

Training Title

CENTRIFUGAL COMPRESSORS & TURBINES: DESIGN, OPERATION, MAINTENANCE & FAILURE ANALYSIS

Training Duration

5 days

Training Venue and Dates

REF ME040	Centrifugal Compressors & Turbines: Operation, Maintenance & Failure Analysis	5	22-26 April	\$5000	Kuala Lumpur, Malaysia
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Training will be held at any 5 Star Hotels. Exact venue will be informed later

Training Fees

- 5000 US\$ per participant for Public Training including Course Materials/Handouts, Tea/ Coffee, Refreshments & International Buffet Lunch

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

Compressors are common in almost all industrial systems and applications. Compressors represent a significant part of capital and operating costs on most plants.

Gas turbine is a major power source used in the generation of electricity, and the driver of choice for modern aircraft, pumps, compressorsetc. This training course covers main topics of operation and maintenance of gas compressor and turbines and associated support systems. In addition, the course develops a background in gas turbine operation that enables participants to analyze operating problems properly and take the necessary corrective action. The course combines between the basic and practical considerations related to centrifugal compressors. The use of gas turbines in the petrochemical, power generation and offshore industries has increased considerably during the past few years.

The course will cover the design, installation, operation and maintenance of these machines by highlighting characteristics features, efficiencies, reliability and maintenance implications. Upon completion of this course, participants will gain a complete and up-to-date overview of the Gas Turbine technology.

A Vibration- Monitoring system gives warnings when vibration levels reach a preset level, and hence provides a round- the - clock watch on vital machinery. The training course aims to provide a treatment of the detection and diagnosis of faults in rotating equipment using vibration measurement and analysis

TRAINING OBJECTIVES

The course will cover the construction, operation and maintenance of these machines by highlighting characteristics features, efficiencies, reliability and maintenance implications.

Upon completion of this course, participants will gain a complete and up-to-date overview of the centrifugal compressor and Gas Turbine technology and be familiar with all operation and maintenance requirements.

- Learn the principles of the centrifugal compressors and gas turbine.
- Familiarize the participants with various types of centrifugal compressor & gas turbine.
- Understand the operation principles of the centrifugal compressor and gas turbine.
- Learn the maintenance procedure of the centrifugal compressor and gas turbine.
- Discuss the troubleshooting and failure analysis of the centrifugal compressor and gas turbine.

WHO SHOULD ATTEND?

Turbine & compressor maintenance engineers of relatively short experience and senior technicians of medium experience who have the ability to improve & develop their capabilities. Members of the following departments: Engineering, Planning, Procurement, Operation, Maintenance or Inspection and those who are engaged in or intend to be familiar with compressor systems. Also senior staff should update and refresh their knowledge by attending this course.

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

COMPETENCIES EMPHASIZED

- Understanding of monitoring techniques as applied to compressors and turbines.
- Ability to put in place measures to quantify equipment condition.
- Interface with and control service providers.
- Identify and specify new compressor and turbine plant.

TRAINING OUTCOME

- At the end of the course participants will learn the principles of the centrifugal compressors and gas turbine.
- Familiarize the participants with various types of centrifugal compressor & gas turbine.
- Understand the operation principles of the centrifugal compressor and gas turbine.
- Learn the maintenance procedure of the centrifugal compressor and gas turbine.
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DAILY OUTLINE

Day 1

Introduction.

What is a compressor?

Compressor terminology

Compressor classification

(Centrifugal – axial – reciprocating –helical- screw, ranges of application)

Compressor finite-life parts (bearings-mechanical seals-couplings.....)

Compressor Drivers

- Overview of maintenance function and objectives.
- Maintenance job standards.
- Maintenance types & strategies.
- Common problems associated in the rotating equipment in general.

PRINCIPLES OF CENTRIFUGAL COMPRESSORS

- Theoretical H-Q curve.
- Theoretical Power-Q curve.
- Performance curves.
- Centrifugal compressor classification
- Basic components and their function
- The effect of outlet blade angle
- Function of the diffuser.

Day 2

CENTRIFUGAL COMPRESSOR OPERATION

- Compressor start-up and shut down.
- Speed limits.
- Required speed calculations
- System Resistance
- Inlet conditions Effects
- Parallel and series operation.

CENTRIFUGAL COMPRESSOR MAINTENANCE

- Maintenance strategies
- Lubrication Systems
- Inlet Filtration
- Sealing Systems
- Shaft Deflection
- Rotor Balancing
- Shaft Alignment

CENTRIFUGAL COMPRESSOR TROUBLESHOOTING AND FAILURE ANALYSIS

- Troubleshooting procedure
- Site inspection
- Monitoring systems
- Surge line and stonewall.
- Anti-surge control system
- Excessive vibration
- Check list of compressor problems

Predictive Maintenance Program

- a) Building a system
- a) Equipment data

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- b) Failure data
- c) Maintenance data
- d) Data format
- b) Failure and maintenance notations
- c) Failure descriptors
- d) Failure causes
- e) Method of detection
- f) Maintenance activity

Data requirements for various applications

Day 3

OVERVIEW OF GAS TURBINES:

- Industrial heavy duty gas turbines
- gas turbine theory and systems
- Major gas turbines components
- Applications

PRINCIPLES OF GAS TURBINE

- Gas Turbine Components (Compressor-Turbine-Combustor-Ancillary & Auxiliary Systems)

Gas Turbine Components:

- Axial-flow compressor
- Radial-inflow turbines
- Combustors, construction types
- Igniters
- Hot path components
- Firing concept and emission control
- Fuel nozzles
- Air standard cycles and other famous cycles.
- Turbine performance characteristics.
- Main requirements of a gas turbine engine.

GAS TURBINE OPERATIONS

- Pre Start Checks
- Starting Sequence
- Loading/Unloading Operations
- Shutdown Sequence

Day 4

GAS TURBINE CHECKS

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- Inlet filter
 - Lubricating oil
 - Hydraulic and control oil
 - Cooling water
 - Cooling and sealing air
 - Fuel system(s)
 - Starting means
 - Heating and ventilation
 - Fire protection

Materials of Construction:

- General metallurgical behavior
- Gas turbine blade materials

- Turbine wheel alloys
- Corrosion problem

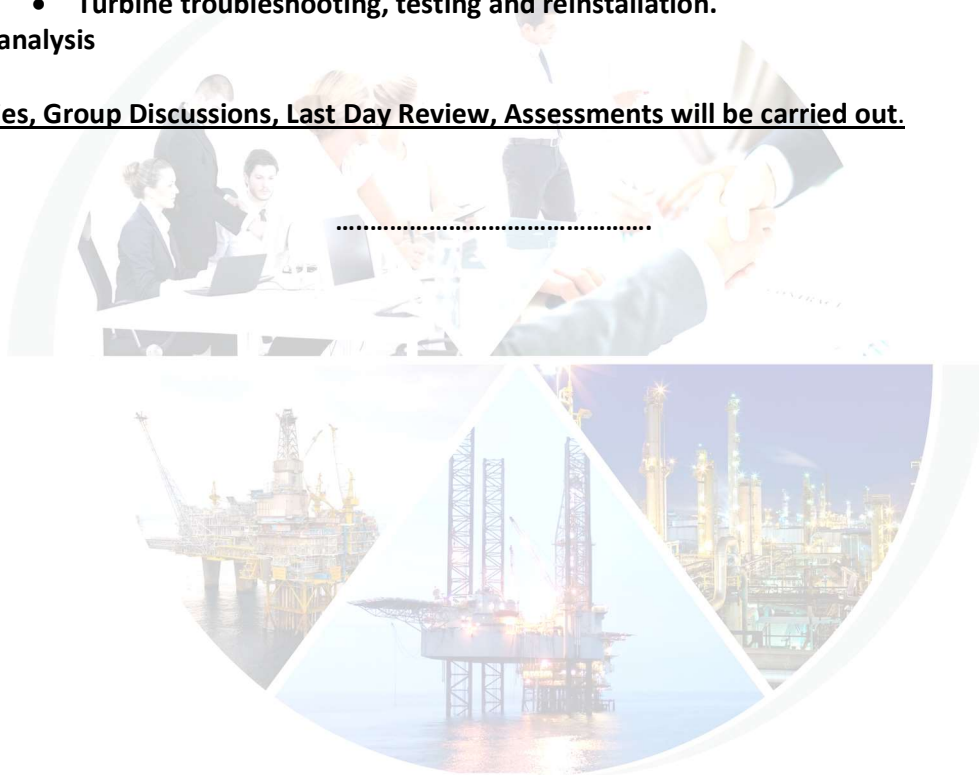
Day 5

Turbine Maintenance.

- GT operating principles, components and characteristics.
- Turbine operating checks & Performance monitoring.
- Shaft, bearings and seals maintenance.
- Blades and nozzles maintenance.
- Shaft sealing system.
- Hydraulic and pneumatic systems maintenance.
- Cooling water system and water injection system maintenance.
- Starting system maintenance.
- Ducting and valves maintenance.
- Turbine troubleshooting, testing and reinstallation.

Vibration analysis

Case Studies, Group Discussions, Last Day Review, Assessments will be carried out.



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