Training Title

HYDRO PROCESSING FOR CLEAN ENERGY: DESIGN, OPERATION AND OPTIMIZATION

Training Duration

5 days

Training Venue and Dates

RT132	HYDRO PROCESSING FOR CLEAN ENERGY: DESIGN, OPERATION AND OPTIMIZATION	5	09 – 13 February, 2020	$4,500	Dubai, UAE

In any of the 5 star hotels. The exact venue will be informed once finalized.

Training Fees

- **US$4,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch.**

Training Certificate

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

As refiners and chemical producers worldwide see higher crude oil and feed prices and continued demand for clean energy and lower production costs, a sound knowledge of Hydro processing for clean energy design, operation, and optimization is essential.

Refiners are facing a dynamic business environment. Crude prices are volatile. Heavy, high-sulfur and acidic opportunity crudes are increasingly available. Demand for lighter products is increasing; product legislation and emissions standards are tightening; and health, safety and environment mandates also have to be met. This necessitates that refiners are now required to reduce the products sulfur content before it can be sold and satisfy market demand of lighter products. This is most commonly done by hydroprocessing. Hydrotreating and hydrocracking processes share many common features, so they often are discussed together as "hydroprocessing" . Hydrotreating removes contaminants from distilled crude oil fractions and intermediate process streams. Hydrocracking converts heavy oil fractions into lighter, more valuable products.

For refiners to sustain their profit margins, economical access to state-of-the-art technology is a must. Hence, this course is designed to provide in depth practical review of all hydrotreating and hydrocracking processes key variables that affect product yields,

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properties, catalyst issues, reaction mechanisms, process design, operation, control, troubleshooting and optimization. Several significant product quality specifications (for instance, 10–15 ppm sulfur in diesel and gasoline), nitrogen and aromatic content, cetane number, API gravity, smoke point, cold flow properties such as pour point, cloud point and cold filter plug point and many other topics will be deeply discussed in this course.

A framework is presented for troubleshooting operating problems and, throughout this discussion, participants are encouraged to describe their specific challenges.

This course will feature:

- Lectures/discussions on hydrotreating and hydrocracking process technologies, roles and techniques for improving process operations, designs and applying optimization techniques.
- Fuel quality for clean energy
- Euro 5 and Euro 6 fuel specifications
- Open discussion on the latest development on the applications of hydroprocessing.
- Actual troubleshooting case studies.

Group activities (workshop) on process design, operation, maintenance, inspection, control and optimization.

TRAINING OBJECTIVES

Upon completion of this course, participants will be able to:

- Gain in-depth knowledge of the exact role of hydrotreating and hydrocracking unit regarding to feeds and product's characteristics, analyze the importance and impact of operating parameters on process output, identify common potential incidents in the reaction section: origin, consequences, solutions and preventive measures.
- Describe clean fuels chemistry, manufacturing technologies, and standards.
- Evaluate different flow schemes for Hydrotreating and Hydrocracking processes.
- Understand process design and operation variables for better H2-conversion performances.
- Grasp the experiences of chemistry/kinetics, function of catalysts, clean production, environmental issues of very typical upgraded fuel productions.
- Develop deep understanding of mass/H2/energy balance in refining processes.
- Identify unit-specific damage mechanisms.
- List the key steps in the inspection planning process.
- Identify unit-specific problems and describe typical solutions

WHO SHOULD ATTEND?

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This course is intended for anyone who takes part in the Hydroprocessing facilities in oil refining and petrochemical industries or who helps decide Hydroprocessing investments.

The course is suitable to a wide range of professionals but will greatly benefit to:

- Refinery operation managers
- Process Engineers and technologists
- Operation engineers
- Shift team leaders
- Maintenance Engineers
- Plant Engineers
- Inspection engineers
- All professionals involved in refinery process unit operations
- Anyone who wishes to update himself on the methods used in this important field

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.
Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

DAILY OUTLINE

DAY-1

Refining Operations and Introduction to Clean Energy

- Refinery Feed stocks and Products
- Physical Separation Processes
- Chemical Catalytic Conversion Processes
- Thermal Chemical Conversion Processes
- Refinery Configurations
- Crude Assay and Quality
- Role of Hydroprocessing in refineries: Development of New Technologies

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- New Trends for Clean Fuel Productions
- Recent developments in Hydro-treatment and Hydro-conversion of heavy residues
- Environmental Regulation

Hydrotreating Process Description

- Objectives and Roles of Hydrotreating
- Chemistry of Hydrotreating
- Hydrotreating Catalysts
- Thermodynamics of Hydrotreating
- Reaction Kinetics
- Hydrotreating Applications
- Applications to Naphtha, Middle Distillates, Gas Oil, ARD,...
- Different Process Flow Schemes
- Operating Conditions
- Hydrotreating Correlations
- Class Work Exercise

DAY-2

Hydrotreating Unit Operation, Design, and Optimization

- Introduction
- Reactor Design
- Recycle Gas Purity
- Wash Water
- Separator Design
- Makeup Gas Compression
- Potential Improvements for Material and Energy Savings
- Clean Diesel Hydro-treating Process Technology – Critical Issues
- Recent developments in Hydro-treatment and Hydro-conversion of Heavy Residues
- Deep Desulfurization
- Startup, shutdown and normal operating procedures
- Class Work Exercise

DAY-3

Hydrocracking Process Description

- Role of Hydrocracking in the Refinery
- Feeds and Products
- Hydrocracking Chemistry
- Hydrocracking Catalysts
- Thermodynamics and Kinetics of Hydrocracking
- Different Hydrocracking Processes

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- Process Configurations
- Hydrocracking Unit Flow Schemes and Equipment
- Hydrocracking Severity
- Hydrocracking Correlations
- Reactor Technologies for Hydrocracking
- Class Work Exercise

DAY-4

Hydrocracking Unit Operation, Design, and Optimization

- Introduction
- Single-stage Hydrocracking Reactor Section
- Two-stage Hydrocracking Reactor Section
- Use of a Hot Separator in Hydrocracking Unit Design
- Use of Flash Drums
- Hydrocracking Unit Fractionation Section Design
- Hot Separator Operating Temperature
- Hydrogen Recovery
- LPG Recovery
- HPNA Rejection
- Startup, Shutdown and Normal Operating Procedures (including catalyst activation)
- Class Work Exercise

DAY-5

Hydroprocessing Operational Guidelines, Troubleshooting and Maintenance

- Introduction
- Catalyst Activation Problems
- Feedstock Variations and Contaminants
- Operation Upsets
- Treating/Cracking Catalyst Deactivation Imbalance
- Flow Maldistribution
- Temperature Excursion
- Reactor Pressure Drop
- Hydroprocessing units Maintenance
- Corrosion, Damage Mechanisms and Inspections
- Root cause analysis
- Troubleshooting Case Analysis:
    - Case Analysis-1: Catalyst Deactivation
    - Case Analysis-2: Catalyst Channeling
    - Case Analysis-3: Reactor Bed Temperature Maldistribution

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- Case Analysis-4: Off-Spec Product Quality
- Case Analysis-5: Reactor Temperature Runaway During Catalyst Regeneration

NOTE:

Pre & Post Tests will be conducted

Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.

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