



# Maintenance Of Gas Compressors



## Introduction:

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The course will introduce delegates to the various types of compressors and associated terminology. Centrifugal and positive-displacement compressors, packing, mechanical seals and sealing systems, bearings and couplings will all be discussed. The application of the different types of compressors will be discussed along with their suitability for different operational duties. Compressor operation, troubleshooting and maintenance will be dealt with in depth.

The course covers how these machines work on process, mechanical aspects, wear, lubrication and troubleshooting by vibration analysis and other techniques. The course provides participants with knowledge for inspecting and monitoring compressors, and details how to make fault detections and diagnoses. Emphasis is placed upon the importance of a combined condition monitoring and strip-down inspection approach to maintenance. Extensive use is made of case study material to underline the key aspects of the course and to give the delegates exposure to current best practice.

## Who Should Attend?

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This course is intended for engineers, supervisory and technicians, foremen and technical staff involved in the maintenance and inspection of gas compressors.

## Course Objectives:

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By the end of this course delegates will be able to:

- An understanding of the different types of gas compressors.
- Will be able to monitor compressor efficiency, availability and reliability.
- The ability to confidently overhaul the subject Off Gas Compressors.
- Be able to troubleshoot compressor problems.

## Course Outline:

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### Maintenance Concepts & Control

- Overview of Off Gas Compressors
- Types of Off Gas Compressors
- Cost of ownership

### Maintenance Theories and Strategies

- Breakdown, Preventive & Proactive Strategies
- Detection, Analysis, Correction & Verification, RCA

### Centrifugal Compressors Operation

- Compressors material selecting and testing, Installation & Commissioning
- Compressors start-up and testing, Pressure, Head, Flow & Compressor Curves
- Minimum flow protection, Compressor capacity control

### Centrifugal Compressor Maintenance

- **Centrifugal Compressor Maintenance**
- Mechanical seals, Couplings and Alignment
- Causes of failure, Compressors Maintenance Philosophy
- Maintenance & Troubleshooting, Duty/Standby change-over philosophy

### **Compressors: Centrifugal and Axial Compressors Construction**

- Compressor installation, Lube and Seal oil systems
- Compressor shaft seals – Mechanical & Dry Gas Seals
- Tilt-Pad Bearings

### **Compressor commissioning & Control**

- Compressor start-up and testing, Compressor performance
- Compressor capacity control & anti-surge protection

### **Compressor Maintenance**

- Effect of fouling, Overhaul Philosophy
- Operation and Maintenance of Cryogenic Expanders

### **Reciprocating Compressors & Gas Turbines Reciprocating Compressors**

- Types of Reciprocating compressors
- Valves and unloaders, Fixtures, Piston and rings
- Piston packings, Alignment, Capacity control
- Overhaul philosophy, Effect of gas quality on operation

### **Electric Motor Drives**

- Types of Electric Motor
- Start-up and testing, Operating profile, AC supply systems
- Component parts, Repair of components

### **Troubleshooting & Fault Diagnosis**

- Condition monitoring, vibration, thermography, oil analysis, ultrasound
- Performance monitoring
- Lubrication – Hydrodynamic (Fluid Film) & Elastohydrodynamic
- Bearing types & selection

### **Failure Analysis**

- Overview of API RP 571, Fatigue and fracture
- Corrosion & Material loss mechanisms
- Trouble Shooting & Predictive Maintenance

### **Vibration Analysis**

- Vibration concepts, On-line/Off-line monitoring
- Frequency analysis, Enveloping/Demodulation

### **Diagnosis of Rotating Unbalance**

- What is rotating unbalance? Causes
- Types of Unbalanced: Single plane, Couple & Dynamic
- Diagnosis of unbalance, Eccentricity of rotating components
- Forces associated with unbalance, Types of balancing & balancing machines
- Recommend vibration and balance tolerance

### **Diagnosing Misalignment**

- Different types misalignment: Parallel (offset), Angular, Combined
- Diagnosis and Repair, Alignment techniques

### **Diagnosis of Gear problems**

- Different types of Gears, Gear Mesh Frequencies
- Tooth wear/load, Misalignment/Eccentricity of gears
- Significance of gear sidebands
- Diagnosis Mechanical looseness problems, FFT vibration symptoms

- Diagnosis Belt problems
- Detecting worn or damaged belts/pulleys, Misaligned or eccentric pulleys

### Diagnosing Bearing Problems

- Mounting & Removal, Fits & Tolerances
- Life of Bearings, Failure Modes - Diagnosis & Repair
- Stages of defects
- Examples of Failed Bearings, How bearings fail
- Inspection & Monitoring