



World-Class Training in Solving, Planning, Design and Operation Challenges

From Oct 5th to 9th, 2014 in Malta

October 5-7th, 2014

TROUBLESHOOTING OF MEMBRANE DESALINATION AND WATER REUSE SYSTEMS

With **Hands-On Training**

October 7-9th, 2014

SEAWATER PRETREATMENT – KEY CHALLENGES AND SOLUTIONS

With **Hands-On Training**

The two back-to-back training courses cover wide spectrum of planning and design traps, and operational challenges in reverse osmosis desalination systems and offer practical troubleshooting solutions.

Principal Lecturer:

Nikolay VOUTCHKOV, President, Water Globe Consulting

www.water-g.com

Principal Lecturer:

Nikolay VOUTCHKOV, President, Water Globe Consulting, LLC

Desalination and Water Reuse Course

The first course is focused mainly on **troubleshooting of the operation** of reverse osmosis (RO) membrane systems widely used in desalination and water reuse. The participants of this course will **gain practical knowledge** of how to solve operational problems by proper **planning and design of RO systems** and how to **optimize plant operations** in order to minimize membrane fouling and energy and chemical use for membrane separation.

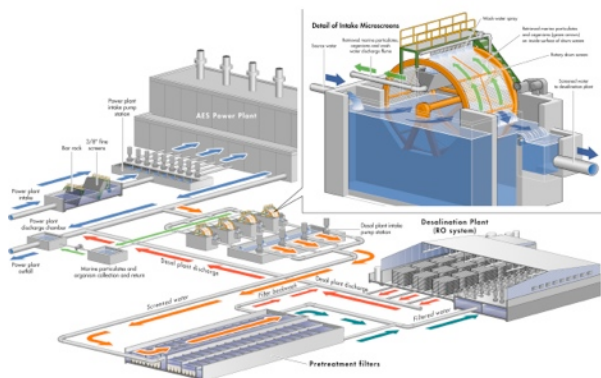
Seawater Pretreatment Course

The second course is focused exclusively on how to **avoid design traps and troubleshoot** dissolved air flotation, granular media and **membrane pretreatment systems** in seawater reverse osmosis desalination plants. The programs of the pretreatment and the RO system troubleshooting courses are designed such that they do not overlap and participants in either course would benefit from attending both courses.

Hands-On Experience

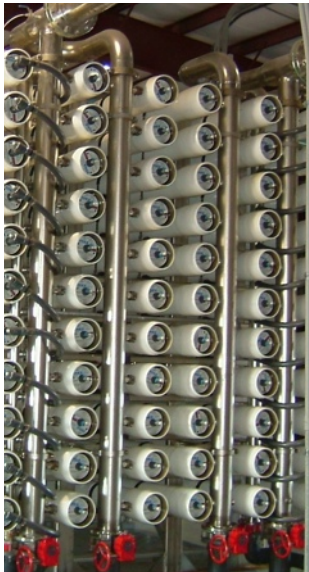
Both courses have an attractive and **unique feature – one day of hands-on training at Malta seawater desalination plant** aimed to give opportunity of course participants to witness and/or gain direct experience with completing a set of the following common operational tasks:

1. *SDI test of source water and pretreated (i.e., cartridge filtered) water;*
2. *Cartridge filter replacement – what do we look for to assess pretreatment by observing cartridge filters;*
3. *Conductivity Profiling of RO Vessels - the course participants will have first-hand experience with vessel probing and analyzing of the collected data;*
4. *Membrane Replacement – Remove one or more RO elements and replace them with new;*
5. *Membrane Rotation – rotate last and first RO elements;*
6. *Membrane Weighing – weight RO elements of one vessel and learn how to develop rotation and cleaning program based on the weights;*
7. *Starting Up or Shutting Down of RO Train;*
8. *Flushing of RO Train;*
9. *Other Practical Tests and Know-how for RO and Pretreatment System Troubleshooting.*



Troubleshooting of Membrane Desalination And Water Reuse Systems

With Hands-On Training



Day 1 State-of-the Art of Desalination and Water Reuse

08.30 – 09:45 - Overview of Desalination and Water Reuse Technologies

- Desalination and Water Reuse – Status and Trends
- Desalination and Water Reuse – Benefits and Challenges
- Alternative Desalination and Water Reuse Technologies
- Videos on Melbourne Desalination Plant and Orange County Advanced Water Recycling Facility

09.45 – 10:30 - Reverse Osmosis System Overview

- RO Separation – Basic Principles
- Key Performance and Design Parameters
- RO System Components
- Video on Reverse Osmosis Fundamentals

10.30 – 10:45 Coffee Break

10.45 – 12:30 - Solutions for Planning and Design Challenges of RO Systems

- Integrated Water Resource Planning: Role and Challenges of Implementation of Alternative Resources
- Source Water Quality Related RO System Problems
- Common Planning Traps and Solutions
- Common Design Traps and Solutions
- Video on Planning of Barcelona SWRO Plant

12.30 – 13.30 Lunch Break

13.30 – 14.45 - Source Water Intakes

- Challenges for Selection and Design of Inlet Structure
- Intake Pump Stations and Screening: Routine Operation, Performance Monitoring, Maintenance and Troubleshooting
- Subsurface Intakes: Advantages and Drawbacks, Routine Operation, Performance Monitoring, Maintenance and Troubleshooting
- Open Ocean Intakes: Advantages and Drawbacks, Routine Operation, Performance Monitoring, Maintenance and Troubleshooting
- Power Plant Collocation: Capex Saving and Environmental Benefits

14.45 – 15.00 Coffee Break

15.00 – 16.30 - Post-Treatment and Concentrate Management

- Lime and Carbon Dioxide Post-treatment Systems: Purpose and Function, Routine Operation, Performance Monitoring, Maintenance and Troubleshooting
- Calcite Conditioning Systems: Advantages and Drawbacks, Routine Operation, Performance Monitoring, Maintenance and Troubleshooting
- Technologies for Reduction of Brine Volume and Beneficial Reuse
- Concentrate Disposal Alternatives: On-shore and Offshore Discharges
- Concentrate and Backwash Treatment and Disposal: Routine Operation, Performance Monitoring, Maintenance and Troubleshooting
- Examples of Concentrate Treatment and Disposal in Water Reuse and Desalination Projects

16.30 – 17.00 Questions & Discussion



Day 2 Plant Performance Optimization and Troubleshooting

08.30 – 10.00 - RO System Performance Analysis and Optimization

- Key Plant Performance Parameters for Desalination and Water Reuse Systems
- Diagnostics of Membrane Fouling
- Key Plant Performance Parameters
- Main Steps of Plant Performance Analysis
- Optimization of Plant Design and Operations
- Membrane Integrity Testing
- Membrane Cleaning
- Video of Pembroke Desalination Plant, Malta

10.00 – 10.15 Coffee Break

10.15 – 12.30 – Desalination and Water Reuse – RO Troubleshooting

- Operations Monitoring Methods and Equipment
- RO Process Performance Challenges and Troubleshooting Solutions
- Diagnostics of RO Membrane Integrity and Fouling Issues
- Diagnostics of Membrane Fouling and Scaling Issues
- Key Equipment Performance Issues and Troubleshooting Solutions
- Product Water Testing and Quality Control
- Video of West Basin Recycling Plant, California

12.30 – 13.30 Lunch Break

13.30 – 14.30 - Water Reclamation Plant Case Studies

- Milestones in Membrane Applications for Water Reuse
- The First Direct Potable Reuse Facility in Namibia – Challenges and Solutions
- Lessons Learned from the Largest and Most Efficient Water Reuse Operations in the World
- Key Advantages and Main Constraints for RO Application for Industrial Water Reuse

14.30 – 14.45 Coffee Break

14.45 – 16.00 Desalination Plant Case Studies

- Tampa Bay Seawater Desalination Plant, USA – Challenges and Solutions
- Al Dur SWRO Plant, Bahrain – RO System Issues and Considerations
- Fujairah SWRO Plant, UAE – Solutions for Source Seawater with High Fouling Potential

16.00 – 17.00 Questions & Answers

Day 3 Hands-on Training at Malta Desalination Plant

08.30 – 09.30 Guided Tour of Malta Desalination Plant

09.30 – 12.00 Training Activities (see below)

12.00 – 13.00 Boxed Lunch

13.00 – 16.30 Training Activities – continued (see below))

16.30 – 17.00 Return to Hotel

Training Activities:

1. SDI test of source water and pretreated (i.e., cartridge filtered) water;
2. Cartridge filter replacement – what do we look for to assess pretreatment by observing cartridge filters;
3. Conductivity Profiling of RO Vessels - the course participants will have first-hand experience with vessel probing and analyzing of the collected data;
4. Membrane Replacement – Remove one or more RO elements and replace them with new;
5. Membrane Rotation – rotate last and first RO elements;
6. Membrane Weighing – weight RO elements of one vessel and learn how to develop rotation and cleaning program based on the weights;
7. Starting Up or Shutting Down of RO Train;
8. Flushing of RO Train;
9. Other Practical Tests and Know-how for RO and Pretreatment System Troubleshooting.



Seawater Pretreatment - Key Challenges And Solutions

With Hands-On Training

Day 1 Hands-on Training at Malta Desalination Plant

08.30 – 09.30 Guided Tour of Malta Desalination Plant

09.30 – 12.00 Training Activities (see page 5)

12.00 – 13.00 Boxed Lunch

13.00 – 16.30 Training Activities – continued (see page 4))

16.30 – 17.00 Return to Hotel



Day 2 Plant Performance Optimization and Troubleshooting

09:00 – 10:30 - Reverse Osmosis and Pretreatment Process Fundamentals

- Pretreatment and Desalination Process Overview
- Chemical Conditioning of Source Water
- Sedimentation and Dissolved Air Flotation
- Granular Media Pressure Filtration
- UF and MF Membrane Filtration
- Cartridge Filtration

10:30 – 10:45 - Coffee Break

10:45 – 12:00 – Source Water Conditioning

- Pre-chlorination and Use of Biocides
- Coagulation and Flocculation
- Flocculation
- Type of Flocculation Chemicals and Feed Systems
- Scale Inhibitors
- Chemicals for Enhanced Boron Removal

12:00 – 13:00 - Lunch Break

13:00 – 14:00 - Dissolved Air Flotation – Design Traps & Troubleshooting

- Sedimentation Tanks
 - ✓ Function, Types and Configurations
 - ✓ Operation and Maintenance Considerations
- Dissolved Air Flotation Clarifiers
 - ✓ Key Performance Parameters
 - ✓ Examples of Existing DAF Systems – Operation Challenges and Solutions



14:00 – 15:00 - Granular Media Filters – Planning & Design Traps

- Key Performance Parameters
- Removal of Solids/Silt
- Removal of Organics and Microorganisms
- Routine Operations Tasks
- Performance Monitoring and Control

15:00 – 15:15 – Coffee Break

15:15 – 16:30 – 2.5 Membrane Filters – Planning & Design Traps

- Key Performance Parameters
- Removal of Solids/Silt
- Removal of Organics and Microorganisms
- Source Water Pretreatment Prior to Membrane Filtration
- Examples of Full-scale Membrane Pretreatment Systems

16:30 – 17:00 Questions and Discussions

Day 3 Pretreatment Performance Optimization and Troubleshooting

09:00 – 10:30 - Comparison of Granular Media and Membrane Pretreatment

- Effect of Source Water Quality on Performance
- Surface Area Requirements
- Quantity and Quality of Generated Residuals
- Chemical and Power Use
- Filtration Media Replacement Costs
- Commoditization
- Water Production Costs
- Guidelines for Selecting Pretreatment System

10:30 – 10:45 - Coffee Break

10:45 – 12:00 – Optimization of Chemical Use for Pretreatment

- Minimizing Use of Intake Chlorination
- Use of Ferric Sulfate vs. Ferric Chloride
- Application of Other Source Water Conditioning Chemicals
- Biofouling Management
- Reduction of Antiscalant Use

12:00 – 13:00 - Lunch Break

13:00 – 14:30 - Troubleshooting and Optimization of DAF Systems

- Common Challenges
- Troubleshooting Practices

14:30– 14:45 - Coffee Break

14:45 – 16:30 - Troubleshooting and Optimization of Pretreatment Filters

- Cartridge Filters – Problems and Solutions
- Gravity Media Filters – Problems and Solutions
- Membrane Pretreatment Filters – Problems and Solutions

16:30 – 17:00 - Questions & Discussions

Instructors



Mr. Nikolay Voutchkov is a registered professional engineer and a board certified environmental engineer (BCEE) by the American Academy of Environmental Engineers. He has over 30 years of experience in planning, environmental review, permitting and implementation of large seawater desalination, water treatment and water reclamation projects in the US and worldwide. 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 author of 10 books and manuals of practice on membrane treatment and desalination.

Dr. Valentina LAZAROVA is a senior expert and technical advisor for support to operations of Suez Environnement, France. She has Master of Science Degree in Sanitary Engineering, a Ph.D in Environmental Engineering and has an Habilitation to Direct Research (University Professor degree) and holds Certification of Professorship in Process Engineering from the French Ministry of Education. Dr. Lazarova is an international expert with over 30 years of research and practical experience in the field of wastewater treatment and reuse. Her career started as designer and project manager of wastewater treatment plants, followed by academic and long-term interdisciplinary research experience, and culminating as senior technical expert.



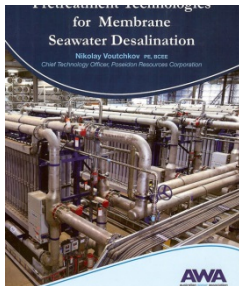
The multidisciplinary extensive expertise of Dr Lazarova includes planning, design and operation of wastewater treatment and reclamation plants, advanced treatment technologies (membranes, disinfection, biofilm reactors), energy efficiency, water quality monitoring, risk assessment, aquifer recharge, as well as odor characterization, control and treatment. Her main professional activities encompass review and/or preparation of international bids, feasibility studies, technical audits and technical assistance to plant designers and operators, master plan development, optimization of capital investment and operation costs of wastewater treatment and reuse plants worldwide (France, French Polynesia, Algeria, Australia, Bolivia, China, Chile, Italy, Hong Long, Macao, Mexico, Middle East, Morocco, Latin America, South Africa, Tunisia, the UK and the USA). Dr. Lazarova is acting also as independent expert and technical advisor for many international projects and organizations, including the European Commission, IWA, WHO, USEPA, WERF, as well as chairing the IWA Water Reuse Specialist Group. She has published over 200 technical and scientific papers in the field of wastewater treatment and reuse, holds 7 patents, and has contributed to and edited a number of books, such as "Irrigation with recycled water: agriculture, turfgrass and landscape", "Water-Energy Interactions in Water Reuse" and "Milestones in Water Reuse: The Best Success Stories".



Mr. David Sacco has been in the water sector for nearly 30 years. He is employed by Water Services Corporation which is the state owned company responsible for the whole water cycle in Malta. Mr Sacco holds a Bachelors Degree in Engineering and a Masters in Business Administration. He is also a Chartered Engineer and a member of the Institute of Engineering Technology of UK. His expertise in desalination projects includes design, project management, operations and maintenance. During his employment period with Water Services Corporation he was responsible for all RO plants' optimization programs that included project financing, design, manufacturing and commissioning. He was also initiator for the development of special tools to ensure production of water at

high efficiency levels, and hence, lowest operational cost. He is currently responsible for the management of all membrane treatment facilities owned by Water Services Corporation in Malta supplying more than 55% of the National demand. Mr David Sacco was also key contributor in acquiring ISO 9001 certification for the design, manufacturing and operation of RO plants and membrane treatment facilities. He also runs a subsidiary company offering services to third parties related to membrane treatment. He is experienced in training in both technical and management fields.

Desalination Books For Course Participants



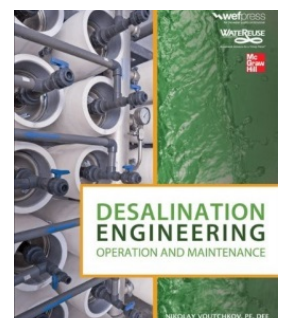
All participants of the two courses will receive a copy of the book

Pretreatment Technologies for Seawater Desalination, Australian Water Association, Sydney, Australia (2008), authored by Nikolay Voutchkov

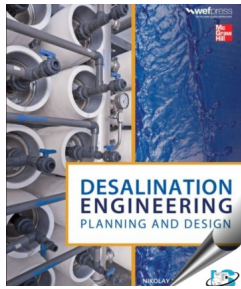
This book presents an overview of pretreatment challenges facing most reverse osmosis seawater desalination plants today and their impacts on the efficiency and costs of operations. Having identified the problems and their causes, the author then provides practical solutions derived from experience using examples drawn from across the globe. Divided into eleven chapters, the reader will find a wealth of information from guidelines for selection of pretreatment system configuration based on source seawater quality to design of the most commonly used pretreatment technologies such as screening, sand removal, sedimentation, dissolved air flotation, granular media filtration and membrane filtration. In concluding, the author shares insights on the present and future use of ultra and microfiltration membrane technologies and their advantages and limitations for seawater pretreatment.

The **first 5 paid participants** of each course which register for the course before May 20, 2014 will also receive on the first come – first serve basis a complimentary copy of the following book

Desalination Engineering: Operation and Maintenance, McGraw Hill, USA (2014), authored by Nikolay Voutchkov



This book is a comprehensive, one-volume engineering reference from the Water Environment Federation and WaterReuse Association on desalination plant operation and maintenance for municipal water supply professionals. This authoritative guide covers key aspects of desalination plant operation, maintenance, and troubleshooting. The focus is on reverse osmosis membrane desalination, which at present is the most widely used technology for production of fresh drinking water from highly saline water sources. The book covers state-of-the-art operation, maintenance, and monitoring practices associated with each of the key desalination plant facilities-intakes, pretreatment technologies, reverse osmosis equipment, energy recovery, membrane systems, post-treatment processes, and solids handling. In addition to the theoretical principles of desalination and their practical application, this guide presents a step-by-step approach for operation, maintenance, and troubleshooting of all desalination plant treatment components. Each chapter contains case-study examples illustrating various technologies and their practical implementation. Moreover, the book provides federal and state regulatory agencies with background on the monitoring requirements to determine and prevent potential environmental impacts associated with the discharges from desalination plants and to reduce the impact of their operations on the environment.



Those who sign for both courses and are in the first 5 registered before May 20, 2014 will also receive on the first come – first serve basis a copy of the following third book:

Desalination Engineering: Planning and Design, McGraw Hill, USA (2012), authored by Nikolay Voutchkov

This Water Environment Federation and WaterReuse Association publication provides comprehensive information on the planning and engineering of brackish and seawater desalination projects for municipal water supplies. After a brief overview of widely used desalination technologies, Desalination Engineering focuses on reverse osmosis desalination. The book discusses basic principles, planning and environmental review of projects, design and selection of key desalination plant components, desalinated water post treatment, and concentrate management. Guidelines on sizing and cost estimation of desalination plant facilities are also included in this practical resource.

Course Venue And Contact

Each of the two courses will be held in the **Pembroke area of the Republic of Malta**. The Republic of Malta is a Mediterranean country and has a successful long term track record in the field of seawater desalination. Most of its plants have been in operation for over 15 years and over 70 % of the country's water is supplied by desalinated water. Malta is internationally renowned as an attractive tourist destination, with numerous recreational areas and historical monuments, including nine UNESCO World Heritage



CONTACT for more information and registration:

Ms. Raya Lazarova – Director of Operations

Tel. +33 (0)6 52 57 55 60

E-mail: rlazarova@water-g.com

website: www.water-g.com/trainings

Registration Form

Troubleshooting of Membrane Desalination and Water Reuse Systems With Hands-On Training

October 5-7, 2014, Malta

Company Name _____

Address _____

Phone _____ Fax _____

Email _____

Contact Person _____ Cell
No. _____ Email _____

Participant Names:

Participant 1 _____ Position _____

Email _____ Cell No _____

Participant 2 _____ Position _____

Email _____ Cell No _____

Participant 3 _____ Position _____

Email _____ Cell No _____

Registration Fee per Participant in Euros

Before May 20, 2014 – 1,700 Euro

Before August 1, 2014 – 1,900 Euro

After September 1, 2014 – 2,100 Euro

*Please note that payment is required with registration. The registration fee includes training documentation, lunch, refreshments during the coffee breaks, and one book on seawater pretreatment. The fee does not include travel expenditures, hotel or other costs for course participation. Additional books will be provided for the first 5 registered participants on the first come – first serve basis. A 10% discount is offered to the participants of both training courses.

Cancellation Policy

Registration fees will be refunded if cancellation is received no later than 1 September 2014. Full registration fees will be refunded less 15% for administration duties.

Seawater Pretreatment - Key Challenges and Solutions With Hands-On Training

October 7-9, 2014, Malta

Company Name _____

Address _____

Phone _____ Fax _____

Email _____

Contact Person _____ Cell

No. _____ Email _____

Participant Names:

Participant 1 _____ Position _____

Email _____ Cell No _____

Participant 2 _____ Position _____

Email _____ Cell No _____

Participant 3 _____ Position _____

Email _____ Cell No _____

Registration Fee per Participant in Euros

Before May 20, 2014 – 1,700 Euro

Before August 1, 2014 – 1,900 Euro

After September 1, 2014 – 2,100 Euro

*Please note that payment is required with registration. The registration fee includes training documentation, lunch, refreshments during the coffee breaks, and one book on seawater pretreatment. The fee does not include travel expenditures, hotel or other costs for course participation. Additional books will be provided for the first 5 registered participants on the first come – first serve basis. A 10% discount is offered to the participants of both training courses.

Cancellation Policy

Registration fees will be refunded if cancellation is received no later than 1 September 2014. Full registration fees will be refunded less 15% for administration duties.

Training Course Name	Early Registration before May 20, 2014	Registration before August 1 st , 2014	Registration after September 1 st , 2014
Troubleshooting of Membrane Desalination and Water Reuse Systems With Hands-On Training	1,700 €	1,900 €	2,100 €
Seawater Pretreatment – Key Challenges and Solutions with Hands-On Training	1,700 €	1,900 €	2,100 €
Sub Total			
10% Discount for participation in both training courses			
TOTAL			

Payment Method:

by Bank Transfer

to **Water Globe Consulting, LLC**

SWIFT code: CITI US 33

Account No. 1255504176

Routing No. 221172610

CITI Bank

address: 15 Broad Street, Stamford, CT 06901, USA

Please send a completely filled up registration form to the following address:

Ms. Raya Lazarova / Water Globe Consulting

36 rue du president Wilson, A56

78230 Le Pecq, France

OR

email: rlazarova@water-g.com

www.water-g.com