Virtual Training on Fundamentals of ZLD Technologies for Industrial Wastewater Treatment and Reuse

About the Trainer

Mr Sajid Hussain has over 28 years in Industrial wastewater engineering. He played a key role in the revival of the Tirupur dyeing cluster, through the development and implementation of the unique 'brine reuse technology' for achieving Zero Liquid Discharge (ZLD) norms for the Textile Dyeing effluents, also winning of several international awards from GWI-UK, WateReuse Association, USA etc. He has also developed ZLD technology for Pulp & paper and Leather Tanneries. He has also been consultant to many national and international agencies like UNIDO, ECO-FEI Egypt, IFC World Bank etc. and his work focuses on recovery of resources from wastewater. He has done his M'Tech in Environmental Engineering (Gold medallist) and Environmental Toxicology. His other scholarships and training include, the Dept. of Energy and Environment, Washington University in St. Louis, USA (2012); at the PUM, Netherlands (2006) on Application of Membrane Technology in wastewater Treatment; AOTS, Japan on Environmental Pollution Control Technology, (1996-97). He is presently, the Chief Operating Officer in Tamilnadu Water Investment Co. Ltd (TWIC) responsible for operations and the Water Reuse Business.

Abstract of Training Program

1. **ZLD- A climate Independent Approach for polluting industries**- This chapter covers how ZLD helps industries in maintaining circular economy and closing water cycle

    1.1. **What is ZLD?**- It covers basic definition and Evolution / origin of ZLD with special reference to Indian and International context

    1.2. **Types of ZLD**- It covers different categories of ZLD (Conventional and Hybrid ZLD) and basic configurations

    1.3. **Drivers for ZLD**- It covers Socio Economic and Cost factors which often decides the necessity of ZLD for highly polluting industries

    1.4. **Technological Challenges** – This chapter covers the design and operational challenges that often encountered in a typical ZLD system

    1.5. **Treatment components in a typical ZLD system**- This chapter gives an overall view of various stages of wastewater treatment and resource recovery from the waste streams.

    1.6. **Design Aspects** – It gives some basic idea on how to develop a robust and tailored ZLD system for highly water intensive and polluting industries. Following subsections would be covered under this section.

        1.6.1. **Understanding of wastewater chemistry**- It covers basically ionic balance and scaling potential of various salts which often affecting the reliable performance of RO and MEE system

        1.6.2. **Water and Material balance**- This section covers role/importance of water balance to assess the recovery and losses in a ZLD system.

1.6.3. **Design considerations**- Under this section design aspects would be covered in detail to develop a highly efficient and cost effective system

1.6.4. **Technology selection**- As most of industries are facing challenges in selecting a right technology to suit their requirement, this chapter covers an overview of various technologies and its shortcomings.

1.7. **Brine Management-Options for brine volume reduction**- Generally, brine management is a highly energy intensive process in any ZLD system and at the end of treatment cycle various useful products such as reusable salts would be recovered for reuse. Therefore, this chapter would give more insights on latest technologies to overcome the issues as prevailing in conventional thermal evaporators.

1.8. **Benefits, Cost Economics and Carbon Foot Print**- This chapter covers tangible and intangible benefits of ZLD system, Comparison of Cost economics and carbon emission from the conventional treatment plant and ZLD

2. **ZLD Hierarchies and some Case Studies** – It covers peer reviewed experience of TWIC in handling of the following categories of wastewater and resource recovery and reuse

2.1. Textile dyeing Industry

2.2. Tannery Industry

2.3. Agrochemical Industry

2.4. Pulp and Paper Industry