

# Thermal Cracking, Visbreaking and Coking Operations Training Course

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## Overview

Thermal Cracking, Visbreaking and Coking Operations Training Course is a one-week intermediate course for refinery and petrochemical teams who leave with a Thermal Cracking Operations and Reliability Plan. Participants connect cracking chemistry, feed characterization, process severity, furnace and reactor systems, steam cracking, visbreaking, delayed and fluid coking, yields, coke formation, decoking, energy, control, safety, emissions, inspection, and troubleshooting. Agile Leaders Training Center delivers this course on thermal cracking and coking operations.

## Who Should Attend

- Teams responsible for thermal conversion process performance and product yields
- Functions responsible for furnace, reactor, fractionator, and coke-drum operation
- Groups responsible for process control, energy use, and abnormal-condition response
- Maintenance and inspection teams responsible for fouling, coke, integrity, and decoking
- Technical-service teams responsible for feed evaluation, troubleshooting, and reliability

The course assumes participants can interpret process flows and operating trends, and it leaves out proprietary licensor design, live unit intervention, and detailed mechanical design calculations.

## Departments and Industries

The course supports thermal-cracking decisions across refinery, petrochemical, energy, and technical-service environments.

- Refining, heavy-oil upgrading, and petroleum-coke operations
- Petrochemical olefins and steam-cracking facilities
- Process engineering, operations, control, and production planning
- Maintenance, inspection, reliability, and turnaround teams
- Energy, environment, laboratory, and technical-assurance functions

## Learning Objectives

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

- Analyze thermal-cracking chemistry, feed properties, and severity
- Compare steam cracking, visbreaking, delayed coking, and fluid coking
- Evaluate furnace performance, yields, product quality, and coke formation
- Apply process-control, energy, safety, and emissions checks
- Diagnose fouling, decoking, equipment, and operating problems
- Build a thermal-conversion reliability and action plan

## Course Agenda

## Day 1: Establish Cracking Fundamentals

- Hydrocarbon Bond Scission, Free-Radical Reaction, and Product-Pathway Map
- Feed Boiling Range, Residue, Contaminant, and Coke-Precursor Register
- Temperature, Pressure, Residence-Time, and Severity Relationship Worksheet
- Conversion, Selectivity, Yield, and Product-Quality Balance Sheet
- Thermal Cracking Feed and Severity Evidence Log

## Day 2: Compare Process Configurations

- Steam-Cracking Furnace, Dilution Steam, Quench, and Separation Flow Map
- Coil and Soaker Visbreaking Configuration Decision Matrix
- Delayed-Coking Heater, Fractionator, Drum-Cycle, and Product-Flow Diagram
- Fluid-Coking Reactor, Coke-Circulation, Scrubbing, and Fractionation Review
- Thermal Conversion Configuration and Service-Selection Framework

## Day 3: Control Furnace, Yield, and Coke

- Furnace Heat Flux, Coil Outlet, Draft, and Efficiency Trend Dashboard
- Cracking Severity, Steam Ratio, Recycle, and Product-Yield Sensitivity Matrix
- Quench, Fractionation, Gas-Oil, Olefin, and Coke Quality Review
- Tube Coking, Pressure Drop, Skin Temperature, and Run-Length Diagnostic Method
- Decoking, Coke Cutting, Handling, and Return-to-Service Plan

## Day 4: Manage Operation and Reliability

- Temperature, Pressure, Flow, Level, and Drum-Cycle Control Narrative
- Startup, Shutdown, Switching, Isolation, and Abnormal-Situation Checklist
- Furnace, Coke-Drum, Quench, Blowdown, and Exposure Hazard Review
- Combustion, Fugitive, Coke-Dust, Water, and Waste Control Register
- Inspection, Integrity, Energy, Maintenance, and Reliability Action Matrix

## Day 5: Practice Thermal Conversion Decisions

- Suggested Exercise: Characterize Feed and Set a Severity Window
- Suggested Exercise: Compare Steam-Cracking, Visbreaking, and Coking Configurations
- Suggested Exercise: Diagnose Furnace, Yield, Fouling, and Coke Evidence
- Suggested Exercise: Prioritize Control, Safety, Energy, and Reliability Actions
- Capstone Exercise: Complete the Thermal Cracking Operations and Reliability Plan

## Practical Exercises

The course uses suggested activities to convert thermal-conversion evidence into controlled operating decisions.

- Suggested activity: relate feed properties and operating severity to conversion, yields, and coke tendency
- Suggested activity: compare process configurations against feed, product, energy, and operating constraints
- Suggested activity: interpret furnace trends, pressure drop, product quality, and run-length evidence
- Suggested activity: assemble a control, safety, emissions, inspection, decoking, and reliability action plan

## FAQs

### Who suits thermal cracking and coking operations training, and what does it assume?

Thermal cracking and coking operations training suits process, operations, control, maintenance, inspection, reliability, and technical-service teams. It assumes familiarity with process flows and operating trends.

### How does thermal cracking differ from catalytic cracking training?

Thermal cracking uses heat, residence time, and pressure to break hydrocarbons without a cracking catalyst. Catalytic cracking training centers on catalyst behavior, reactor-regenerator operation, catalyst circulation, and catalyst-related product control.

### How is thermal-cracking severity evaluated?

Thermal-cracking severity is evaluated from feed properties, temperature, pressure, residence time, steam or dilution, conversion, product yields, product quality, coke tendency, furnace evidence, and operating constraints.

## What causes coke formation in thermal conversion units?

Coke formation reflects feed composition, reaction severity, residence time, surface temperature, flow distribution, vaporization, local stagnation, and unstable operating conditions. Diagnosis compares process trends with furnace, drum, product, and inspection evidence.

## How are thermal-cracking operating problems diagnosed?

Thermal-cracking problems are diagnosed by reconciling feed, furnace duty, temperatures, pressure drop, flows, controls, yields, product quality, coke, emissions, equipment condition, and the timing of operating changes.

## Conclusion

Participants take back a Thermal Cracking Operations and Reliability Plan containing feed evidence, severity limits, configuration choices, yield checks, coke controls, safety constraints, inspection priorities, and troubleshooting actions. The plan links process behavior with operating and maintenance decisions. It supports traceable coordination across refinery, petrochemical, engineering, operations, and reliability teams.

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