Heavy Oil Upgrading

Course Price

£3050

Course Description

As the supply of light crude oils decreases, the global oil supply will move towards the use of more heavy crude oils (below 30 API) and an increased production of heavy oils (below 22 API) and extra heavy oils (below 10 API). This is part of the forecast growth of unconventional sources, such as heavy oils, together with tight oil and biofuels, that is needed to meet projected market demand for transportation products (gasoline, aviation fuel and diesel). In the case of heavy oils, this requires growth in the use of “bottom of the barrel” technologies to upgrade these heavy feedstocks to distillates for use in the transportation products. Both crude oil residue and unconventional heavy oil upgrading technologies will grow in importance as part of meeting this challenge.

This course is aimed at engineers and chemists who work in the hydrocarbon industry and need a broad understanding of conversion technologies that will be needed to meet the increasing use of heavy oil feedstocks in the future.

The course will give a brief overview of the key feedstock properties as future oil supply changes and the challenges that this presents to the refining industry in meeting the market product demand slate. The course will include a technical overview of current and, where appropriate, emerging upgrading technologies.

For each technology, the following will be given:

- a brief process description.
- key feedstock and product qualities.
- reactor and catalyst system parameters.
- product slate and key constraints / limitations.

Market outlook and economic factors will also be addressed.

Course Objectives

The objective of the course is to develop a sound overview of the technology options available and possible future developments.

The principal intent of the course is to provide:

- Awareness of the key feedstock challenges.
• Understanding of the key technology options available and possible future developments.
• Understanding of the principles, technical parameters and key constraints of each technology covered.
• Examination of the catalyst systems employed, limitations and possible developments.
• Examination of integration of each technology into a refinery complex or use as a standalone facility.
• Awareness of market and economic factors

Who Should Attend

Professional engineers and chemists, working in the hydrocarbon industry, who need a broad overview of crude oil residue and heavy oil upgrading technologies, as part of understanding the future technical and development challenges presented by the future movement in global oil supply towards heavy feedstocks.

Course Content

Day 1

Overview of Crude Residues and Heavy / Extra Heavy Oils, Product Specifications and Market Outlook

• Crude Oil Residues Overview – definitions, key feedstock properties, typical values.
• Heavy Oil and Extra Heavy Oil Overview – definitions, key feedstock properties, typical values.
• Market Product Specs – LPG, gasoline, kerosene, diesel, fuel oil.
• Market Outlook for Heavy / Extra Heavy Oil.
• Hydrogen Management – hydrogen content of feed and products, carbon – out vs hydrogen – in.

Day 2

Carbon – Out Upgrading Technologies

• Review Summary Day 1.
• Thermal Cracking Overview.
• Fluid Catalytic Cracking (FCC) Technology.
• Residue Catalytic Cracking (RCC) Technology.
• Delayed Coking Technology.
• Developmental – eg sand – based.
• Technology Suppliers.
Day 3

Hydrogen – In Upgrading Technologies

- Review Summary Day 2.
- Hydrocracking Technology Overview.
- Feed Treatment Options.
- Residue Hydrocracking Technology.
- Slurry – Phase Technology.
- Heavy Oil Upgraders.
- Refinery Integration vs Standalone.
- Developmental.
- Technology Suppliers.

*CASE STUDY: Commercial Projects Overview

Day 4

Catalyst Systems for Converting Heavy Oils and Residues

- Review Summary Day 3.

- Catalytic Cracking Catalysts
  - Definition, chemical and physical properties.
  - Performance constraints / limitations (feed properties, reactor design, regeneration).
  - Typical Commercial Suppliers.
  - Future Developments.
    - Hydrocracking Catalysts
      - Definition, chemical and physical properties.
      - Performance constraints / limitations (feed properties, reactor design, regeneration).
      - Typical Commercial Suppliers.
      - Future Developments.

*CASE STUDY: Heavy Oil Project Experience Overview

Day 5 – Economics Overview

- Review Summary Day 4
- CAPEX and OPEX
- Capital Investment
– Catalytic cracking
– Delayed coking
– Hydrocracking
  • Refinery Economics
– Product Pricing
– Refinery Margins and Netbacks
– LP Modelling
  • Production Cost Estimates
  • Financial Modelling (DCF, ROR)
  • Project Investment Phases

*COURSE REVIEW AND SUMMARY

CPD Unit

Continuing Professional Development

35 HOURS CPD