



Compressor & Pump Technology
Controller Training Course





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Introduction

This compressor and pump technology control program provides a comprehensive understanding of the various types of reciprocating, rotary, and dynamic compressors and pumps. Necessary equipment such as trunk piston, sliding crosshead piston, diaphragm, rotary screw, straight lobe, sliding vane, liquid ring, centrifugal, and axial compressors, along with piston pumps, plunger pumps, rotary pumps, screw pumps, two- and three-lobe pumps, cam pumps, vane pumps, bellows-type metering pumps, diaphragm pumps, canned motor pumps, and centrifugal pumps are thoroughly discussed.

Bearings receive detailed coverage as well. Attendees of this pumps and compressors training course will delve into the characteristics, selection criteria, sizing calculations, sealing arrangements, common problems, repair techniques, and the preventive and predictive maintenance of these crucial devices.

The compressor and pump technology control course is crucial for those working with such equipment, as it not only covers the operational aspects of compressors and pumps but also imparts the necessary guidelines and rules needed for their successful application.

Compressor Training - Understanding Equipment and Application

Through this compressor training, participants in the compressor and pump technology control course will acquire concepts related to air pump technology and technologies relevant to oil and gas pumps, ensuring they understand how to maximize the efficiency of these systems in practical scenarios.

Targeted Groups

- Operation and Maintenance Operators.
- Supervisors and Technicians.
- Facility Engineers.
- Utility Engineers.
- This compressor and pump technology control course is for anyone requiring a working-level knowledge of rotating equipment and compressors.
- Technical Professionals deal with condition monitoring, reliability, and integrity analysis.

Course Objectives

By the end of this compressor and pump technology control course, participants will be able to:

- Maximize the efficiency, reliability, and longevity of all types of compressors, pumps, and bearings.
- Size and select one of the various types of dynamic and positive displacement compressors and pumps using the performance characteristics and the selection criteria that you learned in this program.
- Carry out diagnostic testing and inspection of critical components with the knowledge of standard failure modes of compressors, pumps, and bearings by applying advanced fault detection techniques.
- Select bearings and lubrication, compressor and pump sealing arrangements, meet commissioning requirements, conduct vibration and used oil analyses, troubleshoot, provide predictive and preventive maintenance, enhance reliability, and reduce cost.
- Determine the maintenance required to minimize compressor and pump downtime and operating costs and maximize their efficiency, reliability, and longevity.
- Gain a thorough understanding of compressor and pump characteristics and compressor surge and surge prevention systems.
- Understand all the causes of failures in compressors and pumps.
- Determine all the design features that improve the efficiency and reliability of all compressors and pumps.
- Design different types of compressors and pumping systems.
- Gain a thorough understanding of the various types of sealing arrangements used in compressors and pumps.

Targeted Competencies

At the end of this compressor and pump technology control course, the target competencies will be able to:

- Basic design.
- Specification.
- Selection criteria.
- Sizing calculations.
- Sealing arrangements.
- Common operational problems.
- All diagnostics, troubleshooting, and maintenance are required for this equipment, including vibration analysis and used oil analysis.
- Compressor and pump drivers.

Course Content

Unit 1: Gas Laws, Compressor Types and Applications

- Perfect and imperfect gasses.
- What are compressor polytropic efficiency and power requirements?
- Understand compressor volumetric flow rate and volumetric efficiency.
- Rotary and reciprocating compressors.
- Learn about dynamic compressors centrifugal and axial.
- Compressor performance measurement.
- Understand receivers, compressor control, and compressor unloading systems.
- Preventive maintenance and housekeeping.

Unit 2: Positive Displacement Compressors

- Performance of positive displacement compressors.
- Reciprocating compressors.
- Understand reciprocating compressors, troubleshooting, and maintenance.
- Diaphragm compressors.
- Understand how rotary screw compressors and filter separators work.
- Straight lobe compressors.
- Learn about Recent developments in liquid/gas separation technology.

Unit 3: Dynamic Compressors

- Dynamic compressor technology.
- Centrifugal and axial compressors.
- Learn about simplified equations for determining the performance of dynamic compressors.
- What are centrifugal compressors - components, performance characteristics, balancing, surge prevention systems, and testing?
- Choking and anti-choking systems.
- Understand compressor auxiliaries, off-design performance, stall, and surge.

Unit 4: Dynamic Compressors Performance, Compressor Seals, and Compressor System Calculations

- Dynamic compressors performance.
- Understand surge limit, stonewall, prevention of surge, and anti-surge control systems.
- Compressor seal systems.
- Gas seals, liquid seals, liquid bushing seals, contact seals, restricted bushing seals, and seal liquid leakage systems.
- Learn about dry seals, advanced sealing mechanisms, and magnetic bearings.
- Compressor system calculations.
- Size of compressor system components, sizing of gas receiver.

Unit 5: Bearings, Lubrication, Vibration Analysis, and Predictive Maintenance

- Understand bearings, types of bearings, and thrust bearings.
- Learn about lubrication, the viscosity of lubricants, non-Newtonian fluids, and greases.
- Use oil analysis.
- Understand vibration analysis and predictive maintenance.
- Vibration causes resonant frequency and vibration in predictive maintenance and diagnostics.
- Diagnostic testing.

Unit 6: Pump Categories and Centrifugal Pumps

- Pump categories: Dynamic centrifugal and positive displacement reciprocating and rotary.
- What are centrifugal pumps, and how do operation, casings and diffusers, hydrostatic pressure tests, impellers, hydraulic balancing devices, mechanical seals, minimum flow requirement, performance characteristics, cavitation, and net positive suction head?

Unit 7: Centrifugal Pump Mechanical Seals

- Centrifugal pump mechanical seals, components, temperature control, seal lubrication/leakage, applications, types of mechanical seals, standard failure modes of seals, and seal refurbishment.
- Maintenance is recommended for centrifugal pumps.
- Learn about vibration analysis and predictive maintenance.

Unit 8: Positive Displacement Pumps

- Reciprocate pumps, piston pumps, plunger pumps, rotary pumps, screw pumps, two- and three-lobe pumps.
- Learn about Cam pumps, vane pumps, and bellows-type metering pumps.
- Diaphragm pumps.
- Understand canned motor pumps and sealless pump motors.

Unit 9: Troubleshooting of Pumps

- Understand pump maintenance, inspection, overhaul, and diagnosis of pump troubles.
- Troubleshooting of centrifugal pumps.
- Troubleshooting of rotary pumps.
- Troubleshooting of reciprocating pumps.
- Water hammer.
- Bearings.
- Use oil analysis.
- Smart instrumentation.

Unit 10: Pump Selection

- Pumping system calculations.
- Learn about the design and selection of different pumping systems for the oil and gas industry and the power generation industry.
- Vibrate analysis and predictive maintenance.
- Learn control valve selection, cavitation, and noise.
- Actuators, positioners, and accessories.
- Diagnostics of pumping systems.
- Pump drivers.
- Motors.
- Variable-frequency drives.