

# Hydroleap

## Business Profile

## Company



-Snapshot

## Challenge



-Water Trends  
-Pain Points

## Solution



-Our Innovation  
-Our Product  
Portfolio

## Traction



-By Customer  
-By Industry



**Founded**  
**2016**



**Funding**  
**US\$ 2.6M**



**Team**  
**14**

(incl. 2 PhDs)

## Vision

Hydroleap aims to be the leading next-generation wastewater solution provider, accelerating the adoption of sustainable water.

## Mission

Hydroleap helps our customers by implementing **chemical-free and cost-effective wastewater treatment** for industrial applications, enabled by innovative technology.

Conventional methods are expensive, harms the environment and rigid

## The Problem

### Chemical processes

#### Difficult to Operate



- Frequent **manual calibration**
- **Unadaptable** to changing wastewaters
- **Downtime** for maintenance
- **Large footprint**



#### Environmentally Unfriendly

- **High sludge** generation
- **Chemical storage** and handling (EHS)



#### Expensive

- **\$25 Billion** per year is spent on chemicals for water treatment.

## Solution

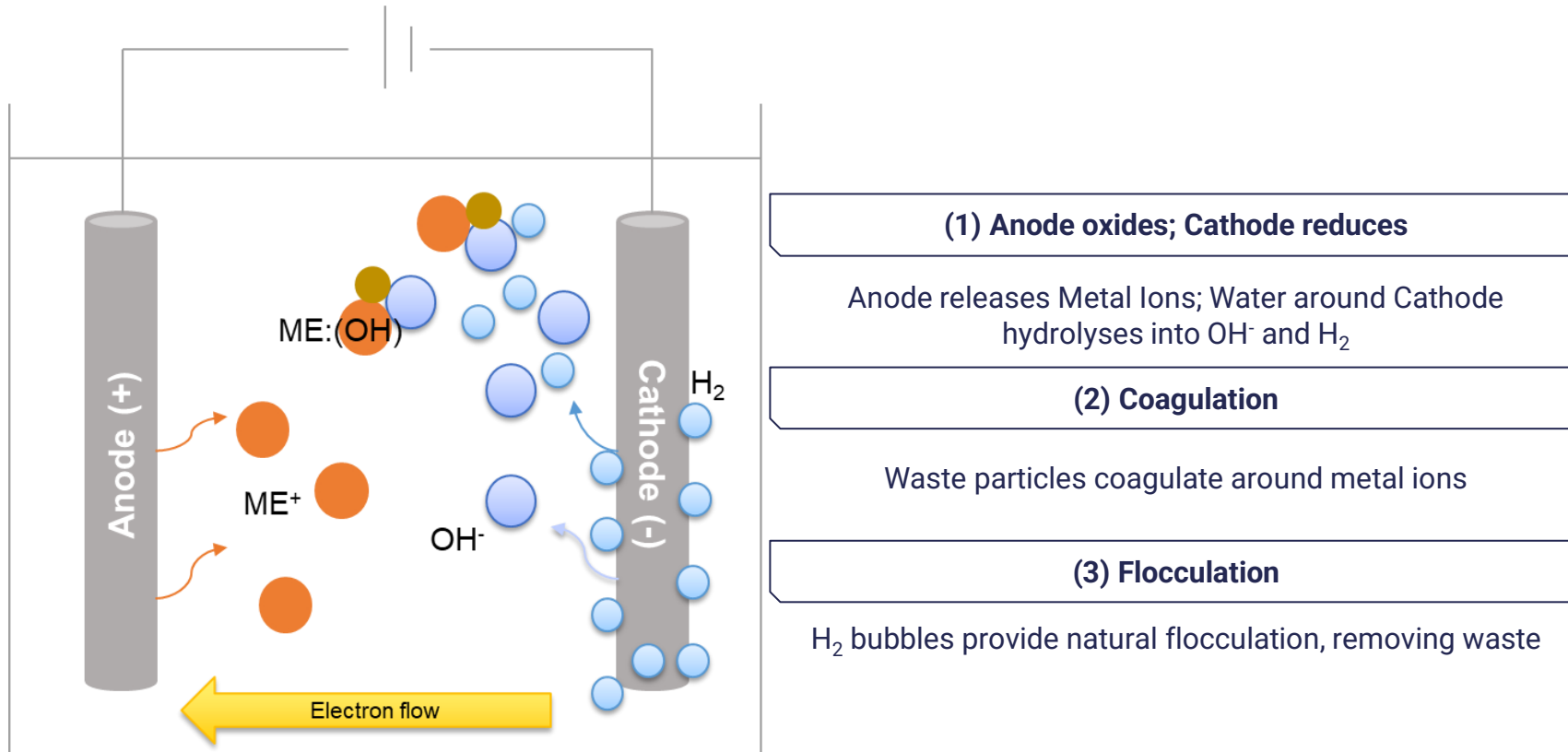
### Chemical-free processes

### Electrochemistry



Conventional electrochemical treatment has faced structural problems

## Mechanism - Electrocoagulation



Although the principle of electrical water treatment has been around for more than a decade, its application on a large-scale has been hindered due to issues of i) power consumption and ii) passivation.

**Our technology overcame this**

## Smart Automation

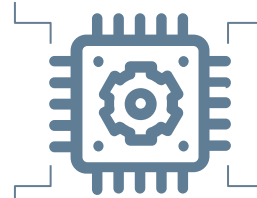
Efficient, Low maintenance, long-lasting

### Smart Energy Distribution

Adapts to feed water quality

### Anti-Scaling

Prevents passivation



### Non-sacrificial electrodes

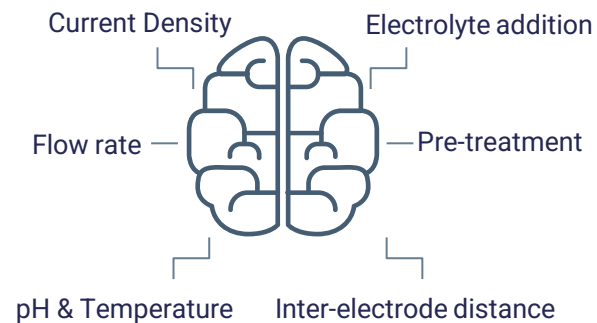
Prevent corrosion

### Self-maintaining

Longer component lifespan

## Research and Development

Optimising complex variables



## Connectivity

Remote Monitoring



## Benefits

### Operations

- Requires **only electricity**, no other additives
- Highly automated with no moving parts, meaning **less maintenance**
- Robust, **modular configuration** - can be standardised or customised

### Suitability

- Can operate **flexibly**, within large pH deviation
- **Versatile** pre- and post-treatment technique

## Outcomes

### Operational Efficiency

- **50% space** utilisation
- **95% reduction** in operating manhours
- **30 - 40%** reduction in **carbon emissions** per m<sup>3</sup> treated

### Cost Savings

- **50% - 60%** cheaper OPEX versus conventional chemical treatment
- **70%** lower energy consumption compared to conventional electrochemical treatment

# Our Capabilities

Removal of a wide range of contaminants

Construction Industry  
Mining Industry  
Urban Runoff

Food & Beverage Industry  
Palm Oil Industry

Petrochemical Industry  
Textile & Tannery Industry  
Semiconductors Industry  
Oil & Gas Industry  
Landfill Leachate

## Silty Wastewater

## Oily Wastewater

## Industrial Wastewater



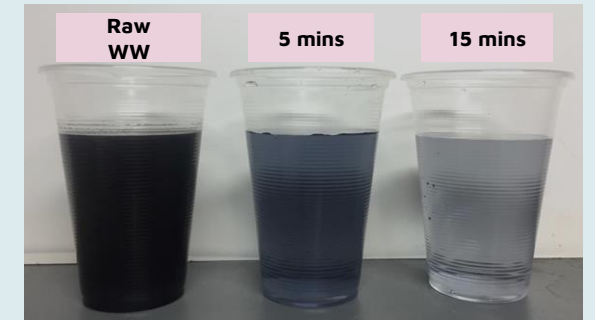
Total Suspended Solids  
(TSS)



Oil & Grease  
Suspended Solids (TSS)  
COD (Organics)



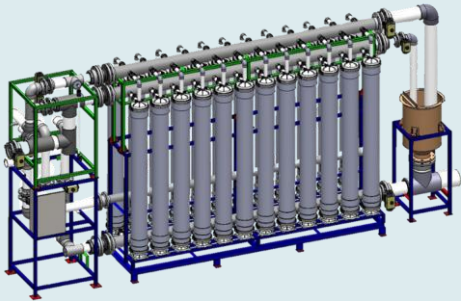
Oil & Grease  
Heavy Metals  
Hardness (Ca, Mg), Silica



Suspended Solids (TSS)  
COD (organics)  
Dye (Colour)

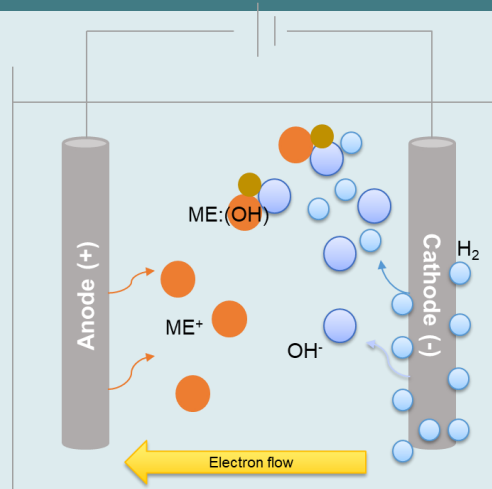


## Filtration



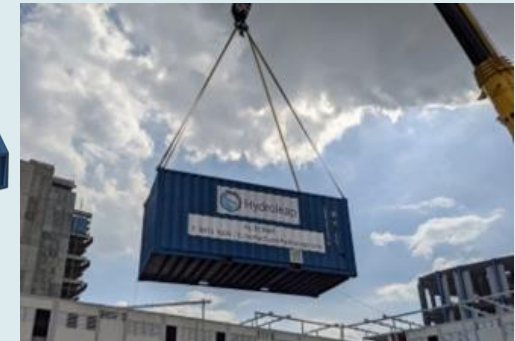
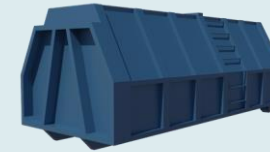
**Pressurized Systems**  
**Submerged Systems**  
**Polymeric and Ceramic Membranes**

## Electrocoagulation



**Electrocoagulation Module**  
**Novel Electrodes**

## End-to-end Solutions



**Advanced Oxidation Processes**  
**Zero Liquid Discharge**  
**De-watering**

# Company Stakeholders

Notable corporates and institutions form our business ecosystem

# Hydroleap



## Customers

## Investors

## Partners

## Commercial



- Client: Alfatech (SG)**
- Water treatment for Facebook Data Centre Construction
  - Issue with silty water



- Client: Public Utilities Board (SG)**
- Commercial R&D project
  - Pretreatment for Desalination
  - Partnership with National University of Singapore



- Client: Shanaya Environmental (SG)**
- Industrial Wastewater Treatment plant
  - Issue with high oil in water



- Client: Universal Robina (PH)**
- Wastewater Treatment from F&B plant
  - Issue with high organic contaminant
  - First international expansion
  - Commission in October 2021

## Pilot Development



- Client: Amazon Web Services (SG)**
- Wastewater Treatment for Data Centre
  - Issue with water Hardness for cooling tower



- Client: Chang Chun**
- Wastewater Treatment for chemical plant
  - Issue with difficult-to-treat organics
  - Taiwanese company with Singapore operations

# Seeking Partnerships

Hydroleap is looking for partnerships and beachhead projects



## Commercial Partners

- Companies who similarly serve a wide-range of industrial customers looking to expand their portfolio.
- Companies looking for differentiated technologies to complement existing water solutions.
- Resellers/ Distributors looking to explore go-to-market opportunities.



## Technical Partners

- Overseas in-market companies with water treatment capability & skills.
- Partners with commissioning & implementation experience



## Beachhead Projects

- Corporates with difficult-to-treat wastewater problem statements.
- Corporates willing to pilot and trial new technologies for their operations.
- Corporates looking to reduce OPEX on water treatment.

## Customer- Led Design

- We begin with your current processes and problem statements faced
- We understand your desired results

## Feasibility Study

- Testing with real-life samples
- Proposal on solution

## Execution

- Safety and quality management system
- Modular design
- Simple operations and maintenance

## Financial

- Cost- effective design
- 'Cost of Ownership' approach - fast return on investment

# Thank you for listening!

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# Annex - Industry Applications

## Construction

*Silty Wastewater*

### Wastewater Characteristics

- Construction has a high impact on the environment. Water pollution can be generated through many sources from a construction process. For example, the treatment of surface runoff, piling work, truck cleaning, etc.
- Countries enforce strict regulation or guidelines to ensure their municipal waterways are kept pollution-free from construction activities. Conventional systems make extensive use of chemicals and are labour intensive to operate.

### Product Overview

Hydroleap offers a chemical-free electrical treatment solution for silty water treatment. These come in standardised capacities, and containerised units

Product	Capacity (m <sup>3</sup> /hr)	Power consumption (kWh/m <sup>3</sup> )	Dimensions (L x W x H) (mm)
HL-ECM05	5	0.4	2500 *1440*2300
HL-ECM20	20	0.3	2990*2440*2590
HL-ECM40	40	0.3	6096*2440*2590
HL-ECM60	60	0.3	6096*2440*2590



### Benefits

Efficient removal of Total Suspended Solids (TSS) from construction wastewater to meet Singapore Public Utilities Board standards of less than 50 mg / L.

**Cost:** 30% savings on total cost of ownership compared to conventional units

**Digital:** 100% Automated operation and maintenance

**Productivity:** 95% of man hour saving on operations



## Textile Wastewater

*Strong colour and Alkalinity*

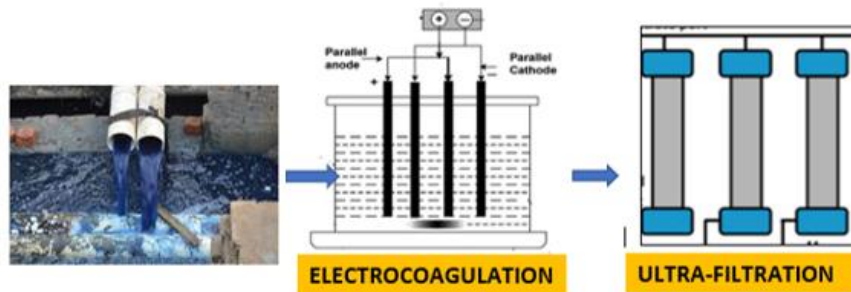
### Wastewater Characteristics

- Industrial textile wastewater (TWW) is a major pollutant that often contains high levels of un-fixed dyes (about 20% wt.) and is characterized by alkaline pH, significant salinity, intensive color, high organic matter load, high ionic strength, poor biodegradability, high dissolved solids content, and high toxicity.
- Governments are imposing more stringent regulations and emission limits, and both industries and academy are requested to seek new methods and technologies capable of effectively removing organic matter (COD, BOD5, TOC), dyes and solid content (total solids and turbidity) and toxicity.

### Influent

COD: 200 - 1500 mg/L  
 BOD: 100 - 500 mg/L  
 Heavy metal: traces  
 Colour: Strongly coloured  
 TDS: 1000 -5000 mg/L

### Technique



### Effluent

COD: 80-90% removal  
 Colour: Colourless  
 TDS > 80% removal

### Benefits

- Efficient removal of color and recalcitrant organics to achieve discharge regulation requirements.
- Significant operating costs savings due to the elimination of chemical use.

## Food Processing Industry

*High Organic Contaminants*

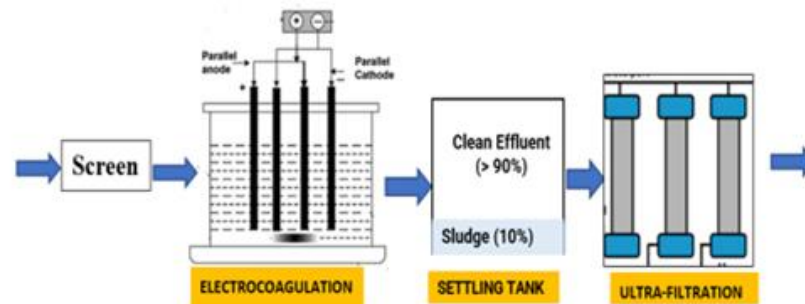
### Wastewater Characteristics

- Waste waters from food processing industries are characterized by moderate to high BOD, high COD, high dissolved and suspended solids, very high nutrient content such as phosphorous, nitrogen, heavy oil and grease. Biological systems are frequently used in food industry due to high biodegradability of wastewater (BOD5/COD: >0.3).
- However, with more stringent discharge standards in most countries, the biological techniques alone became insufficient in degrading the high-molecular-weight fractions and refractory organics.

### Influent

COD: 10,000-20,000 mg/L  
 BOD: 3,000 - 5,000 mg/L  
 TDS: 2,000 - 4,000 mg/L  
 Conductivity: >4,000  $\mu$ S/cm

### Technique



### Effluent

COD > 80% removal  
 TDS > 90% removal  
 BOD5 /COD: >0.4

### Benefits

- Efficient removal of recalcitrant organics, oil and grease, odour and TDS to achieve reusable quality water or further downstream treatment quality of wastewater.
- Significant operating costs savings due to the elimination of chemical use.
- Much faster treatment compared to the biological treatment process.

## Petrochemicals Wastewater

*Recalcitrant and toxic compounds*

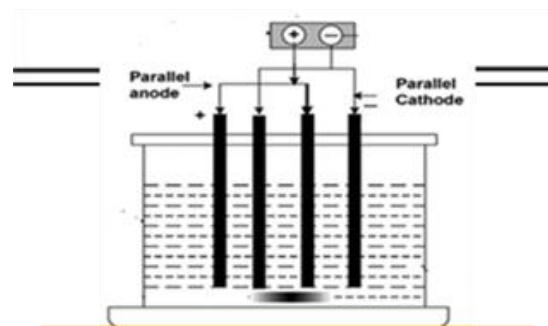
### Wastewater Characteristics

- Petrochemical wastewater mainly contains phenolic compounds and polycyclic aromatic compounds (PAHs) to be largely non-biodegradable due to their recalcitrant and toxic nature.
- Direct treatment of petrochemical wastewater through conventional chemical or biological processes may not be reliable due to inhibition and toxicity contributed by the phenolic compounds. Therefore, advanced treatment must be employed to ensure that organics are destroyed before down-stream treatment process

### Influent

COD 2000-7000  
 Phenol 600-1000  
 BOD5/COD: 0.2-0.3  
 TDS: 4000-7000  
 (mg/L)

### Technique



**ELECTROCOAGULATION**

### Effluent

COD 70-80% removal  
 Phenol > 95%  
 removal

### Benefits

- Enhanced phenolic compounds and recalcitrant organics removal
- Meet the downstream treatment water-quality requirement
- Enhanced water recovery for use in other plant functions

## Pharmaceutical Wastewater (PWW)

*Non-biodegradable / recalcitrant pollutants*

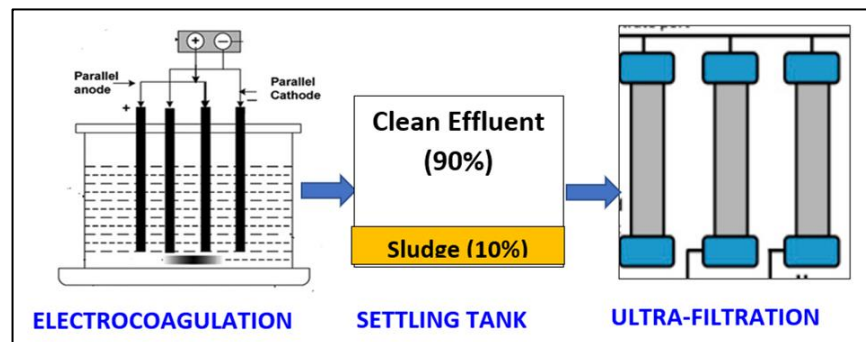
### Wastewater Characteristics

- PWW are extremely heterogenous and contains varieties of chemical pollutants, such as inorganic or organic compounds, metals, hydrocarbons, solvents, polymers, oils, greases and salts with various levels of toxicity.
- PWW cannot be easily treated by conventional chemical or biological processes due to the presence of complex organics.
- PWW are generally non-biodegradable wastewater (BOD5/COD: <0.05) due to the presence of "recalcitrant pollutants" that inhibits the microorganism activity during biological process.
- The complex composition of recalcitrant organics requires specific approach and advanced treatment.

### Influent

COD: 2000-6000  
BOD5: 100-300  
TDS: 800-1700  
(mg/L)

### Technique



### Effluent

COD > 90% removal  
TDS 80-90% removal

### Benefits

- Remove chemically stable, difficult-to-treat contaminants
- Enhanced water recovery for use in other plant functions
- Significant operating costs savings due to the elimination of chemical use.

## Active Pharmaceutical Ingredients (API)

*Non-biodegradable / recalcitrant  
pollutants*

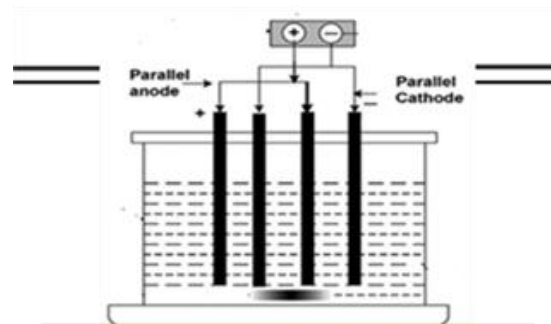
### Wastewater Characteristics

- The pharmaceutical industry manufactures thousands of APIs for a wide range of treatment applications including cancer therapies, pain management, antidepressants, and antibiotics. However, in recent years, there is growing evidence that APIs are accumulating in rivers, lakes, and drinking water worldwide and impacting aquatic ecosystems.
- APIs are challenging to treat with conventional wastewater technologies because they are chemically stable, often recalcitrant and nonbiodegradable.
- Therefore, pharmaceutical manufacturers must employ advanced treatment technologies to ensure that all APIs are destroyed before treated water is discharged into the environment.

### Influent

COD: 6000-7000  
TDS: 15000-20000  
SS: 500-700  
(mg/L)

### Technique



**ELECTROCOAGULATION**

### Effluent

COD: 500-600  
TDS: 1000-1300  
SS: 50-80  
(mg/L)

### Benefits

- Remove recalcitrant organics and non-biodegradable organics
- Able to achieve dischargeable or reusable quality water
- Significant operating costs savings due to the elimination of chemical use.

## Distillery Wastewater (DWW)

*Extremely high BOD and COD*

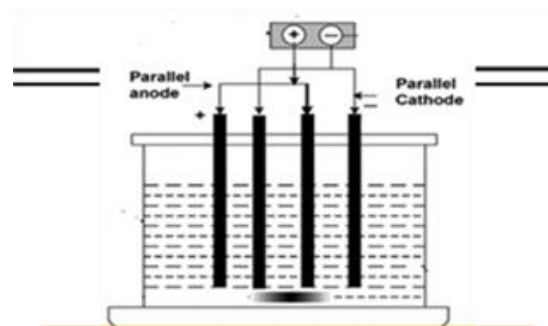
### Wastewater Characteristics

- Sugar mill factories, which supply molasses to distilleries, discharge large amounts of wastewater with high molecular weight organics, oil, grease, sugar cane juice, syrup and molasses.
- DWW has enormously high COD (40,000–100,000 mg/l) and BOD (40,000–50,000 mg/l), apart from low pH, high potassium, phosphorus and sulfate content, strong odor and dark brown color. Hence, it is the most complicated and problematic organic industrial effluents; and appropriate treatment is therefore necessary before the effluent is discharged.

### Influent

COD: 40000  
 Colour: Dark Brown  
 TDS: 55000  
 Salinity: 25000  
 (mg/L)

### Technique



**ELECTROCOAGULATION**

### Effluent

COD: 500  
 Colour: Transparent  
 TDS: 100-300  
 Salinity: 250  
 (mg/L)

### Benefits

- Removal of complex organics from Distillery wastewater to achieve dischargeable water quality requirement.
- Smaller footprint compared to conventional treatment process.

## Desalination

*Energy and cost-intensive process*

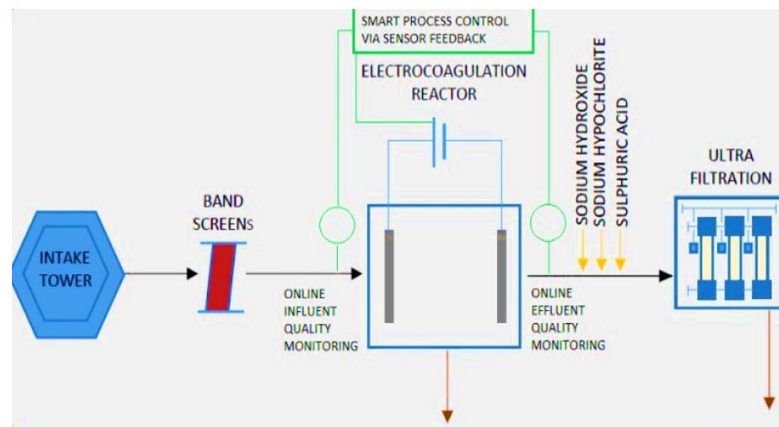
### Wastewater Characteristics

- Reverse Osmosis (RO) is the dominant membrane technology used for seawater desalination. However, the seawater contains varying concentrations of constituents commonly known as foulants that may clog/foul the membranes, leading to a sharp decline in process performance, and consequently, increase energy demand and membrane cleaning frequency.
- Conventional approaches include the use of chemical coagulation/flocculation (CC/CF), pH adjustment, disinfection, or other complex pretreatment stages such as dissolved air flotation (DAF) and ultrafiltration (UF) to remove these foulants. These consume a significant amount of chemicals, especially when the amount of foulants are high.

### Influent

Hardness: 5000-7000  
 Turbidity: 0.4-27.2 NTU  
 TDS: 30000-35000  
 Boron: 2-8  
 SS: 500-700  
 (mg/L)

### Technique



### Effluent

Turbidity > 95% removal  
 TDS > 70% removal  
 Boron > 90% removal

### Benefits

- Increase lifespan of downstream RO membranes
- Smart Process Control to address variable influent characteristics of seawater
- Significant operating costs savings due to lower energy consumption and elimination of chemical use.

## Cooling Towers and Chiller Water

*High hardness and biological contamination*

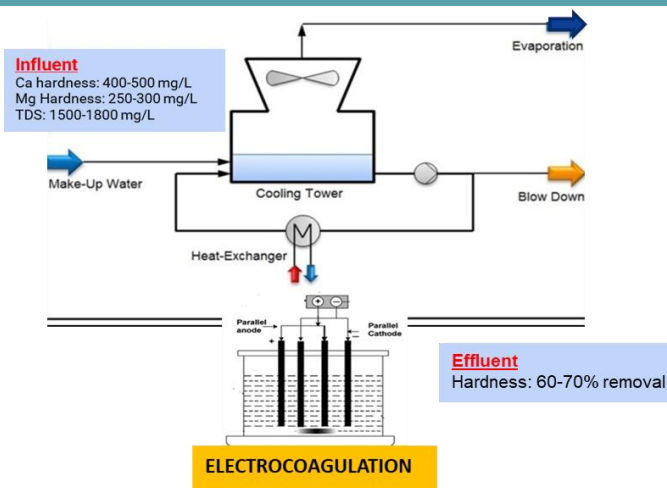
### Wastewater Characteristics

- Issues with operating evaporative cooling towers are the large water consumption (estimated 11,000 m<sup>3</sup> per day of water in Singapore), high hardness (minerals and compounds) of residual water, and biological contamination (e.g. Legionella). Consequently, water is required to be discharged and replenished several times a day – a substantial cost for properties.
- Current conventional treatment methods involving chemicals, filtration, ultraviolet, etc., are not viable due to biological fouling and scale formation and require considerable capital and/or complex operations.

### Influent

Ca: 400-500  
Mg: 250-300  
TDS: 1500-1800  
(mg/L)

### Technique



### Effluent

Hardness > 60-70% removal

### Benefits

- Allows for Cycle of Concentration above 20, significantly reducing freshwater make-up for blowdown operations.
- Reduce blowdown cycle by >99%
- Simple, non disruptive system
- 100% reduction in chemical addition



# System Pictures

# Containerised



**Inside Container**



**Container**



**Pilot Unit**

# Direct Installation - Client Wastewater Treatment Plant (end to end solution)

**Electrocoagulation Unit**



**Clarifier**



**Dewatering**