



Training Course - Cost Estimating of Seawater Reverse Osmosis (SWRO) Desalination Plants

Presenter: Nikolay Voutchkov

Program Day 1:

Desalination Plant Operation and Performance Monitoring

09:00 – 10:30: 1.1 Project Cost Estimating – Overview

Project Cost Definitions

General Methodology for Preparation of Project Cost Estimates

Type and Accuracy of Project Cost Estimates

Cost Models

10:30 – 10:45 Coffee Break

10:45 – 12:00: 1.2 Project Cost Factors

Introduction

Factors Impacting Project Costs within the Control of Project Owner

- Project Size
- Capacity Availability Factor
- Source Water Quality
- Target Product Water Quality
- Environmental externalities including concentrate Disposal Method
- Power Supply and Unit Power Costs
- Project Risk Profile
- Public Participation and Other Project Cost Factors

Project Cost Factors Outside of the Control of Project Owner

12:00 – 13:00 Lunch Break

13:00 – 14:30: 1.3 Construction Costs for Intakes and Pretreatment Systems

Plant-site Related Construction Costs

Intake Costs

- Costs for Subsurface Intakes
- Costs for Open Intakes
- Intake Piping and Pump Station Costs
- Intake Screen Costs

Pretreatment Facility Construction Costs

Chemical Conditioning Costs

Costs of Gravity and Dissolved Air Flotation Clarifiers

Costs of Gravity Media Filters

Costs of UF and MF Membrane Pretreatment Filters

Cartridge Filtration Costs

Cost Tables and Curves

14:30 – 14:45 Coffee Break



14:45 – 15:45: 1.4 RO System Construction Costs

Key SWRO System Components
High-pressure Pump Costs
Costs of RO Membrane Racks
Energy Recovery System Costs
Cost Tables and Curves

15:45– 16:30: 1.5 RO Construction Costs for Post-treatment, Concentrate Management and Other Plant Facilities

Post-treatment Costs
Concentrate Disposal Costs
Waste and Solids Handling Costs
Costs of Electrical and Instrumentation Systems
Costs of Auxiliary and Service Equipment and Utilities
Building Costs
Startup, Commissioning and Acceptance Testing Costs

16:30 – 17:00 Questions and Discussions

Program Day 2:

Total Capital Costs and Operation and Maintenance Expenditures

09:00 – 10:30: 2.1 Estimating Indirect and Total Capital Costs

Costs for Project Engineering Services

- Preliminary Engineering
- Pilot Testing
- Detailed Design
- Construction Management and Oversight

Project Development Costs

- Project Administration, Contracting and Management
- Legal Services
- Environmental Assessment Costs

Costs for Enabling Community Participation

- Costs for Developing Public Relation Documents
- Costs for Public Meetings and Project Reviews

Project Financing Costs

- Government Financing
- Conventional (Bond or Construction Loan) Financing
- Private Project Financing
- Interest During Construction
- Debt Service Reserve
- Other Financing Costs

Contingency
Total Capital Costs

10:30 – 10:45 Coffee Break

10:45 – 12:00: 2.2 Variable O&M Costs



Power
Chemicals
Replacement of Membranes and Cartridge Filters
Waste Stream Disposal

12:00 – 13:00 Lunch Break

13:00 – 14:30: 2.3 Fixed and Total O&M Costs

Labor
Maintenance
Environmental and Performance Monitoring
Indirect O&M Costs
Total O&M Costs

14:30 – 14:45 Coffee Break

14:45 – 16:30: 2.4 Cost of Water Production

Fixed Cost Components
- Capital Cost Recovery
- Other Fixed Costs
Variable Cost Components
Total Cost of Water Production

16:30 – 17:00 Questions & Discussions

Program Day 3:

Desalination Project Costs – Trends, Examples and Interactive Session

09:00 – 10:30: 3.1 Desalination Cost Trends

Overview
Recent SWRO Desalination Projects and Their Cost Breakdown
High-End Cost Projects
- Key Factors Contributing to High Costs
Low-End Cost Projects
- Key Factors Resulting in Low Costs
Impact of Project Delivery
Costing Methods
Project Description
Breakdown of Project Capital Costs
Annual O&M Costs
Cost of Water Estimate
Design-Bid-Build (DBB) Projects
Design-Build-Operate (DBO) Projects
Build-Own-Operate-Transfer (BOOT) Projects

10:15 – 10:30 Coffee Break

10:30 – 12:00: 3.2 Example of SWRO Project Cost Estimate

12:00 – 13:00 Lunch Break



13:00 – 13:30: 3.3 Cost Estimating Session – Team Assignments

Overview of Interactive Case Study Estimating Session

Definition of Project Case Study

Projects and Deliverables

Division of Project Participants into 5-7 People Work Teams and Assignment of Individual Project Case Study to Each Team

13:00 – 14:00: 3.4 Development of Project Cost Estimates by the Work Teams

Work of Seven Individual Teams on their Project Cost Assignments

14:00 – 14:15 Coffee Break

14:15 – 16:00 -3.5 Presentations of Cost Estimates Developed by the Work Teams: Each of the Five Work Teams Gives 20-minute Presentation of the Cost Estimate of their Project Case Study

16:00 – 17:00 Discussions of Case Study Cost Estimates