



MU091: MSF Desalination Plant Heat Balance & Performance Ratio Calculations

Training Description:

Auditing for energy purchases, use, conversion, and waste is the first step in managing your energy consumption. For maximum effectiveness, it is essential to focus on the essentials. This is best done through the Pareto Principle (80% of the effect is caused by 20% of the factors). Energy Audit, takes a broad, comprehensive approach, then progressively zooms in on the specific issues and opportunities that deserve further investigation. The Energy Audit report can be used as the starting point for Feasibility Studies, Energy Management Plans, Retrofitting Existing Systems, and Design of new Energy Efficient Processes.

With each Energy Audit, you get a detailed report on your current situation, and recommendations for more detailed study. Typical costs for an Energy Audit range from \$500 (small, partial audits) to 20,000 for comprehensive studies on large buildings or industrial processes. Typical audits are \$3,000 to 5,000 for 80% of the initial Energy Audits done.

In this short course emphasize is directed towards energy auditing in multistage desalination systems. The attendees will have the opportunity to be exposed to the recent developments in operation and maintenance technology in this area Desalination technologies are overviewed Workshops on MSF system energy calculations are presented. Full and part load performance calculations are illustrated in connection with control systems Operation and maintenance of MSF are presented. Full and Part Load Operations are illustrated in connection with Control Systems in MSF Desalination Plant.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Give the Thermal and Mechanical background of Multi-Stage Flash Systems
- ✓ Understand the layout of the Theories for thermal as well as the Mechanical Sizing and Applications
- ✓ Illustrate the Operation and Troubleshooting of Multi- Stage
- ✓ Know the plants for the whole Plants and Systems
- ✓ Present background information for MSF System and have the attendees Practice Energy Auditing & Methodologies
- ✓ Analyze the system components of MSF Plants and to overview the operation and maintenance technologies of MSF
- ✓ Evaluate the system performance and energy consumption at Part Load and Full Load
- ✓ Evaluate and study the Gap in the system of Performance in Cogeneration Plants
- ✓ Gain more details of understanding the Thermal Desalinations, and Associated Interface with a Power Plant such as Gas Turbine or Steam Turbine with different Capacities

Training Designed for:

This course is intended for Mechanical, Chemical Engineers who are working in MSF Multi-Stage Flash Desalination Plants in Operation & Maintenance. Performance Engineers are recommended to attend this course to gain values.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ PRE-TEST
- ❖ Introduction
- ❖ **Introduction to Desalination**
 - Sea Water Properties
 - Practical Formulas
 - Desalination Technologies
 - Fluid Flow Principles in MSF Plants
 - Heat Transfer Background in MSF Plants
 - Energy Sources for MSF Systems
 - Energy Auditing Technologies
 - Thermodynamics and Energy Calculation Schemes
 - Efficient Energy Transfer through MSF Plant
 - Water Chemistry in relation to Energy Transfer
- ❖ **Heat Balances in MSF Stages**
 - System Overall Analysis
 - Brine Pool Balance
 - Vapor Space Balance
 - Demister Balance
 - Condenser Balance
 - Ejector Section Analysis
 - Workshop (Heat Balance Calculations)

DAY TWO:

- ❖ **Energy Consumption through MSF**
 - System Overall Energy Analysis
 - Brine Characteristics to minimize Energy Consumption
 - Proper Demister Configuration
 - Condenser Design for Energy Consumption
 - Ejector Economical Energy consumption
 - Workshop in the above Energy consumption
- ❖ **Measured Parameters from Control Room**
 - Steam Temperature and Pressure to Brine Heater
 - Vacuum Values in Different Stages
 - Steam Pressure and Temperature to Deaerator
 - Ejector Section Steam Conditions and Flowrate
 - Pumping Power for the Different Pumps
 - Optimization Techniques for System Effectiveness
 - Workshop Thermo-Economic Calculation Evaluation

- Dynamic Analysis of System Components
- Salinity Requirements and System Performance

DAY THREE:

- ❖ **Operation & Maintenance (Cogeneration)**
 - MSF with Steam Turbine Plants
 - MSF with Gas Turbine Plants
 - Economical Evaluation in Desalination Cogeneration
 - GOR and PR in Cogeneration System
 - Workshop in Cogeneration Performance Analysis
- ❖ **Optimization of Energy Consumption**
 - Introduction of Second Law Analysis
 - MSF System Irreversibility
 - Unit Energy Cost
 - Analysis of MSF System Losses
 - Best Operation and Maintenance Strategies
 - Fouling Effect on System Energy
 - Operation and Troubleshooting Schedules
 - Maintenance Program Activities
 - Workshop in Energy Optimization Techniques

DAY FOUR:

- ❖ **Evaluation of System Performance**
 - Calculation for Gain Output Ratio (GOR)
 - Calculation Recovery Ratio (RC)
 - Performance Ratio (PR) Calculations
 - Effect of Operational Parameters on PR
 - Effect of Maintenance Schedule on Performance
 - Effect of Anti-Scale Dosing on PR
 - Effect of Deaerator Steam Consumption on PR
 - Effect of Ph Value
 - Fouling Analysis, Causes & Preventative
 - Workshop in GOR and PR calculations

DAY FIVE:

- ❖ **MSF Plant Strategies**
 - Steady State Operation
 - Part Load Operation
 - Control & Dynamic Performance Analysis
 - Optimization Operation Process
 - Condition Monitoring Strategy
 - Maintenance Program Scheduling
- ❖ Economical Aspects of MSF Operation
- ❖ Course Conclusion
- ❖ POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager

aisha@cmc-me.com / training@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615