

Training Title

Centrifugal Compressors & Turbines: Design Operation and Maintenance & Failure Analysis

Training Duration

5 days

Training Certificate

Define Management Consultants Certificate of course completion will be issued to all attendees.

Training Venue and Dates

Centrifugal Compressors & Turbines: Operation, Maintenance & Failure Analysis	5 days	02-06 May 2010	\$3,300	Dubai
Centrifugal Compressors Maintenance & Failure Analysis	5	01-05 August 2010	\$3,300	Amman, Jordan

Training will be held at any 5 Star Hotels. Exact venue will be informed later

Training Fees

- 3300\$ per participant for Public Training including Course Materials/Handouts, Tea/Coffee, Refreshments & International Buffet Lunch
- Training will be held at any 5 Star Hotels

Course Description

Compressors and Turbines play a very essential role in many petrochemical and industrial plants. Turbomachinery in general runs at very high speeds, exposed to high temperature. The compressor operation is confined between the Surge and Stonewall limits. The compressor performance also is affected by the variation in operating conditions. Elevated temperature and large centrifugal stresses make the gas turbine operating under very critical conditions requires very complicated monitoring and protection systems. The above very sever operating conditions enhances the machines deterioration. Accurate instrumentation, monitoring, troubleshooting and maintenance programs are essential for maintaining and increasing the available time of the machines. Understanding and learning turbomachinery more deeply help smooth and free trouble operation.

During the course the design, performance, operation limits and control system are going to be addressed thoroughly. Parameters affects the above will also be discussed during the course. Troubleshooting turbines and compressors techniques will be covered in the course.

Course Objectives

- Familiarize participant of different turbines and compressors design
- Learn how different design parameter affects the machines performance and operation
- Familiarize participant of the different types of gas turbines and their application
- To deepen the participants understanding of the limits of the compressor and turbine operation
- Enable participants to read and calculate the performance curves of both turbine and compressor
- To familiarise the participant with control, and protection systems of turbomachinery systems

Who Should Attend

Engineers and Technicians working on turbomachinery, turbines and compressors are the ones to attend this course.

Course Outline

The Following Topics will be covered in this course over five days

Outlines:

Ch 1 Centrifugal Compressor Design and Construction

Function of Compressor components

Compressor Casing

Casing

Diaphragms

Nozzles

Compressor Rotor

Shaft

Impellers

Balancing Piston

Thrust Collar

Compressor arrangements

Auxiliary Systems

Compressor Seals

Compressor Bearings

Lubrication Systems

Loop Oil Systems
Moisture Separation System

Ch2 Centrifugal Compressor Performance & Control

The Performance Curves

- Compressor map
- Limits of Flow rates
 - Surge line and Stone line
- Limits of operating speed
 - First and second critical frequency
- Effect of speed variation
- Effect of inlet conditions
- Effect of gas molecular weight
- Volume ratio effect
- Performance of different types of compressors
- How compressor components affect performance
- Performance estimation

Compressors Control System

- Capacity Regulation System
- Anti - Surge control system
- Vibration control system
- Alarm and trip System

Ch 3 Gas Turbines types and Applications

- Gas Turbine Classifications
 - Design Types
 - Frame type Heavy-Duty
 - Aircraft-derivative Type
 - Industrial Type
 - Small Gas Turbines
 - Micro-Turbines
 - Number of Shafts
 - Drive Configurations
 - Turbine Cycles

Ch 4 Gas turbine Performance and Control

Performance

- Thermodynamic principles
- The Bryton Cycle
- Combined Cycle
- Factors affecting Gas Turbine Performance
- Performance Enhancement

Performance Degradation

Control and Protection

Total train Control and Protection Objectives

Start-up and Shutdown sequencing

Gas Turbine Control

Protection Systems

Ch 5 Troubleshooting and Maintenance

Non Destructive Inspection

Destructive Testing

Troubleshooting

Principles of troubleshooting

Lubrication systems

Seals System

Cleaning and Flushing

Alignment and Balancing

Condition monitoring systems

Pressure and temperature measurements

Effective Diagnoses systems

Vibration Analysis

Auxiliary System monitoring

Repair vs. Replacement

Component Repairs

Component Enhancement

Coatings

Case Studies & Discussions
