

Training
Course

**Pumps and Compressors
Operation, Maintenance, and
Troubleshooting**



Course Plan

Introduction

This course covers the construction, design, operations, and maintenance of compressors and rotary/ centrifugal/ reciprocating pumps

Course Objectives:

- ✓ Describe the operation of centrifugal and positive displacement pumps including pump design aspects, laws, performance comparisons, characteristic curves, and performance testing
- ✓ Test rotary pump performance and apply maintenance and troubleshooting techniques
- ✓ Identify reciprocating pump types and maintenance
- ✓ Identify compressor types and how they operate To apply the various methods of pump alignments

Who Should Attend?

- ❖ Individuals who are working in the pipeline industry, such as pipeline engineers, pipeline operators and technicians, pipeline maintenance personnel, pipeline safety professionals, pipeline construction contractors, and the emergency response personnel.



- ❖ Different levels of technical expertise and can cover a range of topics, from basic pipeline operations to advanced troubleshooting and failure analysis.

Training Methods:

- ✓ Online Video material.
- ✓ Presentation.
- ✓ Live Interactive sessions.
- ✓ Course presenter will make extensive use of all tools that will be needed for the virtual environment.
- ✓ Questions & Answers

Course Outline:

Day One

Introduction to Pumps, Compressors, Operation and Maintenance Issues

- Welcome and Introduction
 - Course objectives and outline
 - Participant introductions.
- Introduction to Compressors and Pumps
 - Definition and Purpose
 - Overview
 - Key applications in various industries

- How compressors work: increasing gas pressure by reducing volume
- How pumps work: moving liquids by adding energy to the fluid
- Types of Compressors
- Types of Pumps
- Important parameters: flow rate, pressure, efficiency, power consumption
- Application Examples
- Operation of Compressors and Pumps
 - The need for steps to avoid damage during start-up and shutdowns
 - Importance of operating within specified parameters: Temperature, pressure, and fluid characteristics
 - Key performance metrics: Flow rate, pressure, efficiency, power consumption
 - Adjustments to maximize performance and minimize energy consumption
 - Ensuring safety during operations
 - Emergency procedures and handling unexpected issues
 - Managing emissions and leaks
 - Compliance with environmental regulations
- Common Maintenance Issues in Compressors and Pumps
 - Wear and tear of components (seals, bearings, impellers, rotors)
 - Lubrication problems leading to friction and overheating
 - Clogging and blockages in fluid pathways
 - Symptoms of Malfunction (Unusual noises and vibrations, Decreased performance and efficiency, Leakage of fluids or gases)
 - Identifying and diagnosing issues

- Preventive Maintenance Strategies
- Using monitoring systems to detect early signs of problems
- Safety Considerations: Proper use of personal protective equipment
- Documentation and Record-Keeping
- Summary of key concepts covered
- Open floor for questions and discussion

Day Two

Construction, Design, Operations, and Maintenance of Centrifugal Pumps

- Brief introduction of the day's agenda
- Basic Principles of Operation: How centrifugal pumps work
- Key components:
 - Impeller
 - Casing
 - Shaft
 - Seals
 - Bearings
- Design Aspects
 - Types of impellers (open, semi-open, closed)
 - Types of casings (volute, diffuser)
 - Materials of construction and compatibility issues
- Performance Characteristics and Testing
 - Laws governing pump performance
 - Affinity laws and their applications
 - Performance metrics: flow rate, head, power, efficiency
 - Characteristic curves

- Reading and interpreting pump curves
- Head vs. flow rate, efficiency, power consumption, and NPSH (Net Positive Suction Head) curves
- Performance Testing
- Standard testing procedures
- Analyzing test results
- Performance comparisons with other types of pumps
- Construction
 - Detailed look at the assembly process
 - Importance of precise manufacturing and quality control
- Operations
 - Operational Considerations
 - Proper start-up and shutdown procedures
 - Operating conditions: temperature, pressure, and fluid characteristics
 - Common operational issues and troubleshooting

Day Three

Centrifugal Pumps: Maintenance and Troubleshooting

- Maintenance and Troubleshooting
 - Routine Maintenance Procedures
 - Scheduled inspections and servicing
 - Lubrication and cooling requirements
 - Common Failures and Troubleshooting
 - Identifying symptoms of pump failure
 - Diagnosing issues: cavitation, vibration, noise
 - Repair techniques and best practices

- Case study
- Summary of key concepts covered
- Exercises
- Open floor for questions and discussion

Construction, Design, Operations, and Maintenance of Reciprocating Pumps

- Brief introduction of the day's agenda
- Basic Principles
 - How reciprocating pumps work
 - Key components: piston, cylinder, valves, crankshaft
 - Performance comparisons with other types of pumps
- Types of Reciprocating Pumps
 - Single-acting vs. double-acting
 - Diaphragm pumps
 - Plunger pumps
- Maintenance and Troubleshooting
 - Scheduled inspections and servicing
 - Lubrication and cooling requirements
 - Identifying symptoms of pump failure
 - Diagnosing issues: wear, cavitation, and noise
 - Repair techniques and best practices
- Case studies
- Summary of key concepts covered
- Exercises
- Open floor for questions and discussion

Day Four

Construction, Design, Operations, and Maintenance of Rotary Pumps

- Brief introduction of the day's agenda
- Basic Principles
 - How rotary pumps work
 - Key components: rotors, casing, and seals
 - Types of Rotary Pumps: Gear, Vane, Screw and Lobe pumps
- Performance Characteristics and Testing
 - Performance Metrics: Flow rate, pressure, and efficiency
 - Reading and interpreting performance curves
 - Head vs. flow rate, efficiency, power consumption
 - Analyzing test results and troubleshooting performance issues
 - Performance comparisons with other types of pumps
- Maintenance and Troubleshooting
 - Scheduled inspections and servicing
 - Lubrication and cooling requirements
 - Identifying common symptoms of pump failure
 - Diagnosing issues: wear, cavitation, and noise
 - Repair techniques and best practices
- Summary of key concepts covered
- Exercises
- Open floor for questions and discussion

Pump Alignment

- Importance of Pump Alignment
 - Types of Pump Misalignment: Angular, Parallel, and Radial Misalignments

- Methods of Pump Alignment
 - Visual Alignment
 - Dial Indicator Method
 - Laser Alignment
 - Plumb Bob Method
- Alignment Tools and Equipment
 - Overview of alignment tools (dial indicators, laser alignment systems, straightedges)
 - Proper usage and calibration of tools
- Common Alignment Issues
 - Identifying signs of misalignment (vibration, noise, excessive wear)
 - Troubleshooting common alignment problems
 - Regular monitoring and re-alignment as part of maintenance
- Summary of key concepts covered
- Exercises
- Open floor for questions and discussion

Day Five

Construction, Design, Operations, and Maintenance of Compressors

- Brief introduction of the day's agenda
- Basic Principles
 - How compressors work
 - Key components: compression chamber, valves, rotors, pistons
- Types of Compressors
 - Reciprocating compressors
 - Rotary compressors (screw, vane, lobe)

- Centrifugal compressors
- Design Aspects
 - Differences in design among types
 - Materials of construction and application suitability
- Performance Characteristics and Testing
 - Flow rate, pressure, efficiency, power consumption
 - Reading and interpreting performance curves
 - Pressure vs. flow rate, efficiency, power consumption
 - Standard testing procedures
 - Analyzing test results and troubleshooting performance issues
- Construction
 - Detailed look at the assembly process
- Operational Considerations
 - Proper start-up and shutdown procedures
 - Operating conditions: temperature, pressure, and fluid characteristics
- Case studies
- Summary of key concepts covered
- Exercises
- Open floor for questions and discussion

Training Details

Course Duration	5 Days
Pre-Schedule	17 – 21 November 2024
Venue	Dubai – Tower Plaza Hotel
Training Fees Per Person	KWD 1200 (One Thousand Two Hundred Only)
Course Fees Include	<ul style="list-style-type: none">✓ Tuition documentation✓ Curriculum and Training Handout✓ Five star Lunch✓ Completion Certificates

