XCELERATE TRAINING INSTITUTE

your learning & development partner

MECHANICAL ENGINEERING

Compressors, Pumps and Turbines Training Course

DURATION	LANGUAGE	FORMAT
5 days	English	Classroom / Online

Upcoming dates

Dates	Venue	Format	Fee
8 – 12 Feb 2027	Live online	Online (live)	€1,200
15 – 19 Mar 2027	Madrid	Classroom	€4,800
16 – 20 Aug 2027	Live online	Online (live)	€1,200

Register or ask a question

Online: x8ti.com/course/compressors-pumps-and-turbines-training-course-2/

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Compressors, Pumps and Turbines Training Course

Introduction

Introduction

Oil and Gas treatment processes and procedures need specialized equipment to provide the energy to move large quantities of liquids and gases through piping and pipelines designed for those purposes. This movement begins from the oil and gas fields through refining and processing plants, and onwards to the storage and sales points. The equipment used to move the fluids is called rotating equipment. These types of equipment are used significantly and provide an increase in pressure for both liquid and gas streams to enable the passage of fluids to the required destination.

This Xcelerate Training Institute course will introduce delegates to various types of compressors, pumps, turbines and their associated equipment, such as bearings, seals, filters, etc. This training course will also develop the technical knowledge of the operation and maintenance staff to build their confidence level in start-up, follow-up, shut down and troubleshooting.

The course defines and describes the systems and subsystems that form the turbine, the potential problems with these systems and subsystems, monitoring techniques for early detection of problems, and methods to analyze and examine the monitored variables to detect potential problems.

Learning Objectives

- Know the principles of compressor, pumps and gas turbine theory of operations
- Recognize different types of pumps, compressors and gas turbines
- Explain the functions and principles of operation of each major component of these machines and systems components
- Learn how to measure and control the performance and efficiency of these machines
- Understand and learn the principles of pump, compressor and gas turbine start-up procedures and introduce standard operating procedures for the package

Training Methodology

The Compressors, Pumps and Turbines training course will employ a variety of proven and verified learning techniques to ensure maximum understanding, comprehension and retention of the information presented. This includes lectures, presentations with active delegate participation including discussions, real-life problems and case studies.

Through an active participation in the group work and class discussions, the delegates will get adequate opportunities to increase their experience and knowledge of techniques available for equipment troubleshooting.

Benefits for Your Organization

- Know the procedure of how to maintain and inspect the compressor, pumps and gas turbine to develop skills in executing activities in a safe and right manner

- Learn and practice troubleshooting techniques for operational problems of compressors, pumps and gas turbines
- Evaluate and check turbine performance parameters during start-up and normal operation
- Analyze common turbine problems, such as vibration, temp/pressure operation, and surge

Benefits for You

- Follow the GT thermodynamic cycle and engine theory
- Demonstrate the support and auxiliary systems
- Explore the different types of combustion chamber and turbines
- Learn the recommended operating procedures
- Develop skills on troubleshooting
- Acquire knowledge about repair, inspection and diagnosis

Target Audience

- Engineering Personnel
- Technical Personnel-in-Charge of Operations and Maintenance
- Maintenance and Operation Engineers
- Supervisors
- Operators

Course Outline

Pump Introduction

- Hydraulics – A Few Basics
- Centrifugal Pump Basics
- Principle of Operation
- Pump Classifications
- Mixed Flow Pumps
- Axial Flow Pumps
- Low-pressure and High-pressure pumps
- Single-suction & Double-suction pumps
- Single-stage and Multi-stage pumps
- Volute & Diffuser pumps
- Closed impeller, open, impeller or Semi-open impeller
- Casing Construction: – Radially Split, Axially Split & Double Casing
- Wear Ring Running Clearances
- Mechanical Seals, Bearings and Couplings
- Pump Bearings

Pumps Operation Procedures

- Operating conditions
- Pump curve against piping system curve
- System curve calculation

- NPSH available and required
- Suction system configurations
- NPSH measurement
- Normal operating range
- Best operating condition
- The minimum flow rate limit
- The maximum capacity limits
- Off-design operation

Pump Troubleshooting

- Diagnoses and Findings of Pump Troubles and Records of Inspections and Repairs
- Vibration Control and Analysis
- Cavitation in pumps
- Net Positive Suction Head
- Available against required NPSH
- Symptoms of cavitation
- Effects of Cavitation’s
- Avoidance of cavitation
- Water Hammer Problems and Troubleshooting
- Shaft deflection
- Critical speed and shaft deflection
- Parameters affecting shaft deflection
- Effects of shaft deflection on Mechanical seals and bearings

Failure or Deviation Symptoms

- General Troubleshooting Guide
- Pump does not deliver
- Insufficient capacity delivered
- Insufficient discharge pressure developed
- Pump loses prime after starting
- Pump requires excessive power
- Stuffing box / mechanical seal leak excessively
- Packing / mechanical seal has short life
- Pump vibrates or noisy
- Bearing have short life
- Pump overheats and seizes

Pump Maintenance and Inspection Based on Daily Observations of Pump Operation

- Pump Installation Guidelines

Introduction to Compressors

- First Law of Thermodynamics
- Second Law of Thermodynamics

- Compressor Types and Applications
- How does a centrifugal compressor work?
- How does a positive displacement compressor work?
- Difference between dynamic and positive displacement compressor
- How screw compressor works?

Centrifugal Compressor Configurations and Components

- Casing Configuration
- Horizontally Split Compressor Casings
- Vertically Split Compressor Casings
- Compressor Impellers
- Impeller Arrangements on Compressor Shafts
- Impeller Thrust
- Balance piston
- Diffusers
- Diaphragms
- Compressor Bearings
- Radial Bearings
- Thrust Bearings
- Compressor seals: – Labyrinths, carbon rings, liquid films & dry gas seals
- Dry Gas Seals and Support Systems
- Dry Gas Versus Wet Sealing Systems

Centrifugal Compressor Control

- Performance Characteristics
- The performance curves
- Know Limits of operating speed: First and second critical speed
- Effect of inlet conditions
- Performance of different types of compressors
- Know Limits of flow rates: Surge line and stonewall line
- Surge and Surge Control
- Stonewall
- Off-design Operation
- Vibration control system
- Alarm and trip system

Centrifugal Compressor Operation

- Compressor start-up and shut down
- System Resistance
- Inlet conditions effects
- Parallel and series operation

Centrifugal Compressor Troubleshooting

- Guidelines for trouble-free centrifugal compressor operation
- Experiential Learning: Examples from recent failure incidents attributed to design defects, processing and manufacturing deficiencies, assembly errors, off-design or unintended service conditions, maintenance deficiencies, etc.
- Liquid Entrainment
- Compressor fouling
- Cleaning Centrifugal Compressors
- Compressor off-design: Performance, low rotational speeds & high rotational speeds
- Performance degradation
- Excessive vibration

Gas Turbine Basics and Introduction

- What's the gas turbine?
- Historic tips on gas turbines invention
- Brayton thermodynamic cycle
- Gas turbine as a continuous ICE
- Advantages and disadvantages of a gas turbine
- Categories of gas turbines
- Main factors affecting gas turbine performance
- General package description
- Core engine main components
- Engine support systems
- Turbine Ancillary components

Core Engine Components

Axial air compressor

- Compressor definition and function
- Principle of operation of axial flow compressors
- Axial flow compressor performance
- Stall and bleed valve
- Compressor washing

Air inlet system

- Air filter
- Inlet air conditioning system
- Primary and secondary air

Combustion chamber

- Combustion process
- Combustion chamber construction and design
- Combustor arrangements (tubular, can annular & annular)
- Combustor chamber performance

- Combustor components

Turbine stages and Exhaust

- Gas turbine configuration
- Blades arrangement and design
- High pressure and power turbines
- Turbine nozzles and blades cooling
- Exhaust duct

Engine support systems

- Starting system
- Lube oil system
- Fuel system
- Control and monitoring system

Turbine Ancillary components

- Acoustic enclosure
- Coupling
- Battery Charger
- Gas and flame detectors
- Firefighting system

Gas Turbine Operation and follow-up

- Pre-start preparation
- Start-up procedures
- Steady state operation follow-up
- Performance evaluation
- Shut down types and procedures
- Alarms investigation

Gas Turbine Troubleshooting

- Simplified troubleshooting flow chart
- Main trouble & possible causes

Gas Turbine Inspection and Overhaul

- Maintenance definition and policies
- Preventive Maintenance (PM) program
- Condition monitoring and diagnosis
- Predictive maintenance (PdM) program (oil analysis, vibration analysis, borescope inspection)

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Registration Form

Compressors, Pumps and Turbines Training Course

Preferred dates: ..... Venue or online: .....

Duration: 5 days Language: .....

Please complete and email this form to us, or register online. We confirm your place and send the invoice within one working day.

Delegate information

Full name (Mr / Ms / Dr / Eng): .....

Position: ..... Telephone / mobile: .....

Official email: ..... Personal email: .....

Company information

Company name: .....

Address: .....

City / country: ..... VAT / tax number: .....

Person responsible for training & development

Full name (Mr / Ms / Dr / Eng): .....

Position: ..... Telephone / mobile: .....

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