

## COURSES IN DESALINATION

Lecturer **Dr. Corrado Sommariva**

**Genoa, Italy**

**June 20–21, 2011 Thermal Desalination**

**June 22, 2011 Material Selection in Desalination**

**June 23–24, 2011 Water Management and Economics**



The topics include information about desalination technology, starting with basic concepts of water chemistry and desalination mass and energy balance. This is followed by detailed evaluation of two major desalination methods: MSF and MED distillation. The technology description includes theoretical principles of the process, principles of desalination system operation, system design, evaluation of the economics of the process. The courses will describe also the common interface of thermal desalination with associated power plants and various configurations and matching criteria.

The main aspects of desalination economics will then be illustrated including a description of the market environment and prices, project delivery mechanisms (private – turnkey multi-contracts etc.) and budgeting a desalination project.

The economic session will be related to both thermal and RO processes.

Participants should be end users, turnkey contractors, developers who wish to gain a more detailed understanding of thermal desalination and the associated interface with a power plant.

The objectives of the courses are to provide a theoretical basis and practical information on desalination technology with emphasis on thermal processes and to become familiar with the basic aspects of the design of a desalination project using thermal technology and with operating conditions of desalination systems.

## Venue Hotel Mediterranee

Via Lungomare 69, 16155 Genoa Pegli, Italy  
Tel. +39 (010) 69 73 850; Fax +39 (010) 69 69 850

The courses will be held in an 18th century building with sea-front accommodation on the picturesque Italian Riviera, just 3 km from C. Colombo Airport and 1 km from the motorway tollgate.

Located in Pegli, near the historical town of Genoa, this former residence of the Lomellini family is sheltered from the winds, enjoying a mild climate in winter and temperate in summer.



The beach is nearby and there is a frequent bus service to the centre of Genoa. There is a nearby port and railway station for making a day trip to the beautiful areas of Portofino and Rapallo.

## Lecturer



Dr. Sommariva has a PhD in Chemical Engineering from Genoa University and a diploma in management from Leicester University. He is Professor at Genoa University. He has published over 40 papers on desalination and economics and holds 2 patents. He is author of a book on *Desalination Management and Economics* and holds a regular course on technical economical and management aspects of desalination as well as power and desalination plant life extension. Dr Sommariva has experience in both thermal, reverse osmosis and waste water systems. Dr. Sommariva is now Managing Director Middle East at ILF and heads the office in Abu Dhabi. From 2000 to 2008 he led the desalination and

water treatment group as Divisional Director at Mott Macdonald. He has been involved in various roles in the majority of the large scale thermal and RO processes in the Middle East in the last 15 years. He has served as President of the European Desalination Society between 2004 and 2006 and chairman of the WHO committee for safe water desalination guidance documents. For the past 9 years has been on the Board of Directors of the European Desalination Society and International Desalination Association. In 2002 he was the Vice President of the International Desalination Association.

# THERMAL DESALINATION

A 2-day intensive course

Lecturer Dr. Corrado Sommariva

June 20–21, 2011, Genoa, Italy

## June 20 Basics of Thermal Desalination

- 09.00 Introduction to thermal desalination plants**  
Basic heat and mass flows for thermal plants  
Performance ratio definitions  
Thermal desalination process and energy input  
Multiple number of stages and effects
- 09.45 Coffee break**
- 10.00 Combined power and thermal desalination plant**  
Thermal desalination plant interfaces with the rest of the yard: Auxiliary equipment;  
Main process interface interconnection; Typical layouts  
Power – desalination plant combinations: Pass out steam turbine; CCGT; Others
- 11.30 Power and desalination matching optimisation**  
Link to the power plant optimisation criteria  
Hybrid plants
- 13.00 Lunch**
- 14.00 Material selection and lifetime expectancy**  
Basics of the corrosion process in desalination  
Criteria for material selection: Evaporator (internal external components);  
Balance of plant (pumps etc.)  
Life expectancy: Rehabilitation and upgrading; Up-rating
- 16.00 Summary and discussion**

## June 21 Technology Review

- 09.00 Multi-stage flash (MSF) technology**  
Basics of the process and the technology  
Different types of MSF plants: Criteria for classification; Schematic configurations
- 10.30 Coffee break**
- 11.00 Multi-stage flash (MSF) technology**  
MSF process description: Flow sheets; Main process parameters profiles  
MSF process thermodynamics: Stage simulation model; Concepts of heat transfer
- 13.00 Lunch**
- 14.00 Multiple effect distillation (MED) technology**  
Basics of the process and the technology  
Typical MED process configurations: MED process description; Flow sheets; Main process parameter profiles  
MED process thermodynamics: Stage simulation model; Concepts of heat transfer  
Sensitivity aspects of thermal desalination to variation in process parameters  
Current status of thermal desalination technology  
History of major developments; Future trends :  
New technologies and processes on the horizon: MSF-MED hybrid; MSF 2;  
Membrane distillation; Renewable thermal desalination; Review of advantages and disadvantages of each technology
- 16.00 Summary and discussion**

# MATERIAL SELECTION IN DESALINATION

A 1-day intensive course

Lecturer **Dr. Corrado Sommariva**

June 22, 2011, Genoa, Italy

## Morning

### **The importance of material selection on water cost**

Lifetime design criteria: desalination

### **Fundamentals in material selection in seawater application**

Corrosion: Basic information

Fundamentals of stainless steel composition and properties: Super austenitic steel, Duplex steels

Fundamentals of CuNi alloys composition and properties

Fundamentals of non metallic material application to desalination and properties: Glass reinforced piping, PVC–HDPE; History of PE pipe materials

### **Recent development and market trends**

#### **Thermal desalination plant material selection**

Typical material selection for MSF: Operational feedback; Evolution of specification material

Typical material selection for MED: Operational feedback; Evolution of specification

Advantages and disadvantages

Balance of plant (deareator seawater intake, etc.)

Material selection for pumps and auxiliary equipment

Material selection for boilers and turbines



## Afternoon

### **SWRO desalination plant material selection**

Typical material selection for SWRO membranes: Operational feedback; Evolution of specification material

Typical material selection for SWRO balance of plant:

Operational feedback; Evolution of specification

Advantages and disadvantages

Material selection for High pressure pumps and auxiliary equipment

### **Requirements for workshop and site testing**

### **Cost and tariff sensitivity to material selection**

Turnkey costs sensitivity to material selection; Turnkey costs sensitivity to raw material costs

### **Process conditions and material selection**

Overview of the operational problems encountered and their solution

Criteria for material selection; Lifetime assessment

Maintenance and routing inspection feedback

### **Rehabilitation, upgrading and life extension**

Managing up-rating: the break even analysis

Managing up-rating: the break even analysis: case study

### **Open discussion, feedback and questions**

### **Certificate awards and conclusion**



# WATER MANAGEMENT AND ECONOMICS

A 2-day intensive course

Lecturer Dr. Corrado Sommariva

June 23–24, 2011, Genoa, Italy

## June 23 Desalination Management and Economics

### 09.00 Desalination process comparison: MSF, MED, RO and future trends

Desalination technologies selection: Seawater requirement; Seawater requirement and heat dissipation; Land footprint; Product water quality; Energy requirements; Energy requirements: re-use versus desalination; Technology sensitivity to energy costs; Construction time; Environmental issues; Seawater discharge; Carbon footprint

### 10.30 Coffee break

### 10.45 Managing water demand; The business environment

Forecasting and planning: Demand forecast; Capacity required; Capacity available and retirement scenarios; Capacity shortfall  
Different players involved in project development  
Technology market segmentation  
Legislation and permits

### 13.00 Lunch

### 14.00 Financing and contracting desalination plants

Managing project delivery mechanisms: Multiple contracts; Turnkey contracts; Management contracts; Private finance initiative; Main agreements  
Funding and gearing of desalination projects: Bond finance; Commercial loans  
Equities  
Steps in privatisation process  
Risk allocation: Market demand risk; Specification and design risks; Force majeure; Financing risks; Operating risks  
Financial modelling: Water capacity charges; Water output charges: SWRO – MBR and UF projects: membrane charges; Indexation  
Tariff modelling  
Deduction for scheduled and unscheduled unavailability of the plant  
Availability and reliability  
De-rating of the plant: Evaluation of tariffs and scenario points; Concession agreement and payment structure for sewage treatment plants  
Functional specification  
Break even analysis

### 16.00 Summary and discussion

## June 24 Budgeting

### 09.00 Budgeting a desalination project

Water cost build up factors: CAPEX; Development costs; OPEX  
Thermal desalination plant capital costs: Evaporator island cost breakdown; Cost component budgeting and analysis; Material and technical specification effects on CAPEX; Auxiliary plants

### 10.30 Coffee break

RO desalination plant capital costs: Seawater quality cost impact; Cost component budgeting and analysis; Material and technical specification effects on CAPEX; CAPEX vs. OPEX comparison  
Sensitivity analysis to cost factors

### 13.00 Lunch

### 14.00 Structuring water tariffs

### 16.00 Summary and discussion

## COURSES IN DESALINATION

Dr. Corrado Sommariva

### REGISTRATION FORM

Surname \_\_\_\_\_ First name \_\_\_\_\_

Address \_\_\_\_\_

Country \_\_\_\_\_ Telephone \_\_\_\_\_

Fax \_\_\_\_\_ E-mail \_\_\_\_\_

<i>Registration fee:</i>	<input type="checkbox"/> 1 day	<input type="checkbox"/> 2 days	<input type="checkbox"/> 3 days	<input type="checkbox"/> 4 days	<input type="checkbox"/> 5 days
<input type="checkbox"/> EDS members	<b>€1,000</b>	<b>€1,800</b>	<b>€2,600</b>	<b>€3,300</b>	<b>€3,900</b>
<input type="checkbox"/> Non-members	<b>€1,200</b>	<b>€2,000</b>	<b>€2,800</b>	<b>€3,900</b>	<b>€4,100</b>

The fee includes accommodation, lunches, coffee, dinners, course material, a book by Corrado Sommariva *Desalination Management and Economics*.

I wish to register for the course in

- Thermal Desalination*
- Material Selection in Desalination*
- Water Management and Economics*

*Payment can be made by:*

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