
Hydroprocessing Unit Operations Training Course: Catalyst Life, Hydrogen Balance and Product Quality

1 – 5 November 2026
Doha





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Programme Summary

Hydroprocessing unit operations is the subject of this one-week training course for refinery operations, technical and planning leaders, ending in a unit performance review pack for one hydrotreating or hydrocracking unit. Product sulphur limits, catalyst cost and hydrogen supply all depend on how these units are run, yet run decisions are often taken from habit and the last start-of-run report. The programme links feed, reactor, catalyst and hydrogen behaviour to product quality, applying each tool to a unit of the participant's own. Mars Training Centre UK delivers this programme on hydroprocessing unit operations to mixed-organisation cohorts.

The Business Case

Hydroprocessing units sit between crude supply and finished fuel, so a weak run decision shows up in product giveaway, shortened catalyst cycles and hydrogen shortfalls. Where hydroprocessing unit operations are judged by outlet sulphur alone, leaders miss the signs of deactivation, poor distribution and recycle limits. Leaders who read temperature profiles, hydrogen balances and feed changes together can plan severity, protect cycle length and explain trade-offs to planning and maintenance.

- Catalyst Cycle Length: Improves as deactivation is tracked against feed and severity.
- Product Quality Giveaway: Falls as severity is set from measured product limits.
- Hydrogen Use: Improves as consumption and recycle are balanced against demand.

Principles and Evidence Base

- ISO 8754: The method for sulphur content of petroleum products by energy-dispersive X-ray fluorescence frames the product quality work in Sessions 1 and 4.
- ISO 20846: The method for sulphur content of automotive fuels by ultraviolet fluorescence supports the low-sulphur targets in Session 4.
- ISO 31000: Risk management guidelines structure the ranking of operating options in Session 5.
- Reaction kinetics and thermodynamics: Reading conversion and heat release from temperature profiles guides Sessions 2 and 3.

Intended Participants

- Operations managers who run hydrotreating and hydrocracking units.
- Technical service leaders who set operating windows and review catalyst performance.
- Planning and scheduling leaders who decide feed slate and severity.
- Laboratory leads who report feed and product quality.
- Maintenance and inspection leaders who plan turnaround scope.



Typical functions include refinery operations, technical services, production planning and turnaround management.

Learning Outcomes

1. Participants will be able to evaluate feed quality effects on hydroprocessing unit operations.
2. Participants will be able to diagnose catalyst deactivation from temperature and conversion data.
3. Participants will be able to construct a hydrogen balance covering consumption, recycle and make-up.
4. Participants will be able to assess reactor temperature profiles and quench use.
5. Participants will be able to prioritise severity and run-length options against product limits.
6. Participants will be able to justify a unit performance review to senior management.

Programme Structure

Day 1: Hydroprocessing Unit Operations and Feed Quality

How do feed properties set what the unit must do?

- Feed Property Impact Table
- Unit Block Flow Diagram
- Sulphur and Nitrogen Removal Map
- Product Specification Sheet
- Run Log Baseline Review

Day 2: Reactor Performance and Temperature Profiles

What do temperature profiles say about reaction progress and heat release?

- Reactor Temperature Profile Chart
- Bed Pressure Drop Trend
- Quench Flow Assessment
- Weighted Average Bed Temperature Log
- Flow Maldistribution Screening List

Day 3: Catalyst Management and Deactivation

Why does activity fall, and how is run length protected?

- Catalyst Activity Decline Curve
- Poison and Metals Deposition Review
- Coke Build-Up Indicator Sheet
- Start-Up and Sulphiding Checklist
- Cycle Length Projection Table



Day 4: Hydrogen Systems and Product Quality

How are hydrogen supply, recycle and severity set against product limits?

- Hydrogen Balance Sheet
- Recycle Gas Purity Review
- Severity Setting Worksheet
- Product Sulphur Trend Chart
- Hydrogen Sulphide Handling Check

Day 5: Applying the Tools to One Hydroprocessing Unit

Do the feed, reactor, catalyst and hydrogen tools support one unit review?

- Applying the Session 1 Feed Property Impact Table
- Using the Session 2 Reactor Temperature Profile Chart
- Testing the Session 3 Cycle Length Projection Table
- Checking the Session 4 Hydrogen Balance Sheet
- Completing the Unit Performance Review Pack

Methodology

The programme uses a case analysis method built on anonymised unit run logs, temperature profiles, feed and product assays and catalyst change records from refinery hydrotreating and hydrocracking units. Participants work in peer groups on a shared unit, challenge each other's readings and receive written facilitator feedback on each exercise set.

- Suggested activity: Reading a temperature profile to locate the start of catalyst deactivation.
- Suggested activity: Rebuilding a hydrogen balance from recycle and make-up data.
- Suggested activity: Comparing two severity settings on cycle length and product giveaway.

Capstone Output

Each participant completes a unit performance review pack for one hydroprocessing unit. It holds a feed property impact table, a reactor temperature profile chart, a cycle length projection, a hydrogen balance sheet and a ranked action list. The pack is used at work to brief senior management, set operating windows and prepare turnaround scope discussions.



Frequently Asked Questions

Is hydroprocessing unit operations suitable for leaders who are not process engineers?

Yes. Hydroprocessing unit operations assumes some refinery operations, planning or technical experience and builds reactor, catalyst and hydrogen reasoning step by step.

Which standards does hydroprocessing unit operations rest on?

Hydroprocessing unit operations rests on ISO 8754 and ISO 20846 for sulphur content and ISO 31000 for risk, with reaction kinetics and thermodynamics.

How is the pack from hydroprocessing unit operations used at work?

You use the unit performance review pack to brief senior management, set operating windows and prepare turnaround scope discussions.

How does hydroprocessing unit operations differ from general refinery processing training?

Hydroprocessing unit operations centres on reactors, catalyst and hydrogen in sulphur removal and conversion units, while general refinery processing training centres on the whole refinery flow.