

Petroleum Refining and Petrochemicals

General Objectives:

To develop a very comprehensive competency in the fields of petroleum refining and petrochemicals, in terms of processes, equipment, operation, safety, economics...

Specific Objectives:

At the end of training the trainees will be able to:

- ✓ Acquire a basic and solid knowledge of refining techniques;
- ✓ Select and design main equipment of processing plants;
- ✓ Learn about the technology and operation of equipment;
- ✓ Understand the main refining processes with their fundamental aspects and their operation;
- ✓ Grasp safety and environmental issues in refinery operations;
- ✓ Touch upon some economic issues of the industry.

Audience:

Engineers entering the refining and petrochemicals industry or professionals with some experience in this industry but only on some narrow aspect.

Workload: 60 hours

CONTENTS:

Module I – Physico-chemical properties of hydrocarbons and petroleum cuts

- ✓ Organic compounds, crude oil and petroleum products;
- ✓ Quality control – Standard tests – Blending rules.

Module II – Applied thermodynamics

- ✓ Properties of pure substances;
- ✓ Fluid properties: liquid-vapor equilibrium of hydrocarbons mixtures, of non ideal mixtures, of non identified components;
- ✓ K values from modern numerical methods.

Module III – Distillation course and project with PROII

- ✓ Classical industrial column design, short cut methods;
- ✓ Operating parameters, optimization, process control parameters;
- ✓ Internal equipment;

- ✓ Practice of PROII/PROVISION, process simulation, simplified design of equipment, economic evaluation and optimization.

Module IV – Crude oil and vacuum distillation

- ✓ Typical distillation units: process diagrams, operating conditions, separation quality;
- ✓ Corrosion and desalting;
- ✓ Operating and control of multidraw-off columns; vacuum systems.

Module V – Processing of light cuts and middle distillates

- ✓ Catalytic reforming, isomerization, hydrotreatment, sweetening of light cuts and sulfur recovery.

Module VI – Processing of heavy cuts

- ✓ Overview of conversion processes: thermal processes, catalytic processes;
- ✓ Visbreaking, coking processes, FCC, RFCC, distillate hydrocracking, residue hydrocracking.

Module VII – Heat transfer equipment

- ✓ Heat transmission;
- ✓ Heat exchangers: sizing and performances, operation;
- ✓ Furnaces and boilers: performances, operating conditions, combustion, operation, safety.

Module VIII – Fluid flow – Rotating machinery

- ✓ Characteristics of liquid and gas simple phase flow; gas compression laws, expansion;
- ✓ Technology and operation of pumps, compressors, steam turbines, gas turbines, electrical motors.

Module IX – Instrumentation and process control

- ✓ Instrumentation, controllers, valves, control loops implementation;
- ✓ PID tuning, monovariable control limits, multivariable control.

Module X – Safety in Operations

- ✓ Product and equipment related risks, safety in process operation;
- ✓ Hazard analysis in design and operation.

Module XI – Production of olefins and aromatics

- ✓ Sources, outlets and main industrial uses of olefinic and aromatic intermediaries;
- ✓ Steam cracking and treatment of the cuts produced;
- ✓ Fluid catalytic cracking (FCC) and production of aromatics;
- ✓ Economics of petrochemicals.