

€ TRAINING

Compressor and Pump Technology





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Introduction:

This training program provides comprehensive instruction on the design, operation, and maintenance of compressors, pumps, and related systems. It equips individuals with the knowledge and skills needed to optimize performance, reduce downtime, and enhance the overall reliability of compressor and pump systems in various industrial applications.

Program Objectives:

At the end of this program, participants will be able to:

- Master techniques to maximize the efficiency, reliability, and lifespan of compressors, pumps, and bearings.
- Apply selection criteria to size and choose from dynamic and positive displacement compressors and pumps effectively.
- Utilize advanced fault detection methods for diagnosing common failure modes in compressors, pumps, and bearings.
- Implement strategies for commissioning, vibration analysis, and used oil analysis to enhance reliability and reduce costs.
- Develop maintenance plans to minimize downtime and operating costs while optimizing efficiency and reliability.
- Understand compressor and pump characteristics, including surge prevention systems and failure causes.
- Identify design features that enhance the efficiency and reliability of compressors and pumps.
- Design various compressor and pumping systems while understanding the selection and application of sealing arrangements.

Targeted Audience:

- Operation and Maintenance Operators.
- Supervisors & Technicians.
- Facility Engineers.
- Utility Engineers.
- Technical Professionals dealing with condition monitoring, reliability and integrity analysis.

Program Outlines:

Unit 1:

Gas Laws, Compressor Types, and Applications:

- Perfect and Imperfect Gases.
- Compressor Polytropic Efficiency and Power Requirements.
- Compressor Volumetric Flow Rate and Volumetric Efficiency.
- Rotary and Reciprocating Compressors.
- Dynamic Compressors Centrifugal and Axial.
- Compressor Performance Measurement.
- Receivers, Compressor Control, and Compressor Unloading Systems.
- Preventive Maintenance and Housekeeping.

Unit 2:

Positive Displacement Compressors:

- Performance of Positive Displacement Compressors.
- Reciprocating Compressors.
- Reciprocating Compressors Troubleshooting and Maintenance.
- Diaphragm Compressors.
- Rotary Screw Compressors and Filter Separators.
- Straight Lobe Compressors.
- Recent Developments in Liquid/Gas Separation Technology.

Unit 3:

Dynamic Compressors:

- Dynamic Compressor Technology.
- Centrifugal and Axial Compressors.
- Simplifies Equations for Determining the Performance of Dynamic Compressors.

- Centrifugal Compressors - Components, Performance Characteristics, Balancing, Surge Prevention Systems and Testing
- Choking, and Anti-Choking Systems.
- Compressor Auxiliaries, Off-Design Performance, Stall, and Surge.

Unit 4:

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

- Dynamic Compressors Performance.
- Surge Limit, Stonewall, Prevention of Surge, Anti-Surge Control Systems.
- Compressor Seal Systems.
- Gas Seals, Liquid Seals, Liquid Bushing Seals, Contact Seals, Restricted Bushing Seals, Seal Liquid leakage System.
- Dry Seals, Advanced Sealing Mechanisms, and Magnetic Bearings.
- Compressor System Calculations.
- Sizing of Compressor System Components, Sizing of Gas Receiver.

Unit 5:

Bearings, Lubrication, Vibration Analysis, and Predictive Maintenance:

- Bearings, Types of Bearings, Thrust Bearings.
- Lubrication, Viscosity of Lubricants, Non-Newtonian Fluids, and Greases.
- Used Oil Analysis.
- Vibration Analysis and Predictive Maintenance.
- Vibration Causes, Resonant Frequency, Vibration in Predictive Maintenance, Diagnostics.
- Diagnostic Testing.

Unit 6:

Pump Categories, and Centrifugal Pumps:

- Pump Categories: Dynamic Centrifugal and Positive Displacement Reciprocating and Rotary.
- Centrifugal Pumps: 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, Common Failure Modes of Seals, Seal Refurbishment.
- Maintenance Recommended for Centrifugal Pumps.
- Vibration Analysis and Predictive Maintenance.

Unit 8:

Positive Displacement Pumps:

- Reciprocating Pumps, 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, Seal-less Pump Motors.

Unit 9:

Troubleshooting of Pumps:

- Pump Maintenance, Inspection, Overhaul, Diagnoses of Pump Troubles.
- Troubleshooting of Centrifugal Pumps, Troubleshooting of Rotary Pumps, Troubleshooting of Reciprocating Pumps.
- Water Hammer.
- Bearings.
- Used Oil Analysis.
- Smart Instrumentation.

Unit 10:

Pump Selection:

- Pumping System Calculations.
- Design and selection of Different Pumping Systems for the Oil and Gas Industry, and the Power Generation Industry.
- Vibration Analysis and Predictive Maintenance.
- Control Valve Selection, Cavitation, and Noise.
- Actuators, Positioners, and Accessories.
- Diagnostics of Pumping Systems.
- Pump Drivers, Motors, Variable-Frequency Drives.