



Environment and Sustainability Training Programs Series

**Master
Class - Design and operation of
Wastewater Treatment and
Zero Liquid Discharge Facilities**

**9 modules
12 hours
3 assignments**

**Designed to meet the
capacity building needs
of project & utility
managers and ETP/ZLD
operating staff**

**More than
500
professionals
trained sofar**



Cholamandalam MS Risk Services Ltd,

Parry House, 4th Floor, No.2, NSC Bose Road,
Chennai, Tamil Nadu, +91(44) 30445620-30,
Mob: 9677003778, inquiry@cholams.murugappa.com



<https://www.inogenet.com/>
**Global Thinking
Local Delivery**

Module 1: Introduction

Water and wastewater discharge norms, directions and guidelines issued by various regulatory agencies on zero liquid discharge (ZLD) requirements, definition of ZLD, typical wastewater and ZLD design and operational challenges, reliability of wastewater and ZLD facilities, basic approaches for developing technical feasibility reports of ZLD facilities

Module 2: Fundamentals of wastewater chemistry

Basic structure of water and its significance in treated wastewater treatment, types of pollutants, polar and non-polar compounds, colloidal compounds, zeta potential, significance of pH in water treatment, solubility product and common ion effect, water quality and economic impacts, scaling and corrosion potential of water, water quality objectives for water reuse, water balance, salt built up and cycles of concentration in the industrial facility and basics of water pinch analysis and recycling.

Module 3: Fundamentals of Wastewater treatment unit operations

Charge neutralization, coagulation and flocculation, Settling, chemical oxidation, biochemical oxidation, gas diffusion and gas transfer, dissolved air flotation, adsorption, separation, evaporation, drying and thermal incineration.

Module 4: Primary treatment facilities

Principles of wastewater segregation and impact on ZLD systems performance, pH correction, technologies for suspended/floating solids, technologies for removal of oil & grease, methods for removal of colloidal and particulate organic matter, removal of hardness, selection of technologies, troubleshooting of primary treatment systems, case studies and quiz.

Module 5: Design and troubleshooting of biological treatment units

Basic principles of biological treatment, eight principles of activated sludge process, basic design approaches, fundamentals of wastewater ecology, bulking in activated sludge process, air/oxygen transfer technologies and selection methods, methods for monitoring and trouble shooting of biological treatment facilities, energy management in biological treatment facilities, advanced digital technologies for efficient monitoring, case studies and quiz.

Module 6: Advanced biological treatment technologies and innovative pre-treatment technologies for ZLD

Fundamentals of Membrane Bioreactor technologies, design principles, operation and monitoring requirements, capital and operating costs, energy management, electrocoagulation technologies, advanced chemical pre-treatment technologies and dissolved air flotation etc.,

Module 7: Fundamentals of Membrane Treatment Technologies

Basics of membrane separation processes, membrane material science and technologies, ten principles of membrane systems design, impact of feed water quality on membrane system operations, membrane technologies, selection of membrane system, group exercise – design example and membrane systems automation

Module 8: UF/RO Trouble shooting and operational excellence

Fundamentals of membrane fouling and scaling, low fouling membranes, chemical conditioning of feed water, pre-treatment of feed water, Methods and strategies for CIP, predictive CIP, predictive monitoring and maintenance, methods for improving reliability and operating costs.

Module 9: Design and operation of evaporation systems

Principles evaporation process, slat balance and modelling crystallization, selection of evaporation technologies, design of multiple effective evaporators, modelling and predicting scaling and fouling potential, nine principles of effective MEE operations, recent advances in evaporation technologies and rejects management.



A member of

Cholamandalam MS Risk Services Ltd,

Parry House, 4th Floor, No.2, NSC Bose Road, Chennai, Tamil Nadu
+91(44) 3044 5620-30, [Mob: 9677003778 , inquiry@cholams.murugappa.com](mailto:inquiry@cholams.murugappa.com)