THERMAL DESALINATION PROCESSES AND ECONOMICS

A 4-day intensive course

Lecturer Corrado Sommariva, Ph.D.

July 23–26, 2007 L'Aquila, Italy

The course 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 & 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 course will describe also the common interface of thermal desalination with associated power plants and various configurations and matching criteria.

The course will then illustrate the main aspects of desalination economics 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.

Course objectives 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.

EDS

European Desalination Society

University of L'Aquila

Faculty of Engineering

VENUE

L'Aquila, Canadian Hotel

L'Aquila, the capital of the Abruzzo region, is dominated by the Gran Sasso mountain, highest point in the Appenines and enjoys a healthy alpine climate: cold but dry in winter, and hot without becoming unpleasant in summer.

The city was born in the Middle Ages, has a hundred splendid squares which are symbols and testimony of the small villages that cooperated in building it. The long cultural tradition is preserved in the beautiful medieval monuments and buildings in Baroque and Renaissance style, in paintings and in its museums, as well as maintaining an active and musical and theatrical life, local cuisine, handicrafts and folklore.
In the surroundings there is a unique natural environment at a height of 3,000 m where there are protected woods with chamoix, bears and wolves.

Lecturer

Mott MacDonald

Dr. Corrado Sommariva, a Divisional Director at Mott MacDonald in the UK, has planned and will deliver the course. He has been involved in thermal and RO processes of desalination for 20 years. He is Professor at Genoa and L'Aquila Universities. He has published over 40 papers on desalination and economics and holds 2 patents. Dr. Corrado Sommariva, the President of the European Desalination Society, has been on the Board of Directors of the European Desalination Society and International Desalination Association for the past 9 years. He is author of a book on *Desalination Management and Economics*.

PROGRAM

Day 1 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 (interal external components)
- Balance of plant (pumps etc.)

Life expectancy
- Rehabilitation and upgrading
- Up-rating

16.00 **Summary and discussion**

Day 2 Technology Review

9.00 **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**

9.00 **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 parameters profiles

MED process thermodynamics
- Stage simulation model
- Concepts of heat transfer

16.00 **Summary and discussion**

Day 3 Desalination Management and Economics

09.00 **Desalination process comparison: MSF, MED, RO and future trends**
Current status of thermal desalination technology
History of major developments
Future trends
Review of advantages and disadvantages of each technology

10.30 **Coffee break**

10.45 **The business environment**
Different players involved in project development
Technology market segmentation
Legislation and permits

13.00 **Lunch**

14.00 **Managing water demand**
Forecasting and planning
- Demand forecast
- Capacity required
- Capacity available and retirement scenarios
- Capacity shortfall

Managing project delivery mechanisms
- Multiple contracts
- Turnkey contracts
- Private projects
- Public versus Private

Private projects
- Key agreements
- Typical structures
- Risk management and allocation

16.00 Summary and discussion

Day 4 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 ad analysis
- Material and technical specification effects on CAPEX
- CAPEX versus OPEX comparison

13.00 Lunch

14.00 Structuring water tariffs

16.00 Summary and discussion

REGISTRATION FORM

Surname _____ Name _____

Address _____

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Country _____ Telephone _____

Fax _____ E-mail _____

Registration fee:	*Till June 15*	*After June 15*
☐ EDS members	**€2.000**	**€2.300**
☐ Non-members	**€2.300**	**€2.500**

The fee includes 5 nights accomodation, transportation to/from airport, lunches, coffee, dinners, course material, a book by Corrado Sommariva *Desalination Management and Economics.*

Payment can be made by:

Cheque made out to
European Desalination Society

Bank Transfer to be sent to the address below and a copy faxed to us
Please take care of your own bank charges

Account No. 10849.36 (Miriam Balaban)
Banca Monte dei Paschi di Siena
67100 L'Aquila, Italy
ABI: 01030 *CAB:* 03600
Swift code: PASCITMMAQU
IBAN code: IT 92 I 01030 03600 000001 084936

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