QUEST
Professional Center

PROFESSIONAL TRAINING COURSE

Course No. 2035

Centrifugal Compressors Operation, Maintenance & Troubleshooting Training Course

MECHANICAL ENGINEERING
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION
5 Days

DELIVERY
Classroom

Course Overview

The Centrifugal Compressors Operation, Maintenance & Troubleshooting Training Course provides a comprehensive and practical framework for the operation, maintenance, performance monitoring, and troubleshooting of centrifugal compressors used in critical industrial and process applications. The programme is designed to strengthen participants' technical capabilities in maintaining compressor availability, efficiency, reliability, and safe operation.

The course examines centrifugal compressor construction, operating principles, aerodynamic performance, and major components, including impellers, diffusers, shafts, bearings, mechanical seals, labyrinth seals, couplings, casings, inlet and discharge systems, lubrication systems, and control systems. Participants will develop a clear understanding of compressor performance curves, pressure ratio, flow, efficiency, operating range, and process requirements.

Particular emphasis is placed on diagnosing common and complex compressor problems, including surge, choke, high vibration, bearing failures, seal leakage, fouling, erosion, corrosion, rotor imbalance, shaft misalignment, excessive temperature, lubrication problems, and performance deterioration. Participants will learn to integrate operating data, vibration trends, process parameters, inspection findings, and maintenance history to identify failure mechanisms and determine appropriate corrective actions.

The programme also addresses preventive and predictive maintenance, condition monitoring, compressor performance testing, inspection and overhaul planning, lubrication and sealing systems, reliability improvement, spare parts, and root cause failure analysis. Practical case studies and troubleshooting exercises enable participants to develop effective maintenance and troubleshooting strategies for critical centrifugal compressors.

Objectives

- By the end of this training course, participants will be able to:
- Analyze the operating principles and construction of centrifugal compressors.
- Evaluate compressor performance using pressure, flow, temperature, speed, and efficiency parameters.
- Assess compressor operating conditions against process requirements.

- Identify aerodynamic, mechanical, and operational failure mechanisms.
- Diagnose surge, choke, fouling, and unstable operating conditions.
- Evaluate the condition of rotors, impellers, bearings, seals, and couplings.
- Analyze vibration patterns associated with centrifugal compressor faults.
- Evaluate lubrication and sealing system performance.
- Identify the causes of compressor efficiency and capacity deterioration.
- Apply systematic troubleshooting techniques to complex compressor problems.
- Develop preventive and predictive maintenance strategies for centrifugal compressors.
- Apply condition monitoring techniques to assess compressor health.
- Optimize compressor inspection, maintenance, and overhaul activities.
- Conduct root cause analysis of recurring compressor failures.
- Establish reliability and performance indicators for centrifugal compressors.
- Develop an integrated centrifugal compressor maintenance and troubleshooting strategy.

Who Should Attend

This course is designed for mechanical engineers, rotating equipment engineers, maintenance engineers, reliability engineers, compressor specialists, and maintenance managers responsible for centrifugal compressor operation, maintenance, performance, and reliability.

It is also suitable for operations engineers, condition monitoring specialists, vibration analysts, inspection engineers, lubrication specialists, maintenance planners, equipment specialists, supervisors, and experienced technicians involved in compressor troubleshooting and maintenance.

The programme is particularly relevant to professionals working in oil and gas, refineries, petrochemicals, power generation, chemical processing, LNG facilities, energy, utilities, manufacturing, and other process industries where centrifugal compressors are critical to production.

Learning Outcomes

- Upon completion of the course, participants will be able to:
- Explain centrifugal compressor operating principles and major component functions.
- Interpret compressor performance curves and operating characteristics.
- Evaluate compressor pressure ratio, flow, efficiency, and operating range.
- Identify aerodynamic and mechanical causes of compressor performance problems.
- Diagnose surge and choke conditions and their contributing factors.
- Analyze vibration patterns associated with compressor faults.
- Assess the condition of impellers, rotors, bearings, seals, shafts, and couplings.
- Identify causes of mechanical and labyrinth seal deterioration.
- Evaluate lubrication system performance and bearing operating conditions.
- Assess the impact of fouling, erosion, corrosion, and deposits on compressor performance.
- Apply structured troubleshooting techniques to complex compressor failures.
- Develop condition monitoring programmes for critical centrifugal compressors.
- Select appropriate preventive, predictive, and corrective maintenance actions.
- Plan compressor inspection, overhaul, repair, and maintenance activities.
- Conduct root cause analysis of recurring compressor failures.
- Prepare a comprehensive maintenance, reliability, and troubleshooting plan for centrifugal compressors.

Course Outline

DAY 01

Centrifugal Compressor Fundamentals, Operation and Performance

- Principles of centrifugal compression
- Compressor types and industrial applications
- Compressor construction and major components
- Impellers, diffusers, casings, shafts, and rotors
- Bearings, couplings, and sealing systems

DAY 01 — CONTINUED

- Compressor performance curves
- Pressure ratio, flow, temperature, and efficiency
- Operating range and performance limitations
- Process conditions and compressor operating requirements

PRACTICAL APPLICATION

Evaluating centrifugal compressor performance and operating conditions

DAY 02

Compressor Maintenance and Component Reliability

- Centrifugal compressor maintenance strategies
- Preventive and predictive maintenance
- Rotor and impeller inspection
- Bearings and bearing reliability
- Mechanical and labyrinth seals
- Shaft and coupling inspection
- Lubrication and oil systems
- Compressor casing and internal component inspection
- Maintenance quality and equipment assembly requirements

PRACTICAL APPLICATION

Developing a maintenance programme for a critical centrifugal compressor

DAY 03

Compressor Troubleshooting and Failure Diagnosis

- Systematic compressor troubleshooting methodology
- Surge and choke conditions
- Aerodynamic instability and operating limitations
- Excessive vibration and rotor dynamic problems

DAY 03 — CONTINUED

- Imbalance and shaft misalignment
- Bearing overheating and premature failure
- Seal leakage and sealing system problems
- Fouling, erosion, corrosion, and deposits
- Capacity and efficiency deterioration

PRACTICAL APPLICATION

Diagnosing a complex centrifugal compressor failure

DAY 04

Condition Monitoring, Performance Testing and Reliability Improvement

- Compressor condition monitoring principles
- Vibration measurement and analysis
- Bearing temperature and lubrication monitoring
- Pressure, flow, temperature, and performance monitoring
- Compressor performance testing
- Early detection of degradation
- Failure trend and maintenance history analysis
- Reliability-centered maintenance for compressors
- Maintenance interval and intervention optimization

PRACTICAL APPLICATION

Developing a compressor condition monitoring and reliability improvement programme

DAY 05

Advanced Troubleshooting, Overhaul and Reliability Management

- Root cause analysis of recurring compressor failures
- Compressor inspection and overhaul planning
- Repair and replacement decisions
- Corrective and preventive action management
- Spare parts and critical component management
- Reliability, availability, and downtime analysis
- Maintenance cost and lifecycle performance
- Compressor reliability improvement programmes
- Continuous improvement and maintenance optimization
- Final Integrated Workshop: Developing a comprehensive Centrifugal Compressor Operation, Maintenance & Troubleshooting Strategy for a critical compressor system

Register or Request More Information

Course page: https://quest-training.com/courses/centrifugal-compressors-operation-maintenance-troubleshooting-training-course
Website: https://quest-training.com
Email: info@quest-training.com
Phone: +905016771440