COURSE BROCHURE

Advanced Refinery Process Units

A two-week advanced program on the chemistry, catalysts and operating variables of refinery conversion and treating units, using operating data to improve yields and extend run length.

Code	HT-OGE-132
Category	Oil & Gas, Engineering & Maintenance
Duration	2 weeks
Level	Advanced

Introduction

Refineries are processing heavier, higher-sulfur crudes while fuel specifications tighten and integration with petrochemicals grows, so margins now depend on how well the conversion and hydroprocessing units perform. Process and operations engineers therefore need a precise understanding of what happens inside the reactors, not just a general view of the flow scheme.

Objectives

- Analyze how feed properties affect the performance and yields of each unit
- Explain reaction chemistry, catalyst function and deactivation mechanisms in conversion units
- Adjust key operating variables within equipment and safety limits
- Monitor unit performance with indicators calculated from operating and laboratory data
- Evaluate optimization opportunities against refinery economics and unit integration

Who should attend

- Refinery process engineers
- Experienced operations engineers and unit supervisors
- Refinery planning and economics engineers
- Technical service and catalyst engineers

Skills you will develop

- Tracking catalyst performance and predicting end of run
- Preparing mass and heat balances for conversion units
- Diagnosing yield and quality deviations
- Assessing optimization options economically

Learning Outcomes

- Calculate WABT and deactivation rate for a hydrotreater and estimate remaining cycle length
- Build a simplified FCC heat balance and interpret the effect of changing an operating variable
- Identify the constraint limiting a unit's capacity and propose a way to relieve it
- Prepare a performance monitoring report for a conversion unit with actionable recommendations

Course Outline

Day 1: Optimizing the Crude and Vacuum Units

- Crude assays, cut points, cut overlap and the effect of crude blending
- Desalter and preheat train performance and overhead corrosion control
- Deep-cut vacuum operation, the wash zone, packing coking and the ejector system

Day 2: Hydrotreating

- Desulfurization, denitrogenation, aromatic and olefin saturation, and hydrogen consumption
- CoMo and NiMo catalysts, presulfiding, deactivation mechanisms and WABT tracking
- Reactor distributors, pressure drop, interbed quench and the demands of ultra-low sulfur diesel (ULSD)

Day 3: Hydrocracking

- Unit configurations: single-stage once-through, single-stage with recycle, and two-stage
- Conversion, product selectivity, hydrogen partial pressure and nitrogen effects on cracking catalyst
- Reactor temperature runaway, emergency depressuring systems and lessons from past incidents

Day 4: Fluid Catalytic Cracking, Reactor and Regenerator

- Riser, reactor, regenerator, catalyst circulation and the slide valve pressure balance
- Heat balance, catalyst-to-oil ratio and how riser and feed temperature drive conversion
- Full-burn and partial-burn regeneration and afterburn

Day 5: FCC Catalyst and Products

- Equilibrium catalyst properties, nickel and vanadium effects, and addition and withdrawal policy
- Additives such as ZSM-5 for propylene, and the effect of feed quality on yields
- Main fractionator and gas concentration unit, and diagnosing catalyst losses from cyclones

Day 6: Catalytic Reforming and Isomerization

- Reforming reactions, hydrogen production and the relationship between severity, octane and yield
- Semi-regenerative and continuous catalyst regeneration units, and the chloride and water balance
- Light naphtha isomerization and benzene management in the gasoline pool

Day 7: Alkylation and Gasoline Components

- Sulfuric acid and HF alkylation: chemistry and reactor arrangements
- Isobutane-to-olefin ratio, acid strength and temperature, and their effect on alkylate quality and acid consumption
- Acid handling hazards and mitigation, and the place of alkylate among blending components

Day 8: Residue Upgrading

- Delayed coking: the heater, drum cycle, coke types, foaming and antifoam

- Coil and soaker visbreaking, solvent deasphalting and fuel oil stability
- Residue hydroprocessing in fixed-bed and ebullated-bed reactors

Day 9: Hydrogen, Acid Gases and Sulfur

- Hydrogen production by steam methane reforming and purification by PSA
- Managing the refinery hydrogen network, hydrogen pinch analysis and recovery of rich off-gases
- Amine treating, sour water stripping, the Claus unit and tail gas treating

Day 10: Integration, Economics and Optimization Project

- Refining margin, linear programming, shadow prices and finding the refinery's real constraints
- Performance monitoring method: closing the mass balance, normalizing catalyst data and test runs
- Applied project in which teams analyze operating and laboratory data from a conversion unit, diagnose the performance gap and present an optimization plan backed by calculations

Training methodology

Spreadsheet exercises on WABT, the FCC heat balance and hydrogen consumption
Analysis of operating and laboratory trends from conversion and treating units
Review of incidents and upsets such as reactor temperature runaway and wash zone coking
Final team project with presentation and technical discussion

Certification

Participants receive a Harbor Training Center certificate of attendance on completing the course.

Upcoming dates

City	Dates	Language	Fee
Istanbul	10 – 21 May 2027	EN	EUR 8,800
Dubai	17 – 28 May 2027	AR	EUR 8,300
London	24 May 2027 – 4 June 2027	EN	EUR 9,300
Amsterdam	7 – 18 June 2027	AR	EUR 10,900
Online	14 – 25 June 2027	EN	EUR 5,000

Fees are per participant.

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To register and for details, scan the code or visit:

https://harbor4training.com/en/courses/advanced-refinery-process-units