

Training
Course

Hydrotreating & Hydrocracker
Technology



Course Overview:

The petroleum industry uses Hydrotreating and hydrocracking as a primary process for quality improvement to meet final fuel specifications as well as feed preparation for many intermediate processing units. This course covers the core elements of Hydrotreating and hydrocracking technology. Key variables that affect product yields and properties are described and their impact on the optimization of the unit operation is discussed. A framework is presented for troubleshooting operating problems and, throughout this discussion, participants are encouraged to describe their specific challenges. The scope of the course includes the core of most Hydrotreating and hydrocracking problems and attempts to cover solutions useful to design and operating engineers. Concerns associated with processing for clean fuels are covered. This course will provide an overview of the diverse nature of the Hydrotreating and hydrocracking processes, depending on the feedstocks used, products made and the environmental issues. It will address process integration issues, which are vital for economic viability

Who Should Attend?

- ✓ Process & Operational Engineers
- ✓ Plant Managers
- ✓ Project and Design Engineers
- ✓ Engineers involved in the operation and design of Hydrotreating and hydrocracking facilities.
- ✓ Technical personnel wishing to gain a perspective of how Hydrotreating and hydrocracking fits into the operation of a complete refining plant.
- ✓ Those who are experienced in other fields and seek a review of the fundamentals of Hydrotreating and hydrocracking.
- ✓

Course Objectives:

Upon completion of this course, participants will have gained a solid understanding of the key elements associated with the design, operation and troubleshooting of Hydrotreating and hydrocracking units. This will include the impact of feed quality, catalyst, operating conditions and unit design on product qualities. In addition, they will have gained some valuable insight into how to optimize, debottleneck and troubleshoot their Hydrotreating and hydrocracking units.

- ✓ Principles of hydro processes
- ✓ Overview of the Catalytic Processes in a Refinery, with a special emphasis on Hydro-treatment Systems.
- ✓ Catalyst Evaluation Techniques.
- ✓ An understanding of Reactor and Catalyst interaction.
- ✓ The operation, control and troubleshooting of a reactor and associated heaters, heat exchangers and distillation equipment.
- ✓ An overview of reactors, practical solutions as well as theory.
- ✓ An understanding of essential reaction concepts.
- ✓ Valuable practical insights for trouble free design and field proven techniques for commissioning, start up and shutdown of reactor, heater, heat exchanger and distillation operations.
- ✓ To tailor your approach to specific design, analysis and troubleshooting problems.

Course Outline:

Day One

Chemistry and principles of hydro processing

Fundamentals of hydrogen and energy balance in refineries

Material and energy integration

Fundamentals of petroleum refinery processing: downstream crude oil refining

Products' specifications and characteristics

Introduction to Hydro-treatment

- HDT role in a refinery: aim of the various treatments with hydrogen and integration in the refining scheme
- Impurities in petroleum cuts and products, their impact on health, environment and on other refining processes
- Recent regulations and future trends: quality specifications of petroleum products and fuels

Hydro-treatment reactions

- Characteristics of the chemical reactions
- Thermodynamic and kinetic aspects
- Consequences on the operation of units
- Side reactions and optimum operating conditions to deplete their evolution
- Specific features of reversion reactions

Hydro-treatment unit design basics and safety

- Unit design features
- Compositions of the main streams; mass balance and yields, sulfur balance, hydrogen balance and consumption

Day Two

Operation, Monitoring and Troubleshooting

- Operating conditions and compositions of the main streams; mass balance and yields, sulfur balance, hydrogen balance and consumption
- Significance of the operating variables and their influence on the process: mean temperatures and profile, pressures, partial pressure of hydrogen, recycle rate, quench ratio, feed flow rate and space velocity
- Advanced process control and optimization of the process
- Catalyst follow up and cycle length optimization, ageing and deactivation
- Reaction Selectivity
- Regeneration steps and monitoring
- Maximizing the performances of the unit under constraints or limit conditions
- Revision of the Basics: FCC Naphtha Treating for Clean Fuels

Catalysis

- Nature of HDT Catalysts
- Composition and activity
- Catalyst selection and reactor loading diagrams
- Multi-catalyst Systems
- Pre-sulfiding procedures: role, steps and details of the different methods
- Catalyst deactivation
- Catalyst Regeneration

Catalyst Management

- Reactor loading and unloading, catalyst handling
- Reactor Distribution and Internals
- Effects of poor distribution
- Developments in internals design
- Pressure drop management

Day Three

Performance of the various Hydro-treatment units

For each of the following processes, the operating parameters and the specific operating features are addressed:

- Naphtha desulfurization for catalytic reformer and isomerization feed.
- Cracked gasoline treatments, special hydrotreatments for the FCC gasoline.
- Stabilization of the pyrolysis gasoline.
- Hydro isomerization of the C4 cut out of the FCC to feed alkylation unit.
- Hydrotreatment of middle distillates: kerosene and gas-oil, LCO processing.
- Desulfurization of vacuum gasoil to FCC units.
- Residues demetalization processes.
- Ultra-low Sulfur Gasoline & Diesel Fuels

Start-up, Shutdown and Troubleshooting

- Startup/Shutdown procedures
- Causes of quality decrease and corresponding actions.
- Main automatic safety systems.

- Feed pump failure, heater failure.
- Compressor failure: fresh gas or recycle, adapted reaction and safe shutdown.

Day Four

Introduction to Hydrocracking

- Feed Stocks and Products
- Process Chemistry / Kinetics
- Catalysts / De-activation and Re-Generation
- Products Quality and Yields: Process Configuration, Catalyst Type and Operating Process Variables and Parameters
- Reactors Technology for Hydrocracking
- Single Stage Hydrocracking Process Technology

Hydrocracking Processing

- Two Stage Hydrocracking Process Technology
- Process Design Features
- Hydrogen Balance and Consumption
- Scope for Process Integration Improvements
- Hydrogen Balance / Integration and Management
- Steam / Methane Reforming

Day Five

Refinery Hydrogen Balance

- Using Hydrogen wisely
- HPU options

Equipment Design and Process Debottlenecking

- Reactors, exchangers, separators, strippers, compressors
- Design options
- Typical bottlenecks
-

Ultra-low Sulfur Gasoline & Diesel Fuels

- Specific developments to specifications

Training Details

Course Duration	5 Days
Pre-Schedule	24 – 28 Nov 2024
Venue	The H Hotel – Dubai ://www.hhoteldubai.com/
Training Fees Per Person	KWD 1200 (One Thousand Two Hundred)
Course Fees Include	<ul style="list-style-type: none"> • Tuition documentation • Curriculum and Training Handout • Five star lunch buffette • Completion Certificates