MERCURY

Reciprocating Gas Compressor Operation & Maintenance for Lift Applications High-Pressure Workshop

23 - 27 Aug 2026
Online

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Ref: 1215T51046956 **Date:** 23 - 27 Aug 2026 **Location:** Online **Fees:** 2900 **Euro**

Introduction

The operation and maintenance of Reciprocating Gas Compressors are among the most critical disciplines in oil and gas production facilities, particularly in high-pressure gas injection systems and Gas Lift applications. These systems require advanced knowledge of compression principles, thermodynamics, compressor internals, valve performance, lubrication systems, vibration diagnostics, and reliability-centered maintenance practices to ensure safe, efficient, and continuous operation.

This workshop provides participants with the technical knowledge and practical understanding needed to operate, monitor, maintain, and troubleshoot reciprocating gas compressors used in lift applications. It focuses on enhancing equipment reliability, improving operational performance, minimizing downtime, and optimizing maintenance strategies in demanding industrial environments.

This advanced training workshop provides participants with practical engineering knowledge and troubleshooting methodologies for operating, maintaining, diagnosing, and optimizing reciprocating gas compressors used in gas injection and gas lift systems while ensuring maximum reliability, efficiency, and equipment availability.

Targeted Audience

- Gas Compressor Operators.
- Mechanical Maintenance Engineers.
- Rotating Equipment Engineers.
- Reliability Engineers.
- Production Engineers.
- Gas Lift Engineers.
- Maintenance Supervisors.
- Mechanical Technicians.
- Instrumentation and Control Engineers.
- Field Operation Supervisors.
- Asset Integrity Engineers.
- Process Engineers working in Oil and Gas Facilities.

Training Objectives

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

- Understand the operating principles of high-pressure reciprocating gas compressors.
- Analyze gas compression through multi-stage compression systems.
- Operate Gas Lift Compressors safely and efficiently.
- Identify compressor performance limitations and optimization opportunities.
- Diagnose common compressor failures and mechanical defects.
- Evaluate compressor vibration behavior and root causes.
- Monitor lubrication system performance and reliability.
- Apply advanced troubleshooting methodologies for compressor operation.

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- Improve compressor availability and reduce unplanned shutdowns.
- Implement predictive and preventive maintenance strategies.
- Explain the complete compression cycle of reciprocating compressors.
- Select suitable compressor components for high-pressure gas service.
- Analyze valve failures and the mechanisms of carbon formation.
- Identify the mechanisms of linear deterioration and corresponding corrective actions.
- Diagnose piston rod vibration and alignment issues.
- Optimize compressor capacity control systems.
- Evaluate lubrication oil system performance.
- Assess electric motor condition and operational reliability.
- Develop maintenance plans based on failure modes and operational history.

Targeted Competencies:

- Reciprocating Compressor Operation Competency.
- Compressor Troubleshooting Competency.
- Mechanical Integrity Assessment Competency.
- Vibration Analysis Competency.
- Reliability and Availability Improvement Competency.
- Lubrication System Management Competency.
- Rotating Equipment Maintenance Competency.
- Gas Injection System Management Competency.

Workshop Content

Unit One, Fundamentals of High-Pressure Reciprocating Gas Compression Systems

- Operating principles of reciprocating gas compressors.
- Compression theory and gas laws affect compressor performance.
- Compressor piston types used in multi-stage gas compression applications:
    - Differential piston design.
    - Double-acting piston arrangement.
    - Trunk piston configuration.
    - Stepped piston applications.
    - Distance piece arrangements.
- Three-stage compression philosophy:
    - First-stage compression characteristics.
    - Inter-stage cooling requirements.
    - Second-stage pressure ratio limitations.
    - Third-stage discharge pressure considerations.
    - Intercoolers and aftercoolers operation.
    - Volumetric efficiency calculations.
    - Compression ratio limitations.
    - Compressor performance curves interpretation.
    - Safety systems and protection philosophy.

Unit Two, Gas Lift Compressor Operation and Gas Injection Systems

- Gas Lift Compressor operating principles.
- Using compressed gas for injection into gas-lift wells.
- Gas injection process requirements.

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- Gas Lift production enhancement methodology.
- Surface facilities associated with gas injection systems.
- Suction and discharge control philosophy.
- Compressor loading and unloading during gas injection.
- Start-up and shutdown procedures.
- Anti-surge and recycle systems.
- Compressor performance optimization in Gas Lift applications.
- Operational limitations during varying well conditions.
- Gas injection reliability improvement techniques.

Unit Three, Compressor Internal Components Failure Analysis and Troubleshooting:

- Compressor valve operating principles.
- Gas Plate Valve construction and functions.
- Carbon Formation on Gas Plate Valves:
    - Lubrication oil carryover.
    - High discharge temperature.
    - Poor gas quality.
    - Contaminated process gas.
    - Inadequate cooling performance.
    - Excessive cylinder lubrication.
    - Valve leakage effects.
- Consequences of carbon deposits:
    - Reduced compressor efficiency.
    - Increased discharge temperature.
    - Valve sticking.
    - Valve plate fracture.
    - Increased power consumption.
- Pitting on the Liner Surface Inside the Cylinder Causes:
    - Moisture condensation.
    - Corrosive gas components.
    - Inadequate lubrication film.
    - Dirt and solid contamination.
    - Metal-to-metal contact.
    - Improper material selection.
    - Excessive operating temperature.
- Effects of linear pitting:
    - Blow-by gas leakage.
    - Reduced compression efficiency.
    - Accelerated ring wear.
    - Increased maintenance frequency.
- Corrective and preventive actions.

Unit Four, Vibration Diagnostics and Capacity Control Systems

- Vibration Through the Piston Rod Causes:
    - Rod runout.
    - Misalignment.
    - Crosshead wear.
    - Connecting rod defects.
    - Worn piston rings.
    - Excessive clearance.

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    - Bent piston rod.
    - Foundation looseness.
    - Cylinder loading imbalance.
    - Pulsation effects.
- Vibration monitoring techniques.
- Rod drop and rider band monitoring.
- Dynamic balancing principles.
- Compressor alignment methodologies.
- Capacity Control in Reciprocating Compressors:
    - Clearance pockets.
    - Valve unloaders.
    - Variable speed drives.
    - Suction valve unloaders.
    - Fixed clearance control.
    - Step capacity control.
- Advantages and limitations of each control method.
- Capacity optimization strategies.
- Energy efficiency improvement opportunities.

Unit Five, Lubrication Systems and Electric Motor Reliability

- Compressor lubrication philosophy.
- Lubrication Oil Flow Rate requirements.
- Factors affecting lubrication oil consumption.
- Low Oil Flow Causes and Effects:
    - Pump failure.
    - Blocked filters.
    - Oil leakage.
    - Low oil level.
    - Incorrect oil viscosity.
    - Instrument malfunction.
- Effects of low oil flow:
    - Bearing failure.
    - Piston seizure.
    - Cylinder scoring.
    - Increased wear rates.
    - High operating temperature.
- High Oil Flow Causes and Effects:
    - Incorrect pump settings.
    - Oversized pumps.
    - Control valve malfunction.
    - Instrument calibration errors.
- Effects of high oil flow:
    - Carbon formation.
    - Valve contamination.
    - Excessive oil carryover.
    - Increased operating cost.
- Main Parts of an Electric Motor:
    - Stator.
    - Rotor.
    - Bearings.
    - Shaft.
    - Cooling fan.

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    - Terminal box.
    - Windings.
    - Frame.
    - Insulation system.
- Electric motor failure mechanisms.
- Motor protection systems.
- Motor condition monitoring techniques.
- Predictive maintenance applications for compressor drivers.

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