



# **Gas Chromatography and Troubleshooting for the Oil & Gas Industry**

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Brussels (Belgium)



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### Introduction

In the past 50 years, Gas Chromatography has become an indispensable analytical tool in virtually every phase of the petroleum industry, from the exploration of crude oil and refining of finished products to research on new petrochemicals. Gas Chromatography GC is one of the most widely utilized techniques in modern analytical chemistry. In its most basic form, it is used to separate complex mixtures of different molecules based on their physical properties, such as polarity and boiling point.

Gas chromatography troubleshooting in the oil and gas industry course stands as an ideal tool to analyze gas and liquid samples containing many hundreds or even thousands of different molecules, as in the case of crude oil or its products. The technique enables analysts to identify both the types and concentrations of molecular species present.

This gas chromatography troubleshooting in oil and gas industry training course introduces the fundamental theory of gas chromatography, including the operation, maintenance, and troubleshooting, from sample introduction to data analysis. Instrument components are described and presented, along with their underlying theories, guiding best practices, and effective method optimization and troubleshooting strategies.

Due to the variety and complexity of sample types, petroleum chemists employ a broad spectrum of gas chromatographic methods. Participants in the gas chromatography troubleshooting in the oil and gas industry course will learn about current best practices concerning system configuration choices and initial method conditions.

### Additional Insights on Gas Chromatography in the Oil and Gas Industry

Gas Chromatography plays a pivotal role in the oil and gas industry's critical operations, encompassing everything from upstream exploration to the final quality inspection of petroleum products. This gas chromatography troubleshooting in the oil and gas industry course offers profound insights into the challenges faced when applying gas chromatography in the oil and gas industry.

The gas chromatography troubleshooting in the oil and gas industry course provides systematic gas chromatography training tailored to those specific needs. Through a combination of theoretical knowledge and practical gas chromatography troubleshooting tips, this course is engineered to enhance the skill set of professionals working within this sector and contribute to their ability to maintain system integrity and achieve accurate, reliable results.

## Targeted Groups

This gas chromatography troubleshooting in the oil and gas industry course is ideal for lab and quality professionals who need more formal training or experience in gas chromatography or those desiring to refresh their current knowledge. The gas chromatography troubleshooting course is also suitable for Environmental Quality Personnel and fiscal quality inspectors.

## Course Objectives

By the end of this gas chromatography troubleshooting in oil and gas industry course, participants will be able to:

- Understand the fundamental theoretical aspects of gas chromatography.
- Communicate practical information, capabilities, and limitations of gas chromatography.
- Gain confidence in:
  - GC analysis technique.
  - GC troubleshooting.
  - Analytical results evaluation.

## Targeted Competencies

At the end of this gas chromatography troubleshooting in oil and gas industry course, the target competencies will be able to:

- Gas supply and handling.
- Split/splitless and PTV inlets.
- The autosampler.
- PC and data system.
- Creating methods.
- Integration and reporting.
- Quantitation and calibrations.
- Sample inlet and autosamplers.
- Columns.
- Detectors.
- Data analysis systems.

## Course Content

### Unit 1: Introduction to Chromatography

- Overview of gas chromatography.
- Gas chromatography theory.
- The development process.
- Factors controlling retention.
- Molecular forces and chromatographic selectivity.
- Stationary phase loading and GC performance.
- Chromatography nomenclature.

### Unit 2: Injection Ports

- Gas supply and handling.
- GC inlet selection variation.
- Capillary vs. packed column.
- Direct capillary.
- Split/split less.
- Programmed Temperature Vaporizer PTV inlets.
- Cool on column.
- The role of sample introduction and injection ports in GC operations.
- Sample introduction to autosamplers.

### Unit 3: Gas Chromatography GC Columns

- Column selection.
- Packed.
- Capillary.
- Impact of GC column on performance.
- Peak dispersion in a chromatographic column.
- Column maintenance and troubleshooting.
- GC oven.
- Isothermal vs. temperature programming.

### Unit 4: Gas Chromatography GC Detectors

- GC detector selection.
- Detector role in GC operations.
- How can detectors impact GC performance?
- Detector maintenance and troubleshooting.
- Chromatography applications.
- Method development.
- Setup and GC operation.
- Preparation for operation.

## **Unit 5: Gas Chromatography GC Data Acquisition and Processing**

- Sampling techniques.
- Data acquisition and processing systems.
- Calibration and GC performance.
- Gas chromatography troubleshooting.
- Laboratory Information Management System LIMS.
- ISO 17025 accreditation basics.
- Laboratory management and troubleshooting.