

€ TRAINING

Water Desalination and Purification
Technology





Water Desalination and Purification Technology

Introduction:

Water Desalination and Purification Technology Training cover many aspects of water supply challenges facing the World, and areas of water desalination and purification technologies that may lead to technological solutions to these challenges.

Having access to drinking water is a global problem. In the US, California, Nevada, New Mexico and other desert states are facing severe drought, which makes drinking water-scarce and precious. The situation is no better in other countries located in desert areas of the globe such as some parts of the Middle East or Africa. Overall, more than 1 billion people in the world do not have access to clean potable water.

Water desalination technology converts the un-drinkable brackish water or seawater into drinkable water. However, it has to be done with minimum cost and energy use in order to be feasible and sustainable.

The water desalination and purification training course are designed to give you sufficient knowledge about desalination and filtration processes. It also teaches you the fundamental thermodynamics and transfer phenomena, which govern the production of water out of brackish or seawater.

The water desalination and purification training course discuss the characteristics of the seawater and brackish water. The course introduces you to thermal technologies, nano-filtration, osmosis, reverse osmosis, electrodialysis, distillation, and desalination processes.

The water desalination and purification training course also discusses the associated costs of desalination and gives you a good perspective about the techniques and strategies that could be applied to reduce the costs.

Course Objectives:

At the end of this course the participants will be able to:

- Anticipate and avoid potential problems that can occur during the desalination process, such as corrosion, fouling, etc
- Evaluate alternative energy sources such as solar, wind, geothermal, and nuclear in order to make the plants sustainable
- Recognize the environmental impacts of desalination
- Evaluate the costs and economics of desalination systems
- Recognize the difference between the chemistry and characteristics of the seawater and freshwater
- Understand different thermal technologies such as multistage flash, distillation, and vapor compression
- Understand different membrane technologies such as osmosis, reverse-osmosis, electrodialysis, and nano-filtration
- Design the desalination process
- Basic Contents.

Targeted Audience:

- Plant personnel
- Supervisors

- Laboratory personnel
- Plant operators and technicians

Course Outlines:

Unit 1: Characteristics of Seawater and Freshwater:

- Salinity concentration
- Molality and molarity

Unit 2: Fundamental of Thermodynamics of Desalination:

- Introduction to basic principals of thermodynamics
- Free energy
- Chemical potential
- Principals of phase transfer

Unit 3: Separation Process:

- Fundamentals of the separation process
- Gibbs energy
- Chemical activity
- Membranes

Unit 4: Membranes:

- Ion-exchange
- Osmosis
- Reverse-osmosis
- Nano-filtration
- Electrodialysis

Unit 5: Desalination Process:

- Thermal desalination
- Multistage flash
- Multiple effects
- Distillation
- Vapor compression

Unit 6: Introduction to Thermal Desalination:

- What is GOR?
- Basics of heat transfer
- Enthalpy diagrams
- Thermal process equations of MSF, MED, and VC

Unit 7: Electrodialysis: Concept, Designs, and Economics:

- Fundamentals of electrodialysis
- Water-salts mass transfer equations

- Transfer mechanism and kinetics
- Design parameters and equations
- Pre- and post-treatment
- Potential problems
- Costs and economics

Unit 8: Sustainability of Desalination Plants:

- Alternative energy sources: solar, wind, hydro
- Link to power plants
- Hybrid plants

Unit 9: Environmental Impacts and Economics of Desalination Plants:

- Costs analysis and economics
- Environmental impacts