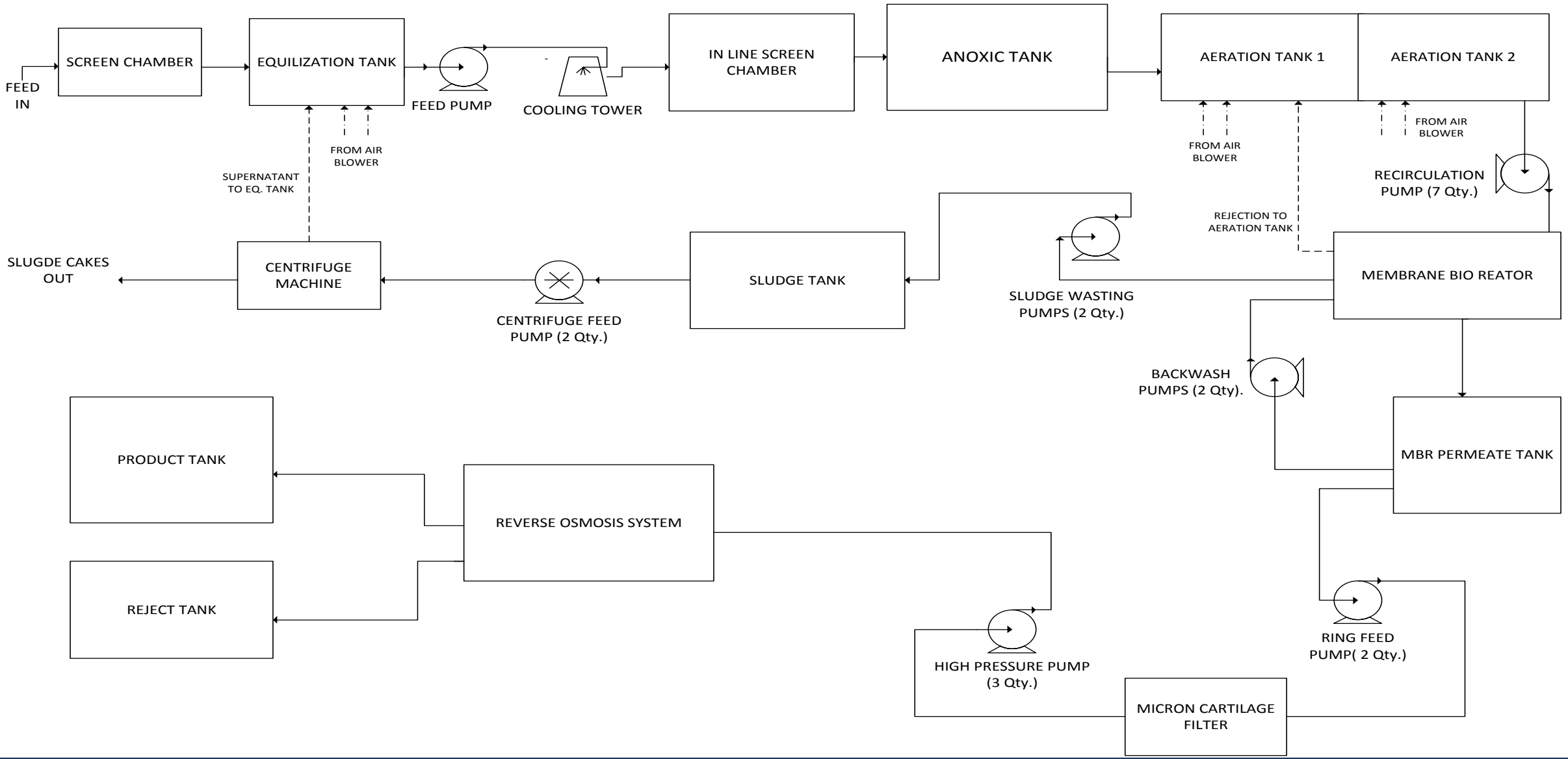
Results inlet, Post MBR & RO



Parameter	Unit	Inlet	MBR Outlet
Flow Rate	m ³ /day	5500	<5500 (less sludge)
pH	-	9-11.5	6.5-7
BOD	mg/L	900	<5
COD	mg/L	3700	<50
TSS	mg/L	315	BDL
TDS	mg/L	4160	4160

Parameter	Unit	RO Outlet
COD	mg/L	ND
pH	mg/L	7
TDS	mg/L	<300

Process Flow Diagram:



Capital intensive plants. Hence, incentive are required for local industries to adopt this technology.

➤ Payback is less than 2.5 years

➤ Cost of water for other sources:

KWSB = USD 0.34 per m³

Commercial water tankers = USD 1.7 per m³

➤ Cost of MBR processed water:

Water recycled by MBR process = USD 0.2 per m³

NOTE: All Calculations are @ current exchange rate

AEES has the expertise to install and operate these plants, having completed 9 plants in Pakistan



S.No.	Customer Name & Location	Type of Industry	Type of System	Project Description
1	Lucky Textiles Mills Ltd., Karachi	Textiles	ETP	Effluent Treatment Plant (ETP) including its Design, Engineering, Supply of hardware and software, Supervision in Erection & Commissioning and training
2	Yunus Textiles Mills Ltd., Karachi	Textiles	ETP-MBR & RO	Design, Engineering, Construction, Supply, Erection & Commissioning of MBR based Wastewater Treatment Plant and Reverse Osmosis Based Recycle/Reuse Plant including 1 Year Operation & Maintenance of the Plant.
3	Engro Foods Ltd., Sahiwal	FMCG	UF	Design, Engineering, Supply, Supervision of installation ,commissioning of plant comprising mechanical, electrical and instrumentation for Effluent Treatment Plant
4	Mehran Sugar Mills Ltd. Tando Allahyar	Sugar	ETP - SBR based	ETP Plant SBR technology (Design, Engineering, Supply, Supervision of Erection & Commissioning along with Glass fused to Steel Tanks for SBR reactors
5	Shafi Texcel, Lahore	Textiles	ETP-CAS	Effluent Treatment Plant (Design, Engineering, Procurement, Supply, Supervision of Assembly/Commissioning (Mechanical, Plant Units, Piping, Electricals & Instrumentation)
6	Eastern Garments Pvt. Ltd., Karachi	Textiles	ETP-MBR & RO	MBR based ETP - Design, Engineering, Procurement, Supply, Supervision of Assembly/Commissioning (Mechanical, Plant Units, Piping, Electricals & Instrumentation. Supply of Low fouling 140 units of RO membranes.
7	Artistic Garments and Fabrics Ltd., Karachi	Textiles	ETP-MBR	Design, Engineering, Construction, Supply, Erection & Commissioning, of MBR based Wastewater Treatment Plant.
8	KIA lucky Motors, Karachi	Automobiles	ETP-MBR	Turnkey based Design, Engineering, Construction, Supply, Erection & Commissioning, of MBR based Wastewater Treatment Plant.
9	National Foods, Karachi	FMCG	ETP-MBR	Design, Engineering, Construction, Supply, Erection & Commissioning, of MBR based Wastewater Treatment Plant.



• Water • Oil • Gas
(A Group of Companies)



*Thank
you*