COURSE OVERVIEW PE0372
Clean Fuel Technology & Standards

Course Title
Clean Fuel Technology & Standards

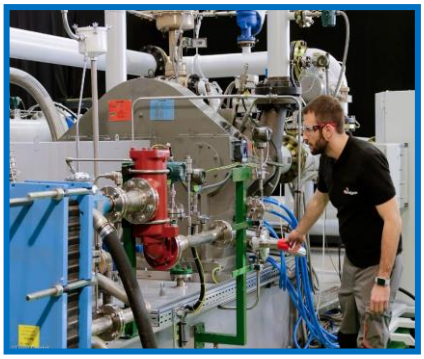
Course Reference
PE0372

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	February 04-08, 2024	Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey
2	March 03-07, 2024	The Mouna Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

Course Description



This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

Over the past decade, the refining industry has taken incredible steps to reduce sulfur levels in transportation fuels. Refiners have invested billions of dollars in new units, upgrades, retrofits and expansions to meet new sulfur and emissions regulations. These investments promote the reduction of carbon monoxide, nitrogen oxide, hydrocarbons and particulate matter in both diesel and gasoline vehicles. New technologies are moving the refining industry toward a low-sulfur world. New regulations and fuel standards are acting as catalysts for additional clean fuels projects to develop higher quality transportation fuels.

Around the world, legislations mandating decreased emissions and lower levels of airborne pollutants is coming into effect. In response, refiners are implementing operational and processing changes to reduce sulfur levels in transportation fuels. New technologies are moving the downstream hydrocarbon processing industry toward cleaner, lower-sulfur transportation fuels. Refiners around the world are working hard to meet new sulfur and emissions regulations, specifically the USA EPA Teir-3, Euro 4, Euro 5 and Euro 6 specifications.

Kuwait's Clean Fuels Project (CFP) is reconfiguring the country's three refineries and, in conjunction with grassroots construction planned at Al Zour, nearly double total refining capacity to 1.4 million b/d. Under the CFP, Kuwait National Petroleum Company (KNPC) is integrating and upgrading the 270,000-b/d Mina Abdullah and 466,000-b/d Mina Al Ahmadi refineries and close the 200,000-b/d refinery at Shuaiba. The newly integrated refineries will operate as a merchant complex with total capacity of about 800,000 b/d. Capacity of the new refinery at Al Zour in southern Kuwait, which will mainly supply low-sulfur fuel to Kuwaiti power plants and yield products for export, will be 615,000 b/d.

The Kuwait CFP includes the installation of 39 units, revamping of 7 units, and retirement of 7 units. After completion of the CFP, the reconfigured Mina Abdulla and Mina Al Ahmadi complex will produce gasoline with no more than 10 ppm sulfur, compared with 500 ppm now. Benzene and aromatics concentrations also will decline. The CFP will lower gas oil sulfur content to as low as 10 ppm, depending on destination. The facilities now produce gas oil with 500-5,000 ppm sulfur. Bunker fuel oil sulfur content will drop to 1 ppm from 4.5 ppm now. Maximum sulfur content of full-range naphtha will drop to 500 ppm from 700 ppm.

This course is designed to provide participants with a complete and up-to-date overview of clean fuel technology and standards. It covers the UOP hydrotreating technology comprising of feedstock compounds of sulfur, nitrogen aromatics and metals; the life cycle of hydroprocessing catalyst and UOP chemical reactions; the HDS, HDN, HDA, HDT catalyst, process variables, UOP naptha mild HDT, middle distillate HDT, VGO HDT process and HDT catalyst selection; and the hydroprocessing of oil fractions that include reaction kinetics, first order reaction, hydrogenation-dehydrogenation equilibrium and saturation of aromatics.

Further, the course will also cover the catalyst properties, catalyst reaction selectivity, mid distillate hydroprocessing, and factors affecting deactivation; the process operating conditions, fixed bed reactors and high quality products of deep HDT; the light oil HDT comprising of heavy distillate HDT, aromatic saturation and low sulfur products; and the dual stage HDT for high level specifications, aromatic saturation over HDT catalyst, reaction rate constant, catalyst reactivity, catalyst susceptibility to poison and first order of reaction.

During this interactive course, partcipants will learn the saturation of first and second ring of aromatics, nitrogen poisoning of catalyst, activity recovery, production of first class diesel, dual stage process and reaction kinetics; the shell middle distillate hydrogenation process, two stage process and product specification; and the HDT conventional catalyst in single and two stages as well as integrated two stages configuration using sulfur and nitrogen tolerant hydrogenation noble catalyst, deep aromatic reduction and catalyst stability.

Course Objectives

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

- Apply and gain a comprehensive knowledge on clean fuel technology and standards
- Discuss UOP hydrotreating technology covering feedstock compounds of sulfur, nitrogen aromatics and metals
- Illustrate the life cycle of hydroprocessing catalyst and UOP chemical reactions
- Determine HDS, HDN, HDA, HDT catalyst, process variables, UOP naptha mild HDT, middle distillate HDT, VGO HDT process and HDT catalyst selection
- Carryout hydroprocessing of oil fractions that include reaction kinetics, first order reaction, hydrogenation-dehydrogenation equilibrium and saturation of aromatics
- Identify the catalyst properties, catalyst reaction selectivity, mid distillate hydroprocessing, and factors affecting deactivation
- Discuss the process operating conditions, fixed bed reactors and high quality products of deep HDT
- Explain light oil HDT comprising of heavy distillate HDT, aromatic saturation and low sulfur products
- Describe dual stage HDT for high level specifications, aromatic saturation over HDT catalyst, reaction rate constant, catalyst reactivity, catalyst susceptibility to poison and first order of reaction
- Explain saturation of first and second ring of aromatics, nitrogen poisoning of catalyst, activity recovery, production of first class diesel, dual stage process and reaction kinetics
- Employ shell middle distillate hydrogenation process, two stage process and product specification
- Illustrate HDT conventional catalyst in single and two stages as well as integrated two stages configuration using sulfur and nitrogen tolerant hydrogenation noble catalyst, deep aromatic reduction and catalyst stability

Who Should Attend

This course will provide a comprehensive understanding and deeper appreciation of the clean fuel technology and standards. It is suitable for operation staff, engineers, supervisors and operators.

Course Fee

Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	**US$ 5,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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: -

- 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 **3.0 CEUs** (Continuing Education Units) or **30 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.

- 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.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Henry Beer is a **Senior Process Engineer** with over **35 years** of indepth industrial experience within the **Petrochemical**, **Oil & Gas** industries specializing in **Process Plant** Troubleshooting, P**rocess Plant Optimization** Technology, **Engineering Problem Solving**, **Process Plant** Performance & Efficiency, **Process Plant** Start-up & Shutdown, **Process Plant** Commissioning, **Process Plant** Turn-around & Shutdown, **Polymers**, **Plastics**, **Polyolefin** & **Catalysts**, **Polymerization**, **Thermal Analysis Techniques**, **Rheology**, **Thermoplastics**, **Thermosets**, **Coating Systems** and **Fibre Reinforced Polymer Matrix Composites**. Further, he is also well-versed in **Catalyst Manufacturing Techniques**, **Fuel Systems Management**, **Aviation Fuel**, **Diesel**, **Jet Fuel**, **Petrol** and **IP Octane**, **Cetane Control** and related Logistics, Road, Rail and Pipeline Distribution, **Process Design** and **Optimisation**, **Boiler Feed Water Preparation**, **Flocculation Sedimentation**, **Hot Lime Water Softening Processes**, **Desalination Processes**, **Reverse Osmosis**, **Molecular Sieves**, activated **Sludge Aerobic/Anaerobic**, **Sludge Removal** and **Incineration Process Control**, **Domestic Sewage Plants Optimisation**, **Process Cooling Water System**, **High Pressure** and **Low Pressure Tank Farm Management**, **Hydrocarbon** and **Chemical products** and **GTL** (**Gas to Liquids**).

During his career life, Mr. Beer holds significant key positions such as the **Director**, **Global Commissioning Manager**, **Senior Business Analyst**, **Process Engineer**, **Chemical Engineer**, **Senior Technician**, **Technical Sales Engineer**, **Entrepreneur**, **Financial Consultant**, **Business Analyst**, **Business Financial Planner** and **Independent Financial Planner** to various international companies such as the **Sasol**, **SASOLChem**, **TAG Solvents**, **Virgin Solvent Products**, **SARS** & **SAPIA** (**South African Petroleum Industry Association**) and **RFS Financial Services** (**Pty**) **Ltd**.

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 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	*Introduction & Welcome*
0815 – 0830	***PRE-TEST***
0830 – 0930	***UOP Hydrotreating Technology*** *Introduction ● Feedstock Compounds of Sulfur ● Nitrogen ● Aromatics & Metals ● Life Cycle of Hydroprocessing Catalyst ● UOP Chemical Reactions ● HDS ● HDN ● HDA*
0930 - 0945	*Break*
0945 – 1100	***UOP Hydrotreating Technology (cont'd)*** *HDT Catalyst ● Process Variables ● UOP Naptha Mild HDT ● Middle Distillate HDT ● VGO HDT Processes ● HDT Catalyst Selection ● Case Study (Effects of Temp & Catalyst on Specifications)*
1100 – 1230	***Hydroprocessing of Oil Fractions*** *Reaction Kinetics ● First Order Reaction ● Hydrogenaion-Dehydrogenation Equilibrium ● Saturation of Aromatics ● Catalyst Properties*
1230 – 1245	*Break*
1245 – 1420	***Hydroprocessing of Oil Fractions (cont'd)*** *Catalyst Reaction Selectivity ● Mid Distillate Hydroprocessing ● Factors Effecting Deactivation*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0900	***Deep HDT*** *Process Operating Conditions ● Fixed Bed Reactor*
0900 – 0915	*Break*
0915 – 1045	***Deep HDT (cont'd)*** *High Quality Products*
1045 – 1230	***Light Oil HDT*** *Heavy Distillate HDT ● Aromatic Saturation*
1230 – 1245	*Break*
1245 – 1420	***Light Oil HDT (cont'd)*** *Low Sulfur Products*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0900	***Dual Stage HDT for High Level Specifications*** *Introduction ● Aromatic Saturation Over HDT Catalyst*
0900 – 0915	*Break*
0915 – 1045	***Dual Stage HDT for High Level Specifications (cont'd)*** *Reaction Rate Constant ● Catalyst Reactivity ● Catalyst Susceptibility to Position*
1045 – 1230	***Dual Stage HDT for High Level Specifications (cont'd)*** *First Order of Reaction ● Saturation of First Ring of Aromatic ● Saturation of Second Ring of Aromatics*
1230 – 1245	*Break*
1245 – 1420	***Dual Stage HDT for High Level Specifications (cont'd)*** *Nitrogen Poisoning of Catalyst ● Activity Recovery ● Production of First Class Diesel*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0900	***Dual Stage HDT for High Level Specification (cont'd)*** *Dual Stage Process ● Reaction Kinetics ● Case Study*
0900 – 0915	*Break*
0915 – 1045	***Shell Middle Distillate Hydrogenation Process*** *Two Stage Process*
1045 – 1230	***Shell Middle Distillate Hydrogenation Process (cont'd)*** *Product Specification*
1230 – 1245	*Break*
1245 – 1420	***Shell Middle Distillate Hydrogenation Process (cont'd)*** *HDT Conventional Catalyst in Single Stage*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0900	***Shell Middle Distillate Hydrogenation Process (cont'd)*** *HDT Conventional Catalyst in Two Stages*
0900 – 0915	*Break*
0915 – 1045	***Shell Middle Distillate Hydrogenation Process (cont'd)*** *Integrated Two Stages Configuration using Sulfur & Nitrogen Tolerant Hydrogenation Noble Catalyst*
1045 – 1245	***Shell Middle Distillate Hydrogenation Process (cont'd)*** *Deep Aromatic Reduction*
1245 – 1300	*Break*
1300 – 1345	***Shell Middle Distillate Hydrogenation Process (cont'd)*** *Catalyst Stability*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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