

Petroleum Refinery Engineering - Web course

COURSE OUTLINE

This course will present an overview of the modern, integrated petroleum refinery, its feedstocks, product slate and the processes employed to convert crude oil and intermediate streams into finished products. Hydrocarbon chemistry, crude oil properties and fuel product quality will be discussed. Each refining process will be presented, covering operating description and conditions, feedstock and catalyst selection, product yields, and the relationship between process parameters, unit performance and product output and properties. This course provides major insights into both primary and secondary processes like Atmospheric Distillation, Vacuum Distillation, Cracking, Hydrocracking, Catalytic Reforming, Processes for LOBS, Coking, Visbreaking, in a typical refinery.

Contents

1. Introduction : Composition of petroleum, laboratory tests, refinery feedstocks and products.
2. Evaluation of crude oil properties and Design of crude oil distillation column.
3. Furnace design.
4. Thermal and Catalytic cracking.
5. Catalytic Reforming.
6. Hydrotreating and Hydrocracking.
7. Isomerization, Alkylation and Polymerization.
8. Lube Oil Manufacturing.
9. Environmental issues and New Trends in petroleum refinery operations.

COURSE DETAIL

S.No	Topics
1	Introduction : Composition of petroleum, laboratory tests, refinery feedstocks and products.
2	Evaluation of crude oil properties and Design of crude oil distillation column.
3	Furnace Design
4	Thermal and Catalytic cracking.
5	Catalytic reforming
6	Hydrotreating and Hydrocracking
7	Isomerization, Alkylation and Polymerization.



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Chemical Engineering

Pre-requisites:

Chemical and catalytic Reaction Engineering.

Additional Reading:

1. J.B.Maxwell, Data Book of Hydrocarbons.
2. W.C.Edmister, Applied Hydrocarbon Thermodynamics Vol I and Vol II Gulf Publishing Co.
3. Joseph Hilyard , International petroleum encyclopedia 2008 (3 Volume).
4. American Petroleum Institute , Technical Data Book.

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8	Lube oil manufacturing
9	Environmental issues and New Trends in petroleum refinery operations.

Detailed Course Plan

Module No.	Topics
1	<p>Introduction : Composition of petroleum, laboratory tests, refinery feedstocks and products.</p> <p>L1: General Definations L2: Introduction to petroleum refinery L3: Classification of Crude oil L4: Characterization of crude oil ,Composition of crude L5: Physical properties L6: Crude oil; analysis and distillation L7: Introduction to refinery "feedstock/s" and refinery products</p>
2	<p>Evaluation of crude oil properties and Design of crude oil distillation column</p> <p>L1: Dehydration and desalting of crude. L2: Crude Assay ASTM TBP distillations evaluation of crude oil properties. L3: API gravity various average boiling points and mid percent curves. L4: Evaluation of properties of crude oil and its fractions. L5: Design concept of crude oil distillation column design.</p>
3	<p>Furnace design L1: Test1 L2:Test2</p>
4	<p>Thermal and Catalytic cracking</p> <p>L1: Coking and Thermal process, Delayed coking. L2: Catalytic cracking, Cracking reactions, Zeolite catalysts. L3: Cracking Feedstocks and reactors, Effect of process variables. L4: FCC Cracking, Catalyst coking and regeneration, Design concepts, New Designs for Fluidized-Bed Catalytic Cracking Units.</p>
5	<p>Catalytic Reforming</p> <p>L1: Objective and application of catalytic reforming process reforming catalysts. L2: Reformer feed reforming reactor design continuous and semi regenerative process.</p>
6	Hydrotreating and Hydrocracking

	<p>L1: Objectives & Hydrocracking Reactions, Hydrocracking feedstocks, Modes of Hydrocracking, Effects of process variables.</p> <p>L2: Hydro treating process and catalysts Resid hydro processing, Effects of process variables, Reactor design concepts.</p>
7	<p>Isomerization, Alkylation and Polymerization</p> <p>L1: Isomerization process, Reactions, Effects of process variables.</p> <p>L2: Alkylation process, Feedstocks, reactions, products, catalysts and effect of process variables.</p> <p>L3: Polymerization: Objectives, process, Reactions, catalysts and effect of process variables.</p>
8	<p>Lube Oil Manufacturing</p> <p>L1: Lube oil processing: propane deasphalting Solvent extraction, dewaxing, Additives production from refinery feedstocks.</p>
9	<p>Environmental issues and New Trends in petroleum refinery operations</p> <p>L1: Ecological consideration in petroleum refinery, Waste water treatment, control of air pollution, New trends in refinery, Alternative energy sources, Biodiesel, Hydrogen energy from biomass.</p>

References:

1. W.L. Nelson " Petroleum Refining Engineering " Mc Graw- Hill.
2. R.N. Watkins, " Petroleum Refinery distillation " Gulf Publishing Co.
3. Robert A Mayers " Hand book of petroleum refining process " .
4. James G Speight " The chemistry and technology of petroleum " .
5. J.H. Gary and G.E. Handwerk " Petroleum Refinery Technologies and economics " .