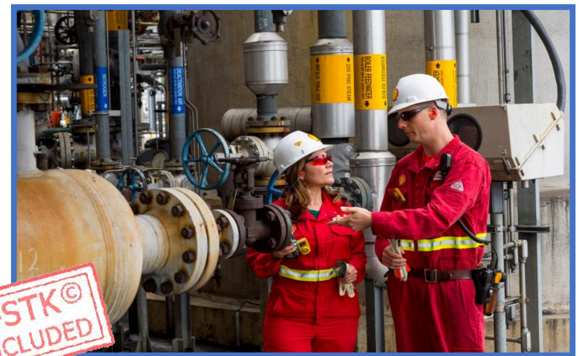
COURSE OVERVIEW PE0580
Product Blending and Acidification



Course Title
Product Blending and Acidification

Course Date/Venue
Session 1: July 07-11, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: November 02-06, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

H-STK© INCLUDED

Course Reference
PE0580

3.0 CEUs (30 PDHs) AWARD

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

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.

Since the phase-out of Lead from Gasoline in 1979, Methyl Tertiary-Butyl Ether (MTBE) has been used worldwide as an octane enhancer or anti-knocking agent. The use of MTBE at higher levels resulted from two fuel programs required by the USA Air Act Amendments (CAAA) of 1990, the Wintertime Oxygenated, and Reformulated Gasoline Programs. Most oil companies chose to use MTBE as the main fuel oxygenate and since 1997 it has become the second most heavily produced chemical in the United States and the world.

Since it has a relatively low heat of vaporization, MTBE improves fuel mixing and atomization during cold operation and consequently reduces emissions. MTBE has been blended into gasoline primarily because it has an extremely high-octane value which has enabled it to take the place of Lead compounds gradually being phased out. Adding oxygen to gasoline allows more complete combustion of the fuel, and this reduces exhaust emissions of CO (Carbon Monoxide). Furthermore, when used as part of the gasoline formulation, MTBE leads to a reduction in emissions of exhaust pollutants such as VOCs (Volatile Organic Compounds), NOx (Nitrogen Oxides) and PM (Particulates).

Reducing these pollutants improves air quality. By reducing the Ozone Forming Potential (OFP) of volatile organic compounds, MTBE performs significantly better than other octane blending components. It generates about half of the ozone when compared to Iso/Alkylates and one-tenth that of Aromatics. For all these reasons MTBE has been widely used all over the world for the last 20 years.

MTBE is manufactured by reacting Methanol, made from Natural Gas, with Isobutylene (2-Methyl-1-Propene) in the liquid state, using an Acidic Catalyst at 100°C. The physical properties of MTBE resemble most of those of hydrocarbon components of gasoline. MTBE is highly soluble in water and more soluble than other gasoline constituents. In almost all cases, MTBE is transported and stored much the same as gasoline. Some of the MTBE is made in the petroleum refineries, but most is manufactured at chemical facilities and then transported to the refineries where it is blended into gasoline. The MTBE-containing gasoline is then transported to the distribution terminals (via pipelines or other methods), distributed to the underground storage tanks (USTs) at gasoline service stations, and sold to consumers. While MTBE may be good for air quality, it now appears to be harmful for other parts of the environment, especially ground water. Over the past few years, monitoring has detected MTBE in lakes, streams, and ground water.

This course is designed to provide a comprehensive overview of MTBE production, blending and process troubleshooting. The course covers the production of MTBE and other fuel oxygenates, MTBE Chemical & Physical Properties, MTBE in Gasoline & Blending Properties, Synthesis & Production of Ethers, Kinetics & Thermodynamic of MTBE Reaction, Hüls Ethers Processes, UOP Ethermax Process for MTBE, ETBE, and TAME Production, UOP Olefin Isomerization, Oxypro Process, MTBE & Safety, MTBE and the Environment, and the Impact of MTBE Phase-out on the Refining and Petrochemical Industries.

Course Objectives

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

- Apply and gain a comprehensive knowledge on MTBE production, blending and process troubleshooting
- Discuss fuel oxygenates, MTBE, origin of gasoline additives and product description
- Describe the chemical and physical properties of MTBE
- List the components and benefits of MTBE in gasoline along with its blending properties and extent of use
- Identify the different catalysts for synthesis and explain the commercial production of ethers
- Analyze the kinetics and thermodynamics of MTBE reaction
- Identify hüls ethers processes for MTBE, ETBE and TAME along with proper process flow, economics and operating costs
- Describe the process of UOP ethermax for MTBE, ETBE and TAME production and analyze their operating cost and economics
- Discuss UOP olefin isomerization and illustrate the pentesom and butesom process
- Describe the oxypro process including the process flow scheme, operating costs and economics

- Carryout safety precautions of MTBE and explain the hazardous effects of MTBE to people and to the environment
- Evaluate the impact of MTBE phase-out on the refining and petrochemical industries

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

The course covers systematic techniques and methodologies on the production, blending and process troubleshooting for engineers working in the MTBE & fuel industry, particularly those who have recently assumed new responsibilities, to increase their technical knowledge in MTBE and for experienced engineers to become better acquainted with new technologies in the industry. The course will help to improve the participants' skills and broaden their vision and understanding of the entire industry, including technology, economics, energy, use, safety, and environmental stewardship. Further, the course is very important for HSE professionals, mainly environmental personnel in order to update themselves with the developments and regulations related to the MTBE environmental concerns, mainly the phase-out of MTBE in California in 2004 and the latest Remediation technologies.

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.

Accommodation

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

Course Fee

US$ 5,500 per Delegate. 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: -

- 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 **3.0 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.

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. Mervyn Frampton is a **Senior Process Engineer** with over **30 years** of industrial experience within the **Oil & Gas**, **Refinery**, **Petrochemical** and **Utilities** industries. His expertise lies extensively in the areas of **Distillation Column** Operation & Control, **Oil Movement** Storage & Troubleshooting, **Process Equipment** Design, Applied **Process Engineering** Elements, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Monitoring, **Catalyst** Selection & Production Optimization, Operations Abnormalities & Plant Upset, **Process Plant** Start-up & Commissioning, **Clean Fuel** Technology & Standards, Flare, Blowdown & Pressure Relief Systems, **Oil & Gas Field Commissioning** Techniques, **Pressure Vessel** Operation, **Gas Processing**, **Chemical** Engineering, **Process Reactors** Start-Up & Shutdown, **Gasoline Blending** for Refineries, **Urea Manufacturing** Process Technology, Continuous Catalytic Reformer (**CCR**), **De-Sulfurization** Technology, Advanced Operational & Troubleshooting Skills, Principles of Operations Planning, **Rotating Equipment** Maintenance & Troubleshooting, **Hazardous Waste Management & Pollution Prevention**, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Energy Conservation** Skills, **Catalyst Technology**, **Refinery & Process Industry**, **Chemical Analysis**, **Process Plant**, **Commissioning & Start-Up**, **Alkylation**, **Hydrogenation**, **Dehydrogenation**, **Isomerization**, **Hydrocracking & De-Alkylation**, **Fluidized Catalytic Cracking**, **Catalytic Hydrodesulphuriser**, **Kerosene Hydrotreater**, **Thermal Cracker**, **Catalytic Reforming**, **Polymerization**, **Polyethylene**, **Polypropylene**, Pilot Water Treatment Plant, **Gas Cooling**, **Cooling Water Systems**, Effluent Systems, Material Handling Systems, **Gasifier**, **Gasification**, Coal Feeder System, **Sulphur Extraction Plant**, **Crude Distillation Unit**, **Acid Plant Revamp** and **Crude Pumping**. Further, he is also well-versed in HSE Leadership, Project and Programme Management, Project Coordination, Project Cost & Schedule Monitoring, Control & Analysis, Team Building, Relationship Management, Quality Management, Performance Reporting, Project Change Control, Commercial Awareness and Risk Management.

During his career life, Mr. Frampton held significant positions as the **Site Engineering Manager**, **Senior Project Manager**, **Project Engineering Manager**, **Construction Manager**, **Site Manager**, **Area Manager**, **Procurement Manager**, **Factory Manager**, **Technical Services Manager**, **Senior Project Engineer**, **Project Engineer**, **Assistant Project Manager**, **Handover Coordinator** and **Engineering Coordinator** from various international companies such as the **Fluor Daniel**, **KBR** South Africa, **ESKOM**, MEGAWATT PARK, CHEMEPIC, PDPS, CAKASA, **Worley Parsons**, Lurgi South Africa, **Sasol**, **Foster Wheeler**, **Bosch** & **Associates**, **BCG** Engineering Contractors, Fina Refinery, Sapref Refinery, Secunda Engine Refinery just to name a few.

Mr. Frampton has a **Bachelor degree** in **Industrial Chemistry** from **The City University** in **London**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

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	***Overview of Fuel Oxygenates and MTBE*** *The Origin of Gasoline Additives • MTBE – Benefits and Perceived Costs History of MTBE • Tert Butyl Alcohol • Product Description*
0930 - 0945	*Break*
0945 - 1100	***MTBE Chemical & Physical Properties*** *Boiling Temperature • Specific Gravity • Water Solubility • Vapor Pressure • Vapor Density • Adsorption • Henry's Law Constant*
1100 - 1200	***MTBE in Gasoline & Blending Properties*** *The Nature of Gasoline • What Are Fuel Oxygenates?*
1200 - 1215	*Break*
1215 - 1420	***MTBE in Gasoline & Blending Properties (cont'd)*** *Oxygenates in Gasoline • Benefits of MTBE in Gasoline*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0900	***MTBE in Gasoline & Blending Properties (cont'd)*** *Extent of Oxygenates Use • General Components including MTBE • Used Gasoline Blending – Like Naphtha, Pyrolisis, Gasoline, LPG, etc.*
0900 – 0915	*Break*
0915 – 1100	***MTBE in Gasoline & Blending Properties (cont'd)*** *Overview/Explanation of Test Reports for Items, with the Objective of Gasoline Blending as the Requirement • Various Blending Proportions Possible with the Components with MTBE, to Result in Standard Unleaded Gasoline; and the Changes Required in the Proportions to Changes in the Test Result Characteristics from Batch to Batch.*
1100 – 1230	***Synthesis & Production of Ethers*** *Zeolites as Catalysts for Ether Synthesis • Fluorinated Zeolite-Based Catalysts*
1230 – 1245	*Break*
1245 – 1420	***Synthesis & Production of Ethers (cont'd)*** *Heteropolyacids as Catalysts for MTBE Synthesis • Ethanol-Based Oxygenates from Biomass*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 - 0900	***Synthesis & Production of Ethers (cont'd)*** *Catalytic Distillation Technology Applied to Ether Production • Commercial Production of Ethers*
0900 – 0915	*Break*
0915 – 1100	***Kinetics & Thermodynamic of MTBE Reaction*** *Kinetics of Tertiary-Alkyl Ether Synthesis • Thermodynamics of Ether Production*

1100 – 1230	***Hüls Ethers Processes*** *Introduction • Hüls Ethers Process for MTBE, ETBE and TAME • Process Flow*
1230 – 1245	*Break*
1245 – 1420	***Hüls Ethers Processes (cont'd)*** *Yields • Economics and Operating Costs • Commercial Experience*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 - 0900	***UOP Ethermax Process for MTBE, ETBE, & TAME Production*** *Process Description • Process Flow • Yields • Operating Cost and Economics • Ethermax Commercial Experience*
0900 - 0915	*Break*
0915 - 1030	***UOP Olefin Isomerization*** *Introduction • Description of the Pentesom Process • Description of the Butesom Process • Economics • Commercial Experience*
1030 - 1215	***Oxypro Process*** *Process Description • Process Flow Scheme • Yields • Operating Costs and Economics • Commercial Experience*
1215 - 1230	*Break*
1230 - 1420	***MTBE & Safety*** *Toxicology • Cancer Effects • Noncancer Effects*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0900	***MTBE & Safety (cont'd)*** *Ecological Effects: Aquatic Toxicity • Evaluation of Studies and Data Gaps • Key Issues*
0900 – 0915	*Break*
0915 – 1100	***MTBE & the Environment*** *Air • Soil and Groundwater*
1100 – 1200	***MTBE & the Environment (cont'd)*** *Preventing Contamination • Emergency Response • Procedures and Technology*
1200 - 1215	*Break*
1215 – 1345	***Impact of MTBE Phase-Out on the Refining & Petrochemical Industries***
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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