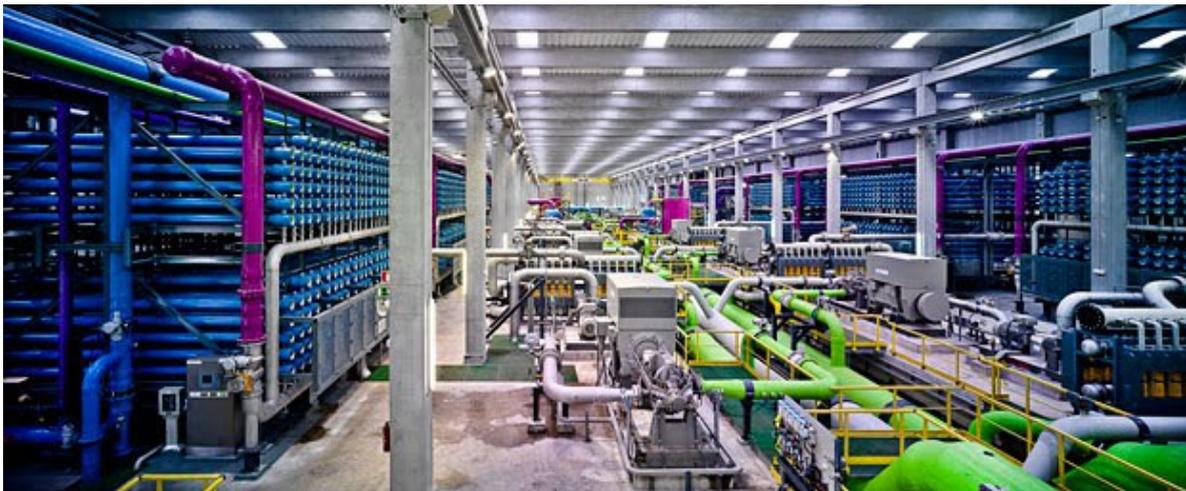


International Training Program

Seawater Desalination

24-27 October 2011, H10 Marina Hotel, Barcelona, Spain

This training program covers both theoretical and practical aspects of desalination technology, which focuses on selection, design and operational monitoring of desalination plants. This program is useful for water treatment plant designers and operators.



Program Outline

Following subjects will be covered in this 4-day training program which includes desalination plant visit in Barcelona, Spain.

1. Desalination Fundamentals

- Overview of Desalination Technologies
- Introduction to Desalination
- Alternative Desalination Technologies

2. Reverse Osmosis Fundamentals

- RO Separation – Basic Principles
- Key Performance and Design Parameters
- RO System Components

3. Planning for Seawater Desalination Plant

- Key Desalination Plant Components
- How to Determine Plant Site Size and Location?
- Source Water Quality Characterization
- Choosing Product Water Quality – Issues & Considerations

4. Seawater Intakes

- Source Water Quality Issues & Considerations
- Subsurface Intakes
- Open Ocean Intakes
- Selection of Intake
- General Design Guidelines

5. Seawater Pretreatment

- Sedimentation and Dissolved Air Flotation
- Granular Media Filtration
- Membrane Filtration
- Selection of Pretreatment System

6. Reverse Osmosis System Configuration

- High Pressure Pumps – Type and Applications
- Reverse Osmosis Trains – Alternative Configurations
- Reverse Osmosis Membrane Cleaning System
- Energy Recovery Systems – Type and Applications
- Alternative Reverse Osmosis System Configurations
- Sizing of Key Components of Seawater RO System

7. Seawater Concentrate Disposal

- Concentrate Disposal Alternatives
- On-shore Discharges
- Open Ocean Discharges with Diffuser Systems
- Subsurface Discharges (Wells and Ex-filtration Galleries)
- Technologies for Reduction of Concentrate Volume and Beneficial Reuse
- Environmental Discharge Considerations
- Guidelines for Selecting and Designing Concentrate Disposal System

8. Desalination Plant Energy Use

- Key Energy Use Components & Factors
- Methods to Minimize Desalination Plant Energy Use
- Example of Plant Energy Use Breakdown

9. Desalination Costs

- Construction Costs
- O&M Costs
- Total Cost of Water Production O&M Costs
- Example of Plant Cost Estimate

10. Desalination Plant Performance Analysis and Optimization

- Key Plant Performance Parameters
- Main Steps of Plant Performance Analysis
- Optimization of Plant Design and Operations

11. Desalination Plant Operational Monitoring and Troubleshooting

- Operations Monitoring Methods and Equipment
- Troubleshooting of Pretreatment Systems
- RO System Operation and Troubleshooting

12. Desalination Plant Case Studies

- Tampa Bay Seawater Desalination Plant, USA – Challenges and Solutions
- Ashkelon Plant, Israel – the Largest and Most Efficient Desalination Operations in the World
- Point Lisas Desalination Plant, Trinidad – Solutions for Source Seawater with High Fouling Potential

13. Small/Package Desalination Plants - Configuration

- Key Components of Small Desalination Plants
- Intakes
- Pretreatment
- RO System
- Concentrate Disposal

14. Small System Equipment Selection & Sizing

- Intakes & Pretreatment Facilities
- Reverse Osmosis Trains
- Energy Recovery Systems
- Sizing of Key Components of Small Seawater RO System

15. Small RO Plant Procurement & Costs

- RO System Suppliers – Selection & Procurement
- Small/Package Plant Costs

16. Operation and Monitoring of Small Plants

- Operations Monitoring Methods and Equipment
- RO System Operation and Troubleshooting

17. Example of Small RO Plant Design & Cost Estimate

- Selection of Plant Components
- Assessment of Construction Installation Costs
- Estimate of O&M and Water Production Costs

18. Plant Visit to Desalination Plant

- Barcelona Seawater Desalination Plant (200,000 m³/day)

Program Language: ENGLISH

Program Agenda: 08.30 am to 05.00 pm (each day)

Barcelona Seawater Desalination Plant



The 200,000 m³/day Barcelona seawater desalination plant at present is the largest desalination plant in Europe. Located south of Barcelona between the harbor area and the Llobregat River, the plant began operation in 2009 and since then is producing approximately 24 % of the water consumed in the greater Barcelona area. The Barcelona desalination plant is equipped with an open intake extending 2.2 kilometers into the Mediterranean Sea. The plant source seawater has salinity of 41,000 mg/L and water temperature varies between 12 and 27°C. From the open intake the source seawater is conveyed to the plant intake pump station via 1800 mm polyethylene pipe, and

after screening it is pumped to dissolved-air-flotation units, followed by gravity and pressure filters in series for pretreatment. The filtered water is processed through cartridge filters and desalinated using 10-first pass and 2-second pass seawater reverse osmosis trains. The reverse osmosis system is equipped with state-of-the-art isobaric energy recovery units, allowing to the produce fresh water at 4.17 kWh/m³. The concentrate from the desalination plant is co-discharged with the effluent from an adjacent wastewater treatment plant.

(Delegates will visit Barcelona Seawater Desalination Plant on 26 October 2011 during 09.30 am to 12.00 pm)

Program Instructor: Nikolay Voutchkov, Water Globe Consulting, USA

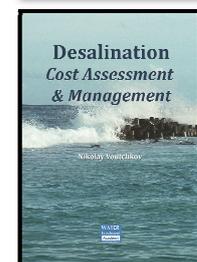
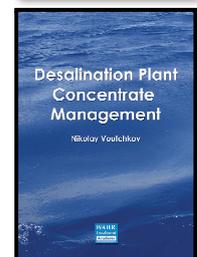
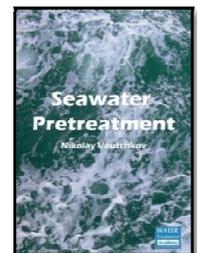
Mr. Voutchkov is a registered professional engineer and a board certified environmental engineer (BCEE) by the American Academy of Environmental Engineers. He has over 25 years of experience in planning, environmental review, permitting and implementation of large seawater desalination, water treatment and water reclamation projects in the US and abroad. *Mr. Voutchkov* has extensive expertise with all phases of seawater desalination project delivery: from conceptual scoping, pilot testing and feasibility analysis; to front-end and detailed project design; environmental review and permitting; contractor procurement; project construction and operations oversight/asset management. *Mr. Voutchkov* is President of Water Globe Consulting – a private company specialized in providing expert advisory services in the field of seawater desalination and reuse. For over 11 years prior to establishing his project advisory firm, *Mr. Voutchkov* was a Chief Technology Officer and Corporate Technical Director for Poseidon Resources, a private company involved in the development of the largest seawater desalination projects in the USA. In recognition of his outstanding efforts and contribution to the field of seawater desalination, *Mr. Voutchkov* has received a number of prestigious awards from the International Desalination Association, the International Water Association and the American Academy of Environmental Engineers. He is one of the principal authors of the American Water Works Association's Manual of Water Supply Practices on Reverse Osmosis and Nanofiltration and of the World Health Organization's Guidance for the Health and Environmental Aspects Applicable to Desalination. *Mr. Voutchkov* has published over 40 technical articles in the field of water and wastewater treatment and reuse, and is co-author of several books and manuals of practice on membrane treatment and desalination. He wrote books on "Seawater Pretreatment", "Desalination Plant Concentrate Management" and "Desalination Cost Assessment and Management", which are published by Water Treatment Academy.



Desalination Books for Delegates

Following three books written by *Nikolay Voutchkov* will be given to all the participants who join this program. These three books are published by Water Treatment Academy (TechnoBiz Communications Co., Ltd.)

- 1. Seawater Pretreatment:** Source water pretreatment is an essential component of every seawater desalination plant. This book presents an overview of pretreatment challenges facing most reverse osmosis seawater desalination plants today and provides practical solutions derived from worldwide experience. The reader will find guidelines for selection of pretreatment system configuration based on source seawater quality and for design of the most commonly used pretreatment technologies, such as screening, sand removal, sedimentation, dissolved air flotation, granular media filtration and membrane filtration. The author shares insights on the present and future use of ultra and microfiltration membrane technologies and their advantages and limitations for seawater pretreatment.
- 2. Desalination Plant Concentrate Management:** This book provides an overview of the alternatives for management of concentrate generated by brackish water and seawater desalination plants, as well as site specific factors involved in the selection of the most viable alternative for a given project, and the environmental review requirements and studies associated with their implementation. The book focuses on widely used alternatives for disposal of concentrate, including discharge to surface water bodies; discharge to the wastewater collection system; deep well injection; land application; evaporation; and zero liquid discharge. Direct discharge through new outfall; discharge through existing wastewater treatment plant outfall; and co-disposal with the cooling water of existing coastal power plant are thoroughly evaluated and design guidance for the use of these concentrate disposal alternatives is presented with engineers and practitioners in the field of desalination in mind. Key advantages, disadvantages, environmental impact issues and possible solutions are presented for each discharge alternative.
- 3. Desalination Cost Assessment & Management:** One of the key challenges associated with the wider implementation of seawater desalination worldwide is its relatively high cost. This book provides engineering guidelines for assessment of seawater desalination project construction, operation and maintenance (O&M) costs, and presents practical approaches for cost management using state-of-the art design methods, technologies and equipment. The book describes step-by-step desalination cost estimating procedures and practices. It clearly explains key factors impacting desalination costs and available tools to manage such impacts. It also provides an overview of the main cost-saving features incorporated in some of the best-in-class seawater desalination plants worldwide and shares lessons-learned from the implementation of recent low- and high-cost desalination projects. This book contains example construction, O&M and water production cost estimates for a typical desalination project.



Venue: H10 Marina Hotel, Barcelona, Spain

H10 Marina Barcelona is a striking hotel located near the Olympic Village and the beaches of Barcelona. This hotel is offering special accommodation rates for the participants of this training program. More information, please visit hotel website at <http://www.hotelh10marinabarcelona.com>. The single room rate is 110 €/night (includes breakfast and taxes). If you decide to stay at this hotel, kindly send an email to us with accommodation requirement (checkin and checkout dates). We will make reservation for your room and you can pay directly to the hotel.

Program Organizer - Water Treatment Academy @ TechnoBiz

Water Treatment Academy is a division of TechnoBiz Communications Co., Ltd. This academy is a educational and knowledge-based platform for water and wastewater treatment operators and designers. The academy organizes technical training programs and conferences. It publishes bi-monthly "Water Treatment Journal" and markets the technical reference books on water and wastewater treatment, published by AWWA, Tall Oaks, Wiley, McGraw Hill etc. More information on academy services and activities can be found at www.watertreatment-academy.org.

Registration Form - Seawater Desalination

24-27 October 2011, H10 Marina Hotel, Barcelona, Spain

Company Name
Address
Tel..... Fax..... Email.....
Contact Person Tel..... Email

Participant Names:

Participant 1 Position Email.....
Participant 2 Position Email.....
Participant 3 Position Email.....

Registration Fee/Participant (in Euros)

Before 31 May 2011	Before 15 July 2011	Before 15 August 2011	After 15 August 2011
1,750 €	1,900 €	2,100 €	2,400 €

Remark: Payment is required with registration. The registration fee includes conference documentation, lunch and refreshments. **Group Registration:** If 3 or more delegates register from the same organization, 10% discount will be offered on the registration fee.

Payment Method

- Bank Transfer to Bank Name : Bangkok Bank, A/C No: 177-0-70727-9
A/C Name : **TechnoBiz Communications Co., Ltd.**
Branch : Ratchada-Latprao Road branch, Bangkok (Swift Code: BKKBTHBK)
(Kindly make payment for all bank charges)
- Credit Card Visa Master (5% bank fee applies for credit card processing)
- Card Number Cardholder Name
- Card Expiry Date Last 3 digits on Signature Panel.....
- Signature of Cardholder Date.....

Please send completely filled registration form to



Water Treatment Academy, TechnoBiz Communications Co., Ltd.
2521/27, Lardprao Road, Khlongchaokhunsingha, Wangthonglang, Bangkok 10310 Thailand
Tel: +66-2-933 0077 Fax: +66-2-955 9971 Mobile: +66-81-988 6874
Email: training@watertreatment-academy.org Web: www.watertreatment-academy.org
Contact Person: Khun Nongkran, Program Coordinator W