COURSE OVERVIEW PE0910-IH
Refinery Production Operations & Petroleum Products

Course Title
Refinery Production Operations & Petroleum Products

Course Date/Venue
As per proposal/Yasref Premises, KSA

Course Reference
PE0910-IH

3.25 CEUs (32.5 PDHs) AWARD

Course Duration/Credits
Five days/3.25 CEUs/32.5 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

The demand for petroleum products is increasing throughout the world. Traditional markets such as North America and Europe are experiencing moderate increase in demand, whereas the other emerging markets are witnessing a rapid surge. This has resulted in a squeeze on existing refineries, prompting a fresh technological approach to optimize efficiency and throughput. Major oil companies and technology suppliers/licensors are investing heavily to revamp their refining technologies in an effort to cater to the growing needs of customers.

Even though the nature of crude oil is changing, refineries are here to stay in the foreseeable future, since petroleum products satisfy wide-ranging energy requirements/demands that are not fully catered to by natural gas, liquefied petroleum gas (LPG), or coal. Refineries are eager to adapt to changing circumstances and are amenable to trying new technologies that are radically different in character. This is evident from the increasing use of different types of refinery process technology and novel separation methods.

This course will give an up-to-date overview of most of the refinery production technologies employed by refineries around the world and it is designed provide an extensive and deep knowledge as well as the description of the technology. Further, this course will guide the participants to develop key concepts and techniques to operate, select and optimize refinery processes.

The course covers a wide range of topics such general chemistry, organic, chemical used in refinery processes, refinery infrastructure, refinery feedstocks, crude distillation, coking & thermal processes, catalytic cracking, catalytic hydrocracking, hydroprocessing & resid processing, hydrotreating, catalytic reforming & isomerization, alkylation & polymerization, product blending, supporting processes, lubricating oil blending stocks, petrochemical feedstocks, additives production from refinery feedstocks, maintenance & safety and environmental considerations

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply systematic techniques and procedures on refinery production operations and petroleum products
- Analyze the usage, optimization, hazards & preventions, storage and specifications of chemicals used in the refinery process
- Discuss refinery infrastructure and refinery products
- Enumerate refinery feedstocks and illustrate the types of crude distillation, crude products, types & properties of coking & thermal processes
- Carryout types and new designs of catalytic cracking, catalytic hydrocracking, feed pretreating, process variables, heat recovery, hydroprocessing and resid processing
- Employ hydrotreating catalyst as well as catalytic reforming and isomerization yields
- Demonstrate alkylation types, process variables, feedstocks and reactions along with product blending and supporting processes
- Determine lubricating oil blending stocks & processes and discuss petrochemical feedstocks, types of production and additives production from refinery feedstocks

Who Should Attend

This course provides an overview of all significant aspects and considerations of refinery production operations and petroleum products for all engineering and operations staff. Further, the course is suitable for maintenance, facility integrity, pipelines/piping, quality, Health, Safety and Environmental personnel who are seeking to improve their knowledge and skills on refinery processes and gain exposure on refinery concepts and technology including the operation, safety and control aspects.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Certificate(s)
Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations
Certificates are accredited by the following international accreditation organizations:-

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.25 CEUs** (Continuing Education Units) or **32.5 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Fee
As per proposal

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Industry Background***
0930 – 0945	*Break*
0945 – 1100	***General Chemistry*** *Basic Material ● Basic Chemical Reaction ● Theory of Gases*
1100 – 1215	***Organic Chemistry*** *Structure of Organic Compounds ● Reaction of Organic Compounds ● Detail Study of Alkenes ● Alkenes ● Aromatics & Alcohol ●Nitrogen Compounds*
1215 – 1230	*Break*
1230 – 1330	***Chemical Used in Refinery Processes*** *Nature of Chemical ● Optimization Usage ● Chemical Hazards and Prevention ● Safe Storage of the Chemicals ● Petroleum Product Specification and Testing*
1330 – 1420	***Refinery Infrastructure*** *Refinery Products ● Characteristics of Crude and Products ●Product Specifications and Tests ● Low-Boiling Products ● Gasoline ● Gasoline Specifications ● Distillate Fuels ● Jet and Turbine Fuels ● Automotive Diesel Fuels ● Railroad Diesel Fuels ● Heating Oils ● Residual Fuel Oils*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*End of Day One*

Day 2

0730 – 0930	***Refinery Feedstocks*** *Crude Oil Properties ● Crudes Suitable for Asphalt Manufacture ● Crude Distillation Curves*
0930 – 0945	*Break*
0945 – 1030	***Crude Distillation*** *Desalting Crude Oils ● Atmospheric Topping Unit ●Vacuum Distillation ● Auxiliary Equipment ● CDU Overhead Condenser Control ● Crude Distillation Unit Products*
1030 – 1100	***Case Study Problem # 1*** *Crude Units*
1100 – 1215	***Coking and Thermal Processes*** *Types , Properties & Uses of Petroleum Coke ● Process Description-Delayed Coking ● Operation-Delayed Coking ● Process Description-Flexicoking ● Process Description-Fluid Coking ● Yields from Flexicoking & Fluid Coking ● Capital Cost & Utilities for Flexicoking& Fluid Coking ● Visbreaking*
1215 – 1230	*Break*

1230 – 1420	***Case Study Problem # 2*** *Delayed Coker*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*End of Day Two*

Day 3

0730 – 0830	***Catalytic Cracking*** *Fluidized-Bed Catalytic Cracking ● New Designs for Fluidized-Bed Catalytic Cracking Units ● Cracking Reactions ● Cracking of Paraffins ● Olefin Cracking ● Cracking of Naphthenic Hydrocarbons ● Aromatic Hydrocarbon Cracking ● Cracking Catalysts ● FCC Feed Pretreating ● Process Variables ● Heat Recovery ● Yield Estimation ● Capital & Operating Costs*
0830 – 0930	***Case Study Problem #3*** *Catalytic Cracker*
0930 – 0945	*Break*
0945 – 1100	***Catalytic Hydrocracking*** *Hydrocracking Reactions ● Feed Preparation ● The Hydrocracking Process ● Hydrocracking Catalyst ● Process Variables ● Hydrocracking Yields ● Investment & Operating Costs ● Modes of Hydrocracker Operation*
1100 – 1130	***Case Study Problem #4*** *Hydrocracker*
1130 – 1215	***Hydroprocessing and Resid Processing*** *Composition of Vacuum Tower Bottoms ● Processing Options ● Hydroprocessing ●Expanded-Bed Hydrocracking Process ● Moving-Bed Hydroprocessors ● Solvent Extraction ● Summary of Resid Processing Operations*
1215 – 1230	*Break*
1230 – 1300	***Hydrotreating*** *Hydrotreating Catalysts ● Naphtha & Distillate Hydrotreating ● Aromatics Reduction ● Reactions ● Process Variables ● Construction & Operating Costs*
1300 – 1330	***Case Study Problem #5*** *Hydrotreaters*
1330 – 1400	***Catalytic Reforming and Isomerization*** *Platforming ● Reactions ● Feed Preparation ● Catalytic Reforming Processes ● Reforming Catalyst ● Reactor Design ● Yields and Costs ● Isomerization ● Capital & Operating Costs ● Penex Processes ● Isomerization Yields*
1400 – 1420	***Case Study Problem #6*** *Naptha Hydrotreater, Catalytic Reformer & Isomerization Unit*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*End of Day Three*

Day 4

0730 – 0830	***Alkylation and Polymerization*** *Alkylation Reactions ● Process Variables ● Alkylation Feedstocks ● Alkylation Products ● Catalyst ● Hydrofluoric Acid Processes ● Sulfuric Acid Alkylation ● Comparison of Processes ● Alkylation Yields & Cost ● Polymerization*
0830 – 0930	***Case Study Problem # 7*** *Alkylation & Polymerization*
0930 – 0945	*Break*
0945 – 1100	***Product Blending*** *Reid Vapor Pressure ● Octane Blending ● Blending for Other Properties*
1100 – 1215	***Case Study Problem # 8*** *Gasoline Blending*
1215 – 1230	***Break***
1230 – 1330	***Case Study Problem # 9*** *Diesel & Jet Fuel Blending*
1330 – 1400	***Supporting Processes*** *Hydrogen Production & Purification ● Gas Processing Unit ● Acid Gas Removal ● LPG Treating ● Merox Processes ● DHDS Processes ● Sulfur Recovery Processes ● SRU Processes ● Ecological Considerations in Petroleum Refining ● Waste Water Treatment ● Control of Atmospheric Pollution ● Noise Level Control*
1400 – 1420	***Case Study Problem # 10*** *Saturated Gas Recovery, Amine & Sulfur Rocovery Units*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*End of Day Four*

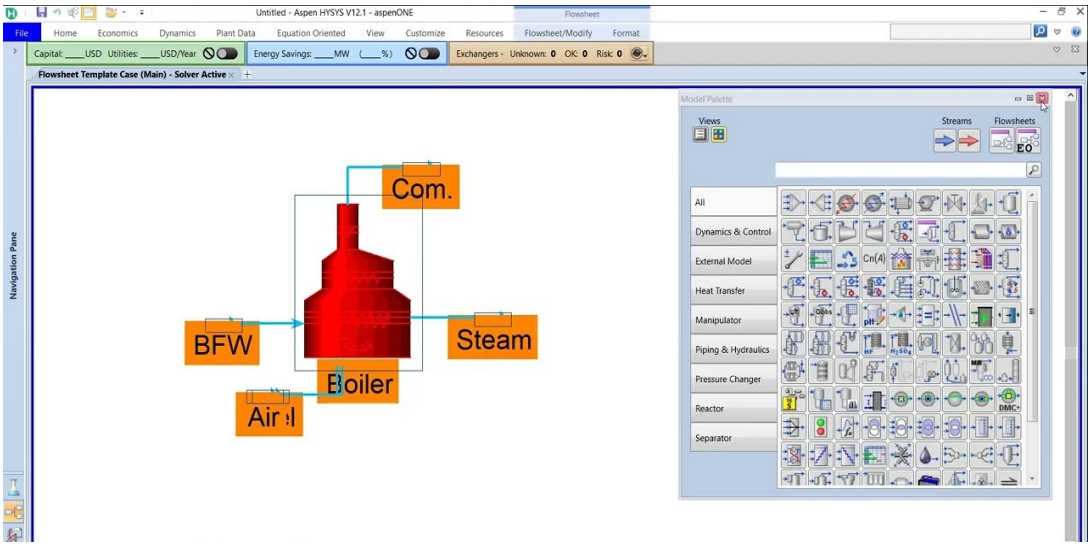
Day 5

0730 – 0930	***Lubricating Oil Blending Stocks*** *Lube Oil Processing ● Propane Deasphalting ●Viscosity Index Improvement and Solvent Extraction ● Viscosity Index Improvement & Hydrocracking ● Dewaxing ● Hydrofinishing ●Finishing by Clay Contacting ● Environmental Impacts*
0930 – 0945	*Break*
0945 – 1100	***Petrochemical Feedstocks*** *Aromatics Production ● Unsaturate Production ● Saturate Paraffins*
1100 – 1215	***Additives Production From Refinery Feedstocks*** *Use of Alcohols & Ethers ● Ether Production Reactions ● Ether Production Processes ● Yields ● Cost of Ether Production ● Production of Isobutylene ● Commercial Dehydrogenation Processes ● Houdry's CATOFIN ● Phillips Petroleum's STAR ● UOP LLC's OLEFLEX ● Snamprogetti/Yarsintez Process ● Costs to Produce Isobutylene from Isobutane ● International Union of Pure & Applied Chemists*
1215 – 1230	*Break*

1230 – 1300	***Maintenance & Safety***
1300 – 1345	***Environmental Consideration***
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the "ASPEN HYSYS V12.1" simulator.



ASPEN HYSYS V12.1 Simulator

Who will Provide the Equipment/Software/Simulators

Haward Technology