
Conversion Unit Yield Improvement: FCC, Hydrocracking and Reforming Training Course

17 – 21 October 2027
Zoom





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Programme Summary

Conversion unit yield improvement for FCC, hydrocracking and reforming is a one-week training course for refinery technical and operations leaders at managerial level, culminating in a yield improvement programme for a conversion unit at their own site. Conversion units turn low-value residues and heavy streams into gasoline, diesel, jet and petrochemical feedstocks, so small shifts in selectivity move refinery profit. The approach links feed quality, catalyst, severity and control to yield accounting and investment choices. Mars Training Centre UK delivers this programme in conversion unit yield improvement.

The Business Case

Conversion units often run below their yield potential because catalyst performance drifts unnoticed, feed quality changes faster than operating targets and yield data are not reconciled well enough to show where product is lost. Leaders who act on these signals recover value from existing hardware before committing capital.

- High-Value Product Yield: Rises as severity, catalyst and feed decisions are tested against reconciled unit data.
- Catalyst Cost per Barrel: Falls as catalyst selection, additions and cycle length are managed against measured activity and selectivity.
- Unit Availability: Improves as constraints in regenerators, reactors and fractionators are tracked before they force rate cuts.

Principles and Evidence Base

- Heat and Material Balance with Yield Accounting: Provides the reconciled basis for every yield comparison from Session 1 onwards.
- Catalyst Activity, Selectivity and Equilibrium Catalyst Analysis: Frame how catalyst condition is judged in Session 2 and Session 3.
- Model Predictive Control MPC: Explains how advanced process control holds units against multiple constraints in Session 4.
- Real-Time Optimisation RTO: Shows how economic targets are pushed to the control layer in Session 4.



Intended Participants

- Leaders accountable for the yields, run length and profitability of cracking, hydroprocessing, reforming or coking units.
- Managers who approve catalyst purchases, changeouts and operating severity targets.
- Heads of technical services who commission test runs and yield studies.
- Managers who sponsor advanced process control and optimisation projects.

The programme serves fuels refineries, integrated refining and petrochemical complexes, residue upgrading facilities and catalyst and technology service organisations.

Learning Outcomes

1. Participants will be able to evaluate conversion unit yields against a reconciled heat and material balance.
2. Participants will be able to diagnose yield losses caused by feed quality, catalyst condition and operating severity.
3. Participants will be able to compare catalyst options on activity, selectivity and cost per barrel.
4. Participants will be able to assess the case for advanced process control and real-time optimisation on a conversion unit.
5. Participants will be able to prioritise yield actions across cracking, hydrocracking, reforming and coking units.
6. Participants will be able to construct a yield improvement programme for their unit.

Programme Structure

Day 1: Conversion Unit Yield Fundamentals

What sets the yield of a conversion unit, and how is it measured reliably?

- Conversion Chemistry: Cracking, Hydrogenation and Dehydrogenation
- Yield Structure and Product Value Weighting
- Heat and Material Balance Closure
- Yield Accounting and Data Reconciliation
- Unit Test Run Planning

Day 2: FCC Yield Drivers

Which feed, catalyst and operating variables move FCC selectivity?

- FCC Feed Quality: Contaminants, Carbon Residue and Hydrogen Content
- Riser Outlet Temperature and Catalyst-to-Oil Ratio
- Regenerator Constraints and Coke Balance
- Equilibrium Catalyst Analysis and Additives
- Slurry, Dry Gas and Delta Coke Management



Day 3: Hydrocracking, Reforming and Coking Yields

How are severity and catalyst life traded against yield in other conversion units?

- Hydrocracker Conversion, Recycle and Distillate Selectivity
- Hydrotreating Pretreatment and Catalyst Deactivation
- Catalytic Reformer Severity, Octane and Hydrogen Yield
- Delayed Coker Liquid Yield and Recycle Ratio
- Catalyst Selection and Changeout Decisions

Day 4: Control, Optimisation and Yield Monitoring

How do control and optimisation layers keep units at their best economic point?

- Model Predictive Control MPC on Conversion Units
- Real-Time Optimisation RTO and Economic Targets
- Inferential Models and Online Analysers
- Data-Driven Process Analytics for Yield
- Yield Key Performance Indicators and Dashboards

Day 5: Applying the Yield Improvement Programme

How are feed, catalyst, severity and control actions combined into one unit plan?

- Yield Gap Assessment of a Participant Unit
- Catalyst and Severity Option Ranking
- Control and Optimisation Investment Case
- Peer Challenge of Yield Improvement Proposals
- Yield Improvement Programme Presentation

Methodology

The programme relies on a data workshop supported by case analysis. Participants reconcile unit balances, interpret catalyst and feed data and test operating changes on cases from fuels refineries, petrochemical complexes and residue upgraders.

- Suggested activity: Closing a heat and material balance for an FCC test run.
- Suggested activity: Comparing two catalyst bids on activity, selectivity and cost per barrel.
- Suggested activity: Ranking control and optimisation projects by yield value.



Capstone Output

Each participant completes a yield improvement programme for a conversion unit at their site. It sets out the reconciled yield baseline, the main sources of lost product, catalyst and severity actions, control and optimisation proposals and a monitoring plan, ready for approval by refinery leadership.

Frequently Asked Questions

Is conversion unit yield improvement suitable for managers who are not process engineers?

Yes. It suits operations and technical managers who make decisions on catalyst, severity and control investment. It assumes refinery experience but no specialist reactor design knowledge.

Which models underpin conversion unit yield improvement?

It draws on heat and material balance and yield accounting, catalyst activity and selectivity with equilibrium catalyst analysis, model predictive control and real-time optimisation.

How is the conversion unit yield improvement programme used at work?

You take back a programme your leadership can approve, with a yield baseline, prioritised catalyst and severity actions, control proposals and indicators to track the results.

How does conversion unit yield improvement differ from refinery planning programmes?

It works inside the unit on feed, catalyst, severity and control, whereas planning programmes decide crude purchases and unit loadings.