

**Training Title**

**CENTRIFUGAL PUMP SELECTION, CONSTRUCTION, OPERATION, MAINTENANCE, REPAIR & TROUBLESHOOTING**

**Training Duration**

**5 days**

**Training Venue and Dates**

ME190	Centrifugal Pump Selection, Construction, Operation, Maintenance, Repair & Troubleshooting	5	10 – 14 November, 2019	\$4,250	Dubai, UAE
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**In any of the 5 star hotels. The exact venue will be informed once finalized.**

**Training Fees**

- **4,250 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch.**

**Training Certificate**

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

**TRAINING DESCRIPTION**

This 5-day course offers delegates a comprehensive overview of the design, construction, control, operation and troubleshooting of compressors of the type normally found in the oil, gas, and other process industries.

The In-house Certification training course on 'Compressors and Control-Operation and Troubleshooting' will be help in-house in the client premises. By Bi-lingual instructor for production department

The course describes the principles of operation of the compressor and how, through a combination of the physical constraints both on the gas being processed and the materials of construction of the compressor, the design is adapted to a number of different configurations to meet numerous needs.

This course defines functions, operation and condition monitoring for most of all types of centrifugal compressors. It also considers and discusses performance and maintenance requirements of compressors.

The operators and supervisors should understand the process, as well as the advantages and disadvantages of each compressor configuration, in order to be able to operate their plant.

This course places your foot on the compressor, components, functions, performance and adequate application for Control-Operation and Troubleshooting'

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## **TRAINING OBJECTIVES**

**At the end of this training module, the participants are able to:**

- Estimate the value of the main operating parameters of these machines
- Understand how these parameters vary when the working conditions of the
- The effect of the process system on compressor performance
- The compressor performance - the curve, concepts and relationships
- Basic understanding of the application, sizing,
- Operation and maintenance of compressors.
- Compressor inspection, monitoring control and troubleshooting
- Describe the purpose of a seal, bearings, and auxiliaries system
- Basic understanding the compressor driver and selection

## **WHO SHOULD ATTEND?**

The programmer will be of great interest to whom responsible for compressor plant operation, process and production staff.

- Process engineers, design engineers, consulting engineers, plant engineers, project managers, maintenance managers, production staff, operators, Maintenance staff, O & M , facility managers and technicians and technologists
- The programmer will be of great interest to chemical oil and gas. Process industries, industries, manufacturing plants, and others industries and organizations that must use compressors.

## **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

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## **DAILY OUTLINE**

### **DAY 1**

#### **Type and Characteristics**

- Compression Methods
- Compressor types

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- Chart of compressor types

### **Centrifugal compressor components**

- Casing
- Diaphragm
- Rotor assembly
- Impellers
- Balancing drum
- Bearings
- Seals
- Gears system

### **Compressor performance**

- Compression Ratio
- Discharge temperature
- Isentropic compression process

### **Reciprocating compressor**

- Principle of operation
- Main components
- Compressor valves
- Pacing and seal
- Lubrication and cooling

### **Compressor Specifications and selection**

#### **Design Consideration**

#### **Operating Condition**

#### **1. Fluid properties**

- a) Gas Composition-
- b) Corrosiveness-
- c) Fouling tendency-
- d) Liquid in gas stream
- e) Inlet pressure
- f) Discharge pressure -
- g) Inlet temperature
- h) Discharge temperature

#### **2. Mechanical design of compressor**

1. Casing and cylinder
2. Piping flanges and rating –
3. Shaft and piston rod sealing
4. Lube oil and seal oil system

#### **3. Compressor selection**

- General process considerations
- Advantages of integrally geared compressor

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- Disadvantages of integrally geared compressors
- Conventional compressor
- Special considerations
- Case studies

## DAY 2

### **Seal Systems**

1. Lube oil and oil seal systems
2. Wet seal
3. Labyrinth seal
4. Carbone seal
5. Mechanical seal
6. Dry seal
  - a. Seal Design
  - b. Types of Dry Gas Seals
  - c. Evaluation

### **Bearing and lubrication system**

- Lubrication types
- Lubrication system and components
- Oil quality and replacement

### **Cooling system**

- Water and air cooling
- Intercooler
- After cooler
- Control the cooling

## DAY 3

### **Control Systems**

- Centrifugal compressor operation
- Compressor performance and efficiency
- Slope of the centrifugal compressor head curve
- Stonewall
- Surge
- Surge control
- Surge Prevention Systems
- Surge Identification
- Liquid Entrainment
- Compressor Control and protection

### **Process of baselining**

- Power and energy
- Unloadered and part-load operation
- Pressure measurement locations

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- Estimating pressure drop
- Energy cost of unloaded operation
- Leak load
- Estimate leak load

#### **DAY 4**

#### **Maintenance and troubleshooting**

##### **Preventive Maintenance:**

- A. Oil
- B. Air Intake Filter-Muffler
- C. Coalescing Filter
- D. Condensate Drain Canister
- E. Pump-Up Times
- F. Leaks

##### **Maintenance activities**

- Off-design Operation
- Rotor Dynamics
- Rotor Balancing
- High Speed Balance
- Rotor Stability
- Avoiding Surge
- Surge Identification
- Liquids
- Compressor Analysis
- Compressor Valve Failures and Leaking Valves
- Restriction Losses
- Scrubbers:
- Pulsation dampener

##### **Alignment**

- Importance of alignment
- Alignment principles
- Misalignment measurements
- Types of misalignment
- Straight edge and feeler gauge
- Rim and face
- Reverse dial indication
- Laser alignment
- Mathematical alignment formula calculations
- Graphical solutions
- Soft foot correction and tolerances

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- Soft foot definition
- Effects of soft foot
- Types of soft foot
- Measuring soft foot
- Correcting soft foot

**DAY 5**

**Compressor monitoring and troubleshooting**

**Condition monitoring**

- Operation parameters
- History data
- Oil analysis
- Vibration analysis
- Leak test
- Balancing
- Surge

**Troubleshooting**

- Compressor will not start
- Motor runs for only a few seconds or “chuggs”.
- Compressor head runs but will not pressurize to 100 PSI.
- Compressor cycles with no air being used
- Moisture indicator is pink.
- Excessive oil use.
- Bearing noise
- Excessive vibration

NOTE:

**Pre & Post Tests will be conducted**

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

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