TOSHIBA

Toshiba Water Solutions Pvt. Ltd.

Water & Waste Water Treatment Market in India
&
Sustainable Solution for ZLD

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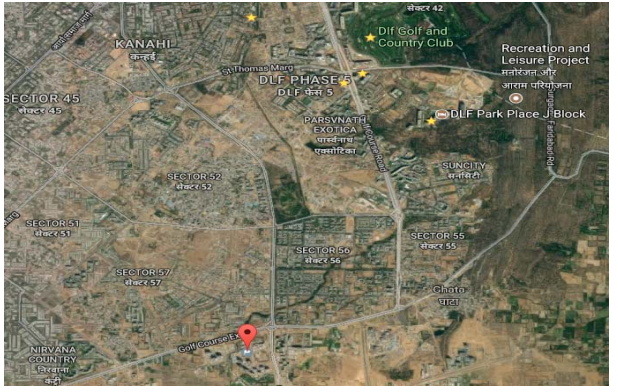
01

INTRODUCTION

Introduction



Toshiba Water Solutions Pvt. Ltd.,
(A Group Company of TOSHIBA Corporation, Japan)

An international multi-disciplined environmental services company specialized in providing turnkey design and construction services in the field of water and wastewater segment for industries and municipalities.

- **Started its journey in 1973** as a Utility management company in Florida, USA.
- Jumpstarted **Indian Operations in 1983 with several Industrial sector turnkey deals for treatment of wastewater from ethanol distilleries.**
- Completed over **350 installations** in approx. **35 countries.**

Global Footprint with Local Expertise

Journey of over 45 years of Experience

1973 — UEM started operating as a **Utility management company in Florida**, USA and provided operations & **maintenance services to water & waste water plants in South & Central Florida**

1975 — UEM was the largest O&M Company in state of Florida with **over 75 client accounts**

1977-79 — UEM's **first turnkey contract and first export awarded in 1977 to treat sewage from Jamaican sugar** plantation colony.

UEM created a strong base in Trinidad and Tobago, building over **20 STPs between 1977 – 79.**

1983 — UEM started India operations, with incorporation of UEM India. Indian operations were **jumpstarted with several turnkey deals for treatment of wastewater from ethanol distilleries.**

UEM brought to Asia a unique floating cover design for anaerobic digesters, which greatly reduced the capital cost of the system.

1995 — UEM entered the municipal sewage treatment segment by winning an order for a **large sewage treatment plant for the City of Delhi**. It was the **first STP in India to include anaerobic sludge digestion and power generation. (Cap – 182 MLD)**

1998 — UEM opened its third office, located in Trinidad and Tobago, which was prompted after UEM won orders for some large municipal water treatment plant contracts in the region.

UEM won an order for a seawater filtration plant of **240 MLD capacity for Reliance Industries Limited** at their Jamnagar Refinery, which is one of the **large seawater filtration plants in the World**

2010 — True North, a PE firm, acquired majority stake in UEM. UEM completed the **largest sewage MBR in India** for the Commonwealth Games Village.

2013 — UEM actively participated in **ZLD** & other projects and licenses **HERO™ Technology.**

2014 — Toshiba acquired **26 % stake** in UEM.

2015 — **Toshiba acquired Majority stake (80%)** in UEM.

2018 — **100 % stake** in UEM Is acquired by Toshiba

2019 — **UEM's name changed to Toshiba Water Solutions Pvt. Ltd.**

Financial Performance

- Strong growth with revenues in FY 2018 – 19 crossing INR 3500 Mn mark.
- Finances backed by Toshiba Corporation, Japan (one of the largest conglomerates in the world having diverse business interests with a turnover in excess of USD 45 Bn).
- Net Worth : INR 1103.41 Mn

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MARKET OUTLOOK

Water Availability

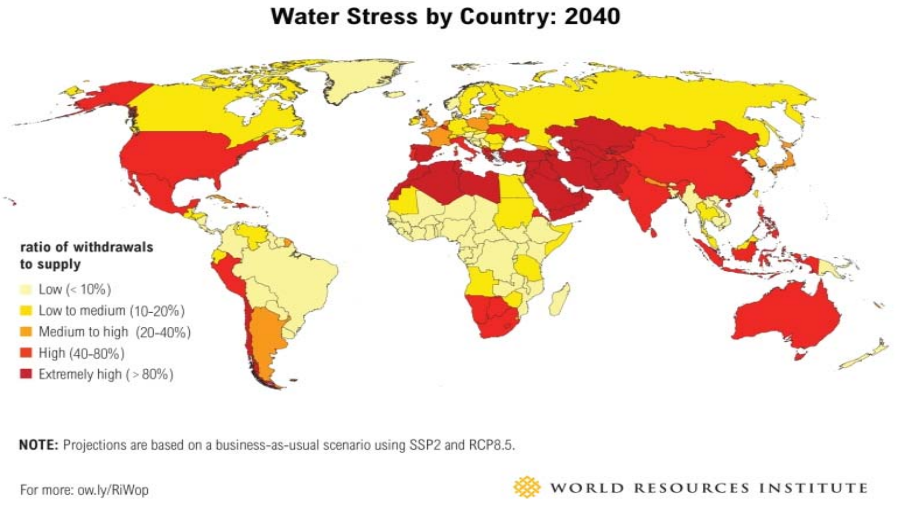
Water shortage

- Water availability per capita in India is 1,550 cum as against stress benchmark of 1,700 cum per annum.

Pressure on fresh water resources in India

- Regulations forcing proper industrial wastewater treatment and recycling & reuse.

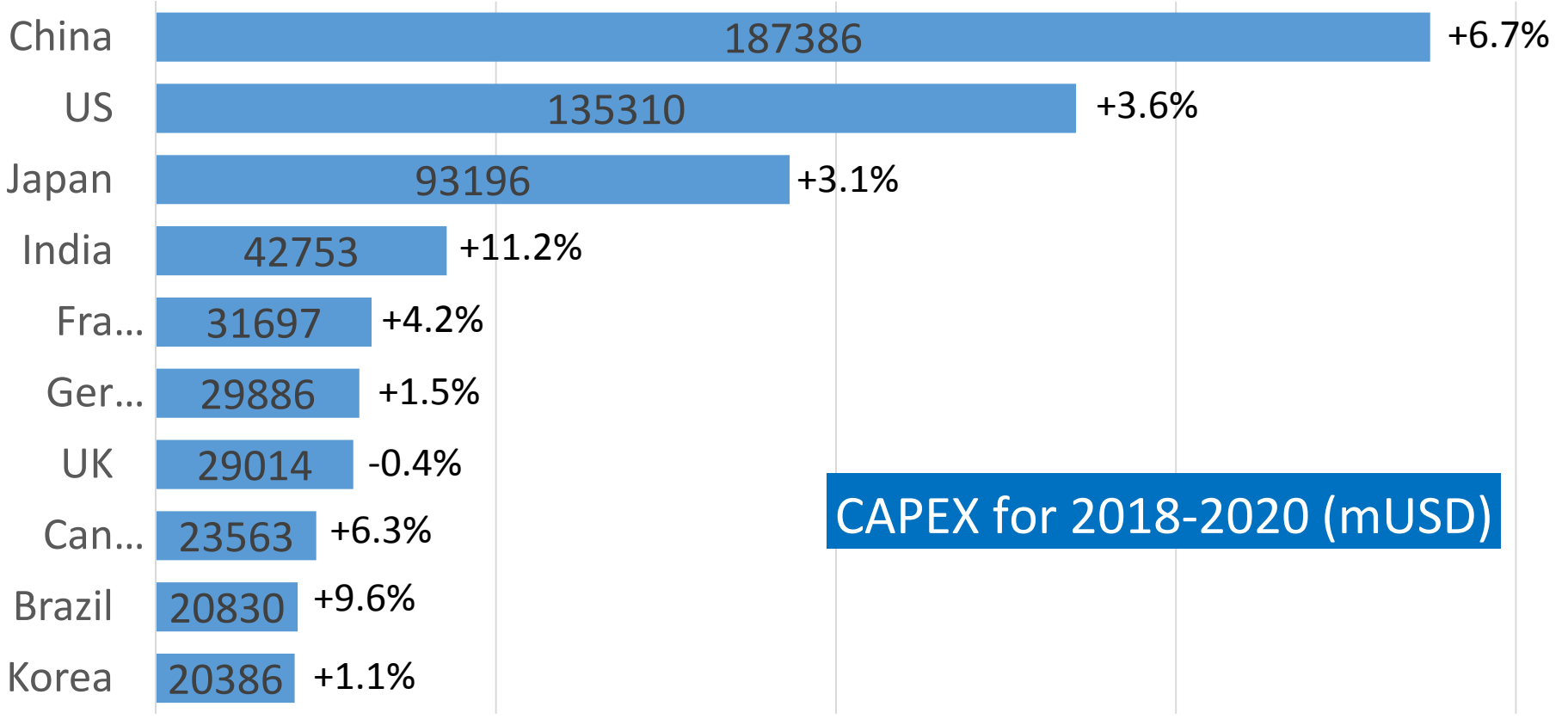
Increasing water scarcity with many countries in stress zone.
Over 40% of world's population is known to live in water stressed areas.



By 2040, water scarcity will have spread further; India and many other countries will continue to be the largest countries facing water stress

Source: 'AQUASTAT: WORLD RESOURCES INSTITUTE

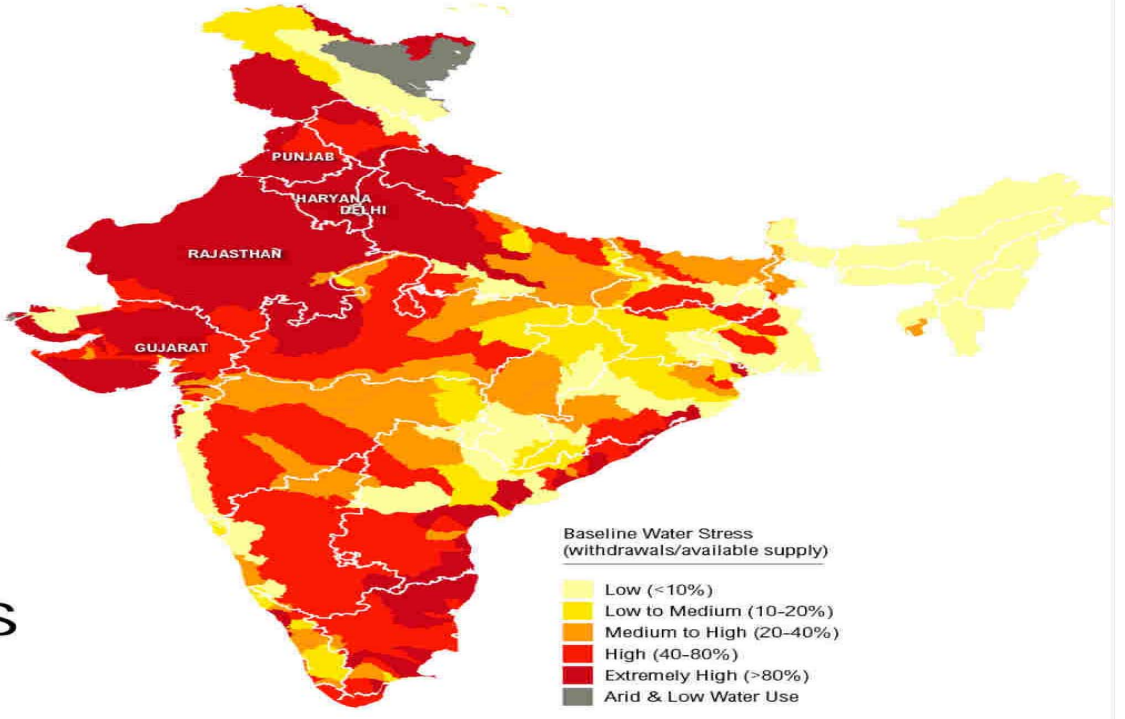
Market Landscape



Source : Global Water Market etc.

Water Stress by 2020

54%
of India
Faces
High to
Extremely
High
Water Stress



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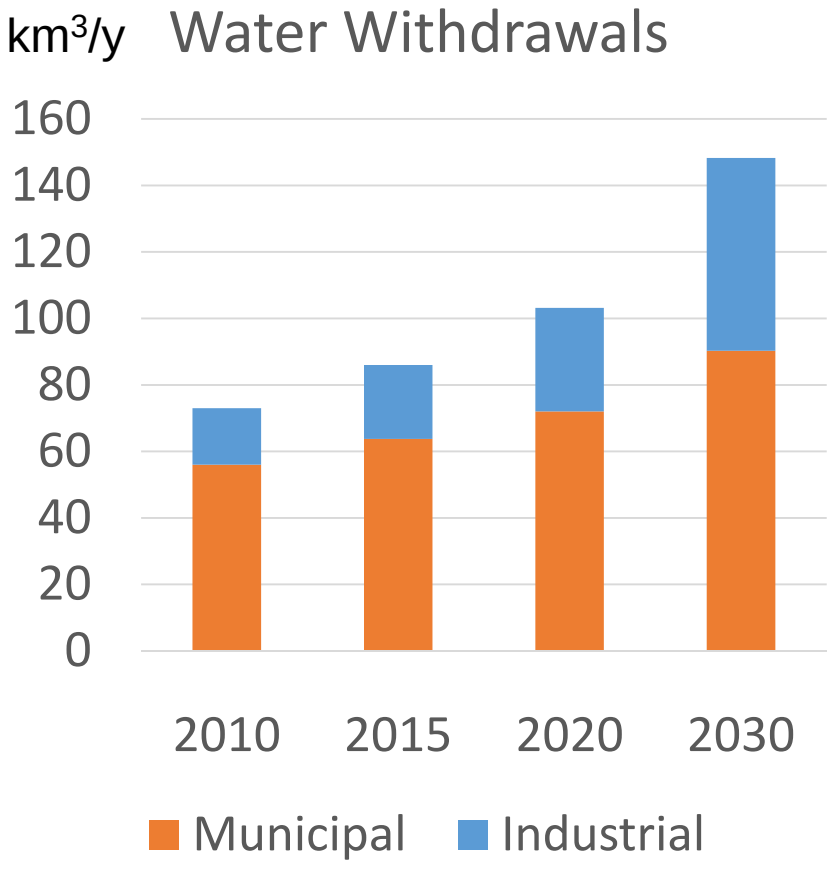
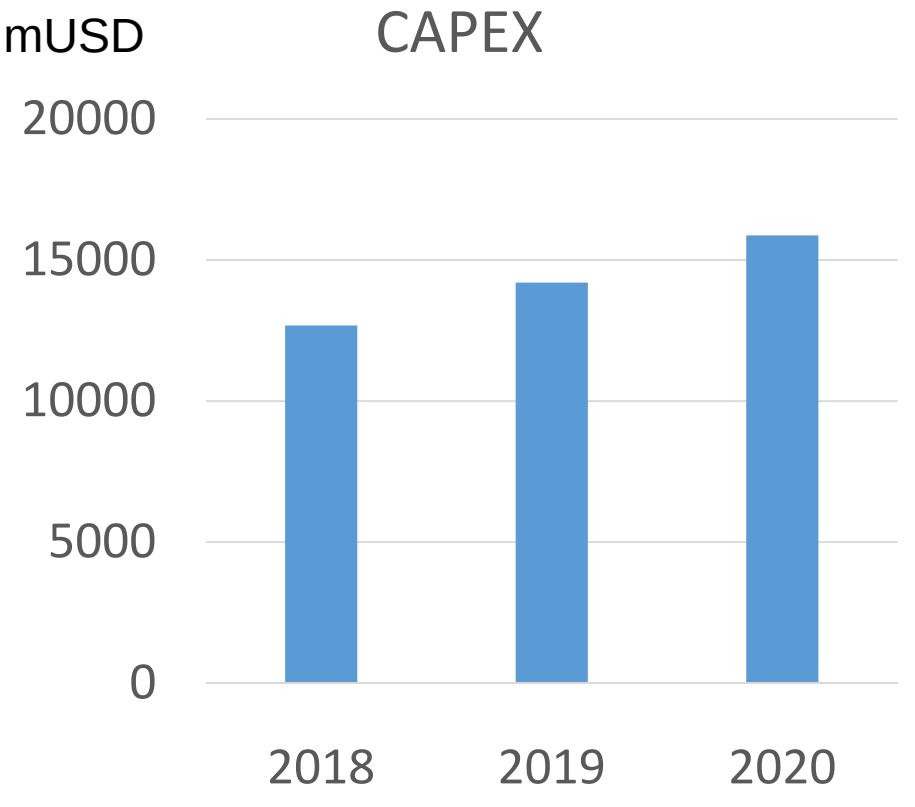
Market Landscape in India





Source : Global Water Market etc.

Key Solution – Recycle and Reuse

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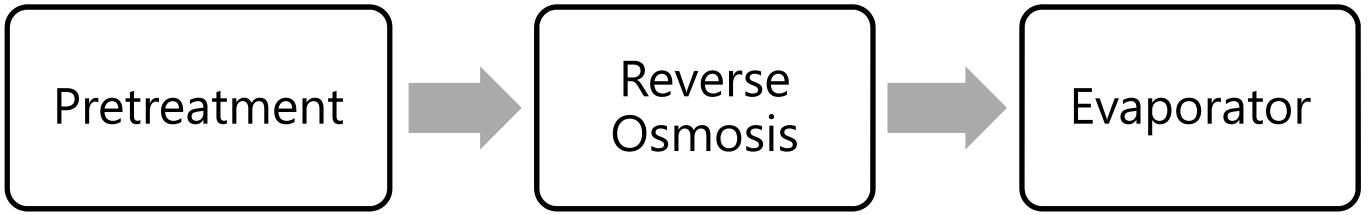
ZERO LIQUID DISCHARGE & HERO™

What is a Zero Liquid Discharge System

Zero-liquid discharge (**ZLD**) is a treatment process in which all wastewater is purified and recycled; therefore, leaving **zero discharge** at the end of the treatment cycle.

ZLD systems are capable of minimizing contamination of water sources and amplifying water supply. In ZLD systems, membrane-based technologies are an attractive choice for industrial wastewater reclamation.

Key Components of ZLD



Pretreatment:	**Reverse Osmosis :**	**Evaporator:**
Shall include suitable pretreatment depending on the nature of effluent like Biological Treatment, Oil Removal Unit, Filtration etc. This step is aimed at conditioning the effluent to minimize its scaling and fouling behavior on Reverse Osmosis membranes.	Shall include recovering the maximum treated water for reuse and recycle, minimizing the flow to Evaporator. Maximum **sustainable** recovery achievable across a RO unit is the key governing parameter for the economic feasibility of a ZLD unit.	Shall include thermal evaporation of the RO Rejects thus recovering the complete liquid effluent and producing salts at the end of the Treatment chain thus enabling the system to achieve a ZLD. Evaporation is the most energy and capital intensive unit in the treatment chain for ZLD.

Performance of RO – Limiting Factors

In a Conventional RO, Recovery is limited by any of the following factors depending on the nature of Effluent:

Hardness scaling - precipitation of saturated salts of Calcium, magnesium & Heavy metals of sulfates, phosphates, carbonates etc. onto the surface of the membrane.

Silica scaling - precipitation of Reactive silica on exceeding its solubility limit on the surface of the RO membrane.

Organic fouling - is a result of deposition of organics, on the surface of the membrane, typically on the feed /concentrate side.

Biofouling – Growth of microbes on the surface of the RO Membrane causing permanent irreversible damage to the surface of the RO membrane.

Conventional RO

Recovery can not be increased simply by adding stages

RO recovery is limited by scaling and fouling *well before* osmotic pressure limits recovery.

RO recovery in conventional RO can not sustainably operate at 80%+ if the feed water >20 ppm COD

HERO™ (High Efficiency RO) – The only sustainable solution to Zero Liquid Discharge

- **HERO™** is a technology specifically designed to purify difficult-to-treat feed waters
- Its has several potential advantages over conventional RO: greater water recovery, higher quality permeate, higher operating flux (gallons per square foot of membrane per day)
- Conventional UF/RO (or MBR/RO) process is limited by :
  - —Hardness
  - —Silica
  - —Organics
  - —Bio Fouling
- **HERO** systems overcomes these and operates at a very high recovery whereas conventional RO operates at moderate recovery and the cost of evaporation is very high.
- **HERO** systems are **most advantageous** for applications with **challenging feed water** or in areas with **high water costs**, **limited available water**, high water quality requirements, or **Zero liquid discharge requirements**
- **HERO** requires less cleaning and maintenance than conventional RO does.

HERO™ (High Efficiency RO) – How it Works?

The key to HERO is the chemical pretreatment that the feed water undergoes before RO. The pretreatment removes hardness from the feed water and raises its pH, which enables high efficiency RO

HERO™ Feed (R), Permeate (M), and Reject (L)

Comparison of HERO™ vs. Conventional RO

Conventional RO	High Efficiency RO
RO cleaning frequency is high and can be as often as weekly if the fouling tendency of the feed water is high.	RO cleaning is less frequent, due to the reduction of fouling potential. Cleaning frequency can be as low as once in few months.
RO membrane life is limited due to numerous cleaning cycles.	RO membrane life is extended due to the lower frequency of cleaning cycles.
Energy costs of evaporation are high due to the limits on achievable RO recovery.	Energy costs are substantially reduced due to the higher recovery achievable by the HERO system.

HERO™ - is more than *Just Savings* in Operating Cost

Evaporator Downtime

- In a ZLD discharge project, sustainable operation of the MEE – Multiple Effect Evaporators which are at the tail end of the Process scheme, is very crucial in achieving Zero Discharge.
- In case of frequent shutdown of evaporator for any failure, shall lead to not achieving ZLD.
- Hardness Scaling in evaporator is one of the common problem experienced by Operators.
  - It leads to low heat transfer Coefficients increasing Steam Consumption.
  - Higher Downtime for Cleaning and Maintenance.
- HERO™ systems as a part its pretreatment process eliminates hardness in the RO Feed and hence leading to very low levels or almost Nil hardness in Rejects which are fed to Evaporator.

HERO™ not only allows for a Higher Recovery but also enables the ETP-RO plant or High Recovery plants for a Sustainable Operation with minimal Maintenance and Shutdowns.

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REFERENCES IN RECYCLE, REUSE AND ZLD

ZLD ETP at Bawal, Haryana

Capacity: 1847cum/day ETP MEE-100 m3/day
Design Build Year: January 2019

ETP ZLD at Bawal, Haryana

ETP MEE-100 m3/day
Design Build Year: January 2019

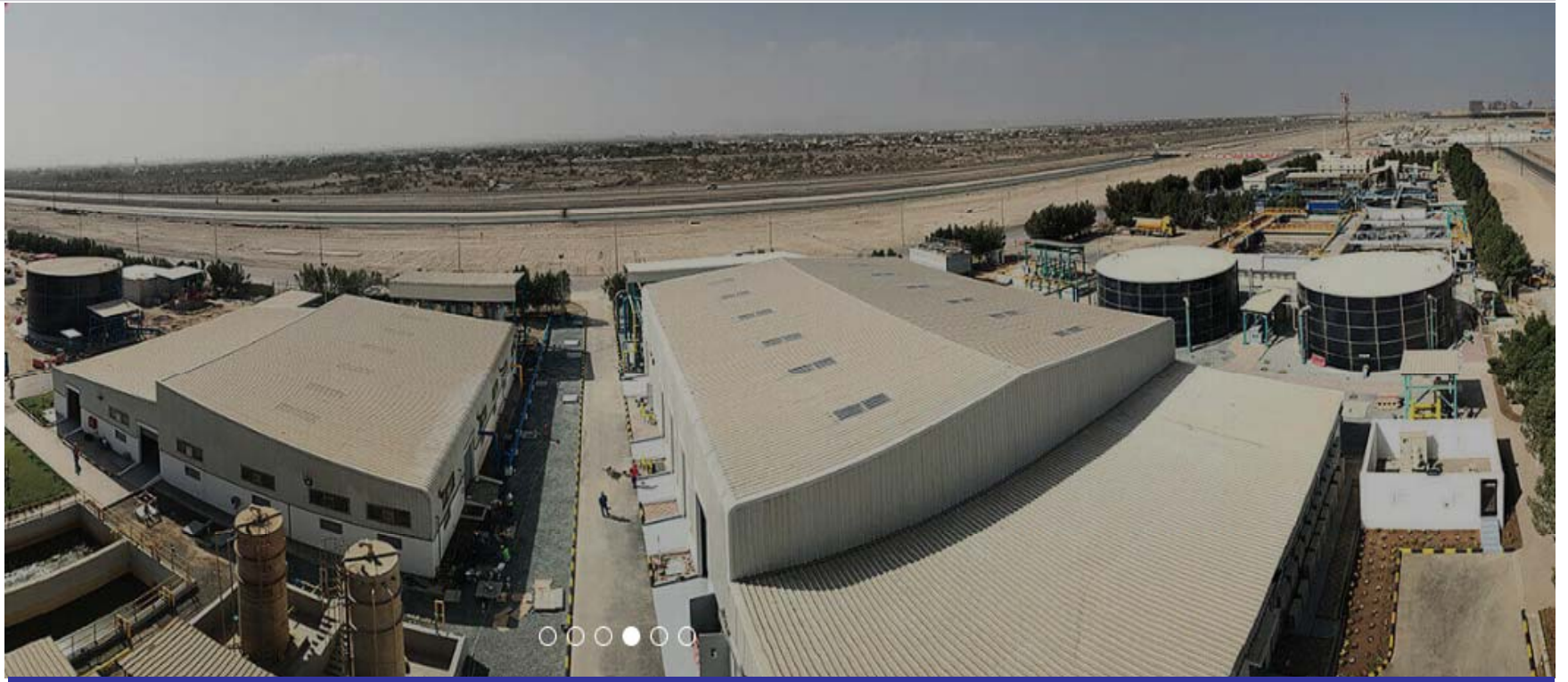
ETP ZLD at Sricity, Andhra Pradesh

Capacity: 250 KLD ETP ZLD
Design Build Year: May 2016

ETP ZLD Plant at Gujarat

Capacity: 400 KLD ETP & ZLD
Design Build Year: May 2017

Recycling Plant at Oman



Capacity: 10,000 cum / day (Phase – I) & 10, 000 cum / day (Phase - I Expansion)
(Recycle & Reuse Plant)
Design Build Year: 2016 & 2018
O&M Period: 5 Years (Phase I) & 10 Years (Phase I Expansion)

MBR Based STP at Delhi

Capacity: 1 MGD STP based on Membrane Bio Reactor, 4545 m3/day
Design Build Year: June 2010

Conclusion

- Water resources are becoming scarce, meaning that reuse options need to be looked into. In this perspective, zero liquid discharge is an emerging technique to minimize waste, treat toxic industrial waste streams and mitigate potential water quality impacts in receiving water streams.

- In a Water Scarce Country like ours, it should be our goal to use Water in a judicious manner and wherever possible, should opt for a system or technology that is able to treat and recycle wastewater sustainably in an economical manner.

- For recycling/zero liquid discharge, the High Efficiency Reverse Osmosis technology really work very effectively and can be an excellent solution to meet the statutory norms as stipulated by regulatory authorities**.**

THANK YOU

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