



External Training Course

Artificial Lift Systems Troubleshooting & Operation

From 19 May To 23 May 2025

From 07 Jul. To 11 Jul. 2025

From 15 Sep. To 19 Sep. 2025

**iH Hotels Milano Ambasciatori
Milano, Italy**

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Course Introduction

In today's demanding industrial environments, minimizing equipment downtime and optimizing system performance are key drivers of success. This comprehensive 5-day training course, "Mechanical Systems Troubleshooting Excellence: Pumps, Compressors, Exchangers & Piping," equips participants with the practical skills and technical knowledge needed to efficiently diagnose and solve mechanical problems. By focusing on critical equipment such as pumps, compressors, heat exchangers, and piping systems, the course offers in-depth analysis techniques, real-world case studies, and troubleshooting strategies to enhance maintenance effectiveness and reliability. Participants will gain hands-on insights into failure modes, root cause analysis, performance evaluation, and the use of diagnostic tools. The program is designed to empower professionals to reduce downtime, improve safety, and extend equipment life. Whether working in oil & gas, power, chemical, or manufacturing sectors, attendees will leave with actionable skills to boost performance in mechanical operations.

Course Objectives

By the end of this course, participants will be able to:

- Understand the principles of operation and common failure modes for pumps, compressors, heat exchangers, and piping systems.
- Apply structured troubleshooting and diagnostic techniques.
- Interpret performance curves and system data to identify inefficiencies or faults.
- Conduct root cause failure analysis (RCFA) and corrective maintenance planning.
- Improve equipment uptime through proactive mechanical troubleshooting.
- Enhance plant reliability and safety through effective problem-solving.

Training Methodology

Instructor-led presentations and real-world case studies.

Group discussions and interactive problem-solving sessions.

Hands-on exercises and visual diagnostic tools.

Practical tips, field checklists, and troubleshooting templates.

Course Outline

Day 1: Fundamentals of Mechanical Systems & Troubleshooting Principles

- Overview of mechanical systems and their interdependencies.
- Introduction to troubleshooting frameworks and strategies.
- Understanding system design and performance parameters.
- Common failure modes and symptoms.
- Troubleshooting documentation and diagnostic checklists.
- Interactive case study: Diagnosing a pressure drop in process systems.

Day 2: Troubleshooting Centrifugal & Positive Displacement Pumps

- Pump classifications and principles of operation.
- Pump performance curves: interpretation and use.
- Common issues: cavitation, seal failure, misalignment, wear.
- Vibration and noise diagnostics.
- Hands-on troubleshooting scenarios.
- Maintenance best practices for pump reliability.

Day 3: Troubleshooting Compressors – Reciprocating & Centrifugal

- Compressor types and their operational characteristics.
- Causes of inefficiency: leaks, surging, valve failure, lubrication issues.
- Vibration analysis and thermography techniques.
- Troubleshooting strategies for reciprocating vs. centrifugal units.
- Condition monitoring and predictive maintenance.
- Case study: Diagnosing a compressor surge event.

Day 4: Heat Exchangers & Piping Systems Troubleshooting

- Types of heat exchangers and common operational problems.
- Fouling, corrosion, thermal fatigue, and pressure drop issues.
- Leak detection and integrity checks.
- Piping systems: flow disturbances, water hammer, stress & vibration.
- Inspection techniques: NDT methods and inline monitoring.
- Hands-on workshop: Troubleshooting piping system anomalies.

Day 5: Root Cause Analysis & Maintenance Optimization

- Root Cause Failure Analysis (RCFA) – tools and techniques.
- Developing corrective and preventive actions.
- Maintenance planning based on troubleshooting findings.
- Enhancing reliability through system design improvements.
- Final troubleshooting challenge: group exercise on integrated systems.
- Course summary, Q&A, and participant feedback.

Course Agenda:

(1st Day) Agenda

8.30	9.00	Opening Remarks (30 Min.).
9.00	11.30	<u>DISCUSS COURSE OBJECTIVES:</u> <ul style="list-style-type: none"> • Fundamentals of Mechanical Systems & Troubleshooting Principles. • Troubleshooting Centrifugal & Positive Displacement Pumps. • Troubleshooting Compressors – Reciprocating & Centrifugal. • Heat Exchangers & Piping Systems Troubleshooting. • Root Cause Analysis & Maintenance Optimization.
11.30	12.00	Coffee Break
12.00	14.00	<u>Fundamentals of Mechanical Systems & Troubleshooting Principles:</u> <ul style="list-style-type: none"> • Overview of mechanical systems and their interdependencies. • Introduction to troubleshooting frameworks and strategies. • Understanding system design and performance parameters. • Common failure modes and symptoms. • Troubleshooting documentation and diagnostic checklists. • Interactive case study: Diagnosing a pressure drop in process systems.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(2nd Day) Agenda

9.00	11.30	<u>Day 2: Troubleshooting Centrifugal & Positive Displacement Pumps:</u> <ul style="list-style-type: none"> • Pump classifications and principles of operation. • Pump performance curves: interpretation and use. • Common issues: cavitation, seal failure, misalignment, wear.
11.30	12.00	Coffee Break
12.00	14.00	<u>Day 2: Troubleshooting Centrifugal & Positive Displacement Pumps:</u> <ul style="list-style-type: none"> • Vibration and noise diagnostics. • Hands-on troubleshooting scenarios. • Maintenance best practices for pump reliability.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(3rd Day) Agenda

9.00	11.30	<u>Troubleshooting Compressors – Reciprocating & Centrifugal:</u> <ul style="list-style-type: none"> Compressor types and their operational characteristics. Causes of inefficiency: leaks, surging, valve failure, lubrication issues. Vibration analysis and thermography techniques.
11.30	12.00	Coffee Break
12.00	14.00	<u>Troubleshooting Compressors – Reciprocating & Centrifugal:</u> <ul style="list-style-type: none"> Troubleshooting strategies for reciprocating vs. centrifugal units. Condition monitoring and predictive maintenance. Case study: Diagnosing a compressor surge event.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(4th Day) Agenda

9.00	11.30	<u>Heat Exchangers & Piping Systems Troubleshooting:</u> <ul style="list-style-type: none"> Types of heat exchangers and common operational problems. Fouling, corrosion, thermal fatigue, and pressure drop issues. Leak detection and integrity checks.
11.30	12.00	Coffee Break
12.00	14.00	<u>Heat Exchangers & Piping Systems Troubleshooting:</u> <ul style="list-style-type: none"> Piping systems: flow disturbances, water hammer, stress & vibration. Inspection techniques: NDT methods and inline monitoring. Hands-on workshop: Troubleshooting piping system anomalies.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(5th Day) Agenda

9.00	11.30	<u>Root Cause Analysis & Maintenance Optimization:</u> <ul style="list-style-type: none"> Root Cause Failure Analysis (RCFA) – tools and techniques. Developing corrective and preventive actions. Maintenance planning based on troubleshooting findings.
11.30	12.00	Coffee Break
12.00	14.00	<u>Root Cause Analysis & Maintenance Optimization:</u> <ul style="list-style-type: none"> Enhancing reliability through system design improvements. Final troubleshooting challenge: group exercise on integrated systems. Course summary, Q&A, and participant feedback.
14.00	14.30	Questions, Discussion & Conclusion Training Course.
14.30		Buffet Lunch