





WATER RECYCLING

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Water is life. It sustains our bodies, our land, plants and animals, and our economies. Today, heightened awareness of water challenges, including polluted drinking water and collapsing ecosystems, has activated public concern about water reycling.

This growing attention creates openings to fundamentally rethink how we ensure safe, reliable water for people and nature.

Aquamatch provides new and innovative approaches to meet your collective water needs.

What is water Reuse?

Water reuse is the use of reclaimed/recycled water for a benefical purpose which has different applications. It is converting wastewater into water that can be reused for other purposes and processes.



Water is too precious to waste.

Water Recycling Benefits

Increase operational efficiency
Reduce wastewater flows
Improve production capacity due to increase availabilaty
Provide social responsibility to your community and positive company image
Increase sustainability efforts to reduce your water use footprint
Help reduce water scarcity

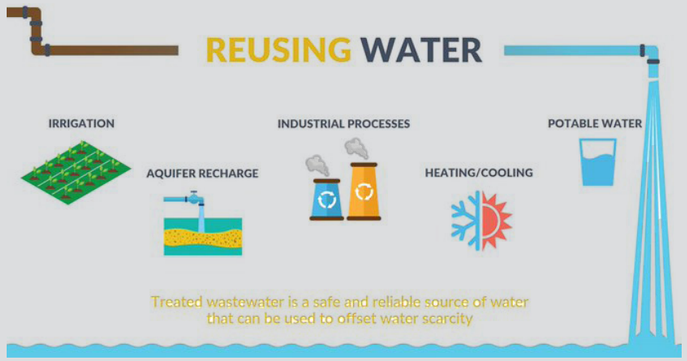
Recycling System

Each sector has a different process and wastewater quality, so the recycling methods to be applied also differ accordingly.

Recycling system is a combination of below typical treatment processes:

- Combination of different filtration steps to remove the suspended solids, particles.
- Ultrafiltration provides fine Filtration upto 0,02 micron.
- Reverse Osmosis and Recovery RO are the solutions for ion removal in case of high TDS.
- Nano Filtration System can be used for backwash water.
- MBR (Membrane Bio Reactor) is the latest technology of advance treatment methods.
- Disinfection is the final step.

Typical applications for recycled water.

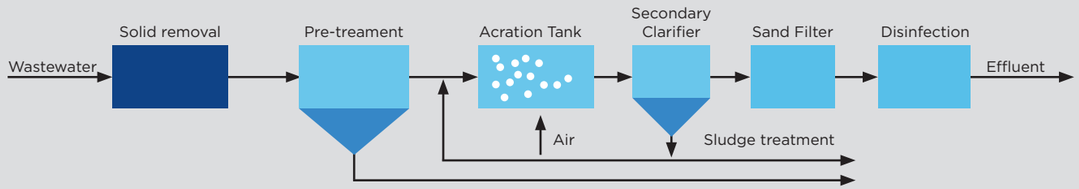


MBR Versus Conventional System

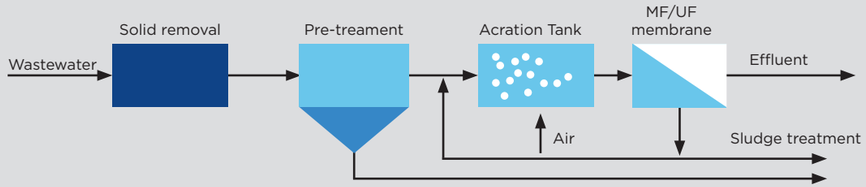
Conventional Waste Water Treatment System

Urban/Industrial wastewater is usually treated by conventional activated sludge processes (CASP) which involve the natural biodegradation of pollutants by heterotrophic bacteria in aerated bioreactors. Activated sludge could be separated by gravitational setting. The treatment efficiency is usually limited by the difficulties in separating suspended solids. The optimal sludge concentration is generally up to 5 g/lt which imposes large size of aerated bioreactor. Further treatment of sludge needs to be provided separatelly.

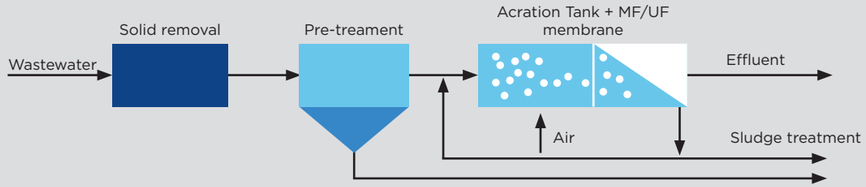
(a)



(b)



(c)



Membrane Bioreactor (MBR) is an improvement of the CASP, where the traditional secondary clarifier is replaced by a membrane unit for the separation of treated water from the mixed solution in the bioreactor.

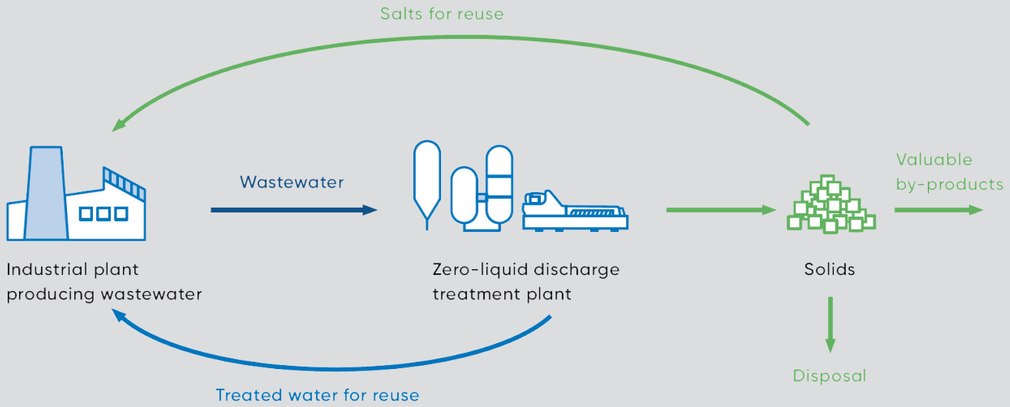
Membran Bioreaktor (MBR) System	Conventional Activated Sludge System
Finest quality of effluent which is very suitable for reuse for process. Turbidity: < 1 NTU Bacteriological Load: None	Effluent must be discharge due to unsuitabilitiy for reuse
High MLSS (8-30 g/lt) Smaller capacity aeration tank	Low MLSS (3-5 g/lt) Bigger aeration tank Bigger footprint
Less Sludge	High sludge
No need settling clarifier	Needs settling clarifier and disinfection
Helps water scarcity	-

MBR system provides superior quality effluent that is completely acceptable for reuse. Membrane separation technologies are used to concentrate, clarify and purify liquids, and recapture valued materials across diverse industries to increase yield and reduce waste. Selection of MBR membrane type depends on the capacity, available area for installation, capex and opex and it should be discussed specifically for each project.

Zero Liquid Discharge (ZLD) Systems

An efficient and well-designed ZLD treatment system should be able to:

- Handle variations in waste contamination and flow
- Allow for required chemical volumes adjustments
- Recover around 95% of your liquid waste for reuse
- Treat and retrieve valuable byproducts from your waste (i.e. salts and brines)
- Produce a dry, solid cake for disposal



What's included in a basic ZLD treatment system?

- Clarifier and chemical feed to help facilitate the precipitation of any metals and suspended solids
- Ultrafiltration (UF) to remove suspended solids
- Reverse osmosis (RO) to remove the dissolved solids in the primary phases of concentration
- Brine concentrator to further concentrate the reject RO stream or reject from electrodialysis or electrodialysis reversal (ERD) to further reduce waste volume.
- Evaporator for vaporizing access water in the final phases of waste concentration before crystallizer.
- Crystallizer to boil off any remaining liquid, leaving you with a dry, solid cake for disposal.

Minimal Liquid Discharge (MLD) Systems

ZLD vs MLD

For a long time ZLD has been suggested as an environmentally friendly way to help the industry meet with increasingly strict discharge requirements.

However ZLD processes are technically complex, very expensive and not necessarily environmentally friendly due to the additional material and energy they require.

MLD is the new approach to improve the water footprint by using dependable filtration based technologies that can achieve high water recovery at a fraction of ZLD's costs.

- MLD provides lower CAPEX and OPEX when compared to the ZLD design.
- The costs of membrane and filtration processes are proportionally minimal in comparison the Thermal ZLD technologies .

Evaluating MLD needs

- If water reuse is needed.
- Identify the waste water streams in terms of flow, contaminants and concentrations.
- By checking the waste streams, we can calculate a more economical and sustainable approach for each case.

Considering the water needs, legislations and environmental requirements, as well the CAPEX and OPEX budget, MLD can prove to be a good option for a wide range of industrial and municipal sites who that prefer cost efficient water footprint.

References – Engro Polymer Karachi

The Recycling Plant for Engro Polymers and Chemicals has been awarded to Aquamatch. Project will be completed in end of 2020.

The project consist of;

- Lamella Clarifier with Coagulation & Flocculation
- Activated Carbon Filters
- Ultrafiltration System
- Reverse Osmosis System
- Drain RO System

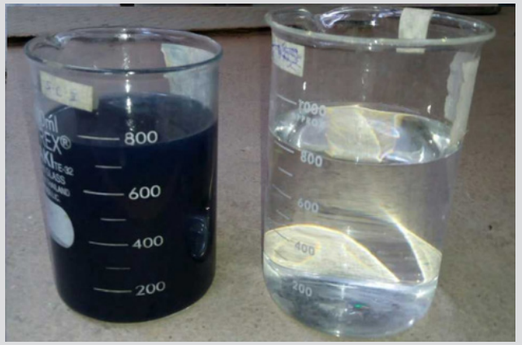
Raw Water Source	Composite Effluent
Raw Water TDS	2800 ppm
Plant Capacity	100 m^3/h
Product Water TDS	< 100 ppm





References - Akhtar Textile Karachi

Effluent of existing biological waste water plant is treated by ultrafiltration and reverse osmosis systems and it is supplied as process water. The plant has been designed and manufactured by Aquamatch in 2016 with the capacity of 28 m3/hr. Second phase UF is installed in 2018 with the capacity of 23 m^3/hr.





Raw Water	WWTP Effluent
Raw Water TDS	3000 mg/lt
Plant Capacity	28 m^3/h
Product Water TDS	< 150 mg/lt

References – Tupras Izmit Refinery Turkey

Aquamatch has built the reuse project from municipality waste effluent with the capacity of 1750 m^3/hr final product water. Product water is used as process water and demin water for boiler systems.





Completion Year	Raw Water Source	Filtration System	Carbon Adsorption	Ultrafiltration	Resmo Osmosis	Product Water Quality
2015	Sewage of Izmit City	2.280 m^3/hr	2.280 m^3/hr	1.750 m^3/hr	1.250 m^3/hr	Demineralized Water

References – Tupras Izmit Refinery Turkey

Aquamatch has built the reuse project from Industrial effluent with the capacity of 250 m^3/hr final product water. Product water is used as make up water for cooling tower.



Completion Year	Raw Water Source	Filtration System	Carbon Adsorption	Ultrafiltration	Product Water Quality
2015	Industrial Effluent	440m^3/hr	340 m^3/hr	250 m^3/hr	Make up water

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