MU063:
Power Plant Performance, Efficiency & Optimization
Training Description:

This intensive training course is designed for performance monitoring & efficiency considering optimization of combined cycle power plant through operation, maintenance and reliability.

This course deals with the design and detailed operation and maintenance characteristics of gas turbine combined cycle power plant, with major emphasis on the major plant components and the performance of the plant. Overall design and operation concepts along with basic and advanced operation and maintenance problems for the various pieces of Turbo Machinery including Gas Turbines, Steam Turbines, Generators, HRSG and Balance of plant Rotating equipment will be discussed. Discussions and design parameters of the Heat Recovery and Steam Generating (HRSG) systems, the feed water heaters and the Condensers are also included. Other topics covered include plant systems, fuel, electrical, pneumatic, hydraulic, instrumentation, components and BOP reliability program, Thermal performance analysis vibration analysis and online condition monitoring of the Power Plant. An emphasis is placed on providing practical information with minimal theory. Case studies with an aim of thorough understanding of Combined Cycle Power Plant life extension and evaluation and Performance Benchmarking for a typical power plant.

Training Objectives:

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

✓ Improve job performance, Decision making capabilities
✓ Understanding the Design Concepts of CCPP Components Systems
✓ CCPP performance Evaluation throughout life Cycle
✓ Understanding Life Extension Evaluation and Recommendations
✓ Understanding CCPP Key Performance Indicators in Operational Performance and maintenance
✓ Understanding CCPP design, operation, and maintenance requirements
✓ Technology transfer between participants
✓ Understanding Operation Cost Monitoring vs Performance

Training Designed for:

This course is intended for all technical staff who are working power generation, utilities, process and other heavy industries. This includes fresh-graduate engineers, under-development engineers and engineers who have limited experience in power plant performance and generation. Further, this course is suitable for all experienced technical personnel in power plant generation field who have no engineering degrees or formal training in engineering. Managers and engineers of different disciplines might find this course very useful as an awareness course in power plant performance and efficiency.

Training Program:

**DAY ONE:**

❖ PRE-TEST
❖ Introduction
❖ Overview of the CCPP major plant
❖ Equipment
Gas turbines
HRSG, steam turbine
Generators
Balance of plant, systems and components
Feed water heaters, Condensers
Boiler feed water pumps
Plant layout
Environmental considerations
Mechanical arrangement
Aero thermal characters of plant equipment
ASME, API codes for plant equipment
Design and operation control criteria for performance
Equipment selection criteria for best integrated performance
Economic aspects of installations, cost
Per MWH Hr Considerations
Cycle analysis of the combined cycle power plant

**DAY TWO:**
- Major equipment
- Advanced gas turbine technology
- Classification, types and sizes of gas turbines in combined cycle power generation
- Technological development trends in gas turbine technology
- Modular design concept, aeroderivative GT vs industrial gas turbines
- Methods of increasing cycle efficiency and the output power
- Overview of fuels and materials consideration
- High temperature turbines, closed cycles and other developments
- Aero thermodynamic considerations
- Cycle analysis of gas turbines and centrifugal compressors
- Gas turbine and axial compressor
- Performance calculations, operating maps
- Mechanical, performance and aerodynamic aspects of gas turbines
- Axial compressors
- High temperature materials coatings
- Gas turbine materials
- Turbine blades, NGVs (Nozzles)
- Design and operational considerations
- Material behavior
- Hot corrosion, high cycle and low cycle fatigue with case study
- Effect of fuel on GT integrated performance
- Advance coatings as applied to both the hot section components and the compressor

**DAY THREE:**
- Fuels, types of fuels
- Natural gas to heavy fuel oil to low Btu gas
- Gas turbine performance with different fuels
- Variable load conditions, base load and full load
Effects on downstream components
HRSG, steam turbine etc.
Duct burners use in the system
Steam turbine technology
Design of the steam turbines, materials
Sub, super critical cycles in power generation
High pressure turbine, IP and LP turbines
Performance analysis of steam turbines
HRSG heat recovery steam generator
HRSG design for performance
Criteria’s, materials
Feed water heaters
Detractors, economizers, pre heaters
Evaporator, and super heater
Cycling issues, thermal & mechanical fatigues
Performance optimization techniques to ensure maximum effectiveness of the HRSG
Corrosion control programs
BOP condensers, feed water pumps condensers
Pumps performance analysis
Effects on power plant output & performance
Design characteristics, charts, maps, piping, structure reliability programs
Life cycle performance analysis
Generator performance, load curves & optimum operation

**DAY FOUR:**

Combined cycle power plant
Performance and optimization
Power plant life cycle
Plant degradation
Performance deterioration
Maintenance program effectiveness cost over life cycle
Performance calculations API, ASME PTC performance test codes
Gas turbine, compressor, HRSG, performance maps margins for steam turbine
BOP rotating equipment
Generators transformers
Performance KPI’s for combined cycle power plant integrating the performance together
Bench marking of CCGTPP
Analysis techniques tools for power
Generation data
Performance, life assessment, case studies
Combined cycle power plant, life assessment principles
Stages approach to life assessment
Cost effective management strategies
Component specific techniques
Performance targets Vs actual
DAY FIVE:
❖ Maintenance, reliability programs to meet performance targets
❖ Power plant maintenance program
❖ Maintenance planning and scheduling
❖ Applying best maintenance strategies and philosophies
❖ Integrating maintenance & reliability with CCPP performance
❖ Performance documents, review reports
❖ Reliability program, reports
❖ Condition monitoring techniques
❖ RCM program, integrating between system, component performance
❖ Repair Vs replace decisions for combined cycle power Plant
❖ Course Conclusion
❖ POST-TEST and EVALUATION

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.”

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

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, Software & General Discussions
• Pre and Post Test

Training Certificate(s):

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

Training Fees:

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 - 13:30  Recess (Prayer Break & Lunch)
- 13:30 - 15:00  Last Session

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

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Training & Career Development Department