COURSE OVERVIEW PE1075
UOP PENEX Isomerization Process

Course Title
UOP PENEX Isomerization Process

Course Date/Venue
September 28-October 02, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

3.0 CEUs (30 PDHs) AWARD

Course Reference
PE1075

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.

This course is designed to provide participants with a detailed and up-to-date overview of Universal Oil Products PENEX Isomerization Process. It covers the various types of isomerization and its role in octane enhancement; the UOP PENEX technology, feed preparation and pretreatment and reaction chemistry and mechanism; the catalyst technology in PENEX, process flow diagram (PFD) familiarization and feed drying and hydrotreating units; and the isomerization reactor design, product separation and recovery and utility systems and ancillaries.

Further, the course will also discuss the control philosophies, distributed control system (DCS) integration, alarms and safety interlocks and advanced process control (APC); the process safety analysis (HAZOP), management of change (MOC), effluent treatment and emissions and handling of chlorides and hazardous waste; and the catalyst loading and start-up procedures, normal operation and monitoring and catalyst deactivation and poisoning.

During this highly interactive course, participants will learn the troubleshooting process upsets, shutdown and catalyst regeneration and performance optimization techniques; the connection with naphtha hydrotreating unit, blending into gasoline pool, integrating with reforming and aromatics units and hydrogen balancing with other processes; the cost-benefit analysis of isomerization, margin improvement and yield assessment; the impact of crude slate variation and optimization for profitability; the energy and utility optimization, digitalization and automation trends and advanced process control (APC) applications; the reliability and asset integrity, debottlenecking and revamp strategies; and the emergency shutdown (ESD) systems, fire and gas detection and chloride/hazardous chemical handling.

Course Objectives

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

- Apply and gain an in-depth knowledge on universal oil products PENEX isomerization process
- Identify various types of isomerization and its role in octane enhancement
- Recognize UOP PENEX technology, feed preparation and pretreatment and reaction chemistry and mechanism
- Discuss catalyst technology in PENEX, process flow diagram (PFD) familiarization and feed drying and hydrotreating units
- Determine isomerization reactor design, product separation and recovery and utility systems and ancillaries
- Explain control philosophies, distributed control system (DCS) integration, alarms and safety interlocks and advanced process control (APC)
- Apply process safety analysis (HAZOP), management of change (MOC), effluent treatment and emissions and handling of chlorides and hazardous waste
- Employ catalyst loading and start-up procedures, normal operation and monitoring and catalyst deactivation and poisoning
- Carryout troubleshooting process upsets, shutdown and catalyst regeneration and performance optimization techniques
- Discuss the connection with naphtha hydrotreating unit, blend into gasoline pool, integrate with reforming and aromatics units and apply hydrogen balancing with other processes
- Carryout cost-benefit analysis of isomerization, margin improvement and yield assessment as well as discuss the impact of crude slate variation and optimization for profitability
- Employ energy and utility optimization, digitalization and automation trends and advanced process control (APC) applications
- Apply reliability and asset integrity covering inspection and testing methods, pressure vessels and exchanger integrity, risk-based inspection (RBI) and maintenance strategies
- Carryout debottlenecking and revamp strategies covering bottleneck identification, reactor and separator upgrades, catalyst technology upgrades and capacity expansion planning
- Apply emergency shut-down (ESD) systems, fire and gas detection and chloride/hazardous chemical handling

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

This course provides an overview of all significant aspects and considerations of universal oil products PENEX isomerization process for process engineers, operations and field engineers, refinery technologists and technical support staff, control and instrumentation engineers, shift supervisors and unit operators, catalyst and chemical engineers, maintenance engineers, planning and scheduling personnel and those who involved in refining operations, process optimization, and technical services.

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 booking.

Course Fees

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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. Karl Thanasis, PEng, MSc, MBA, BSc, is a **Senior Process & Mechanical Engineer** with **30 years** of extensive industrial experience within the **Oil & Gas**, **Refinery** and **Petrochemical** industries. His wide expertise includes **Control Valve** Maintenance & Testing, Advanced **Operational Skills**, Operations & Maintenance for **Gas Processing Plant**, Oil & **Gas Processing Facilities** Operations, **Applied Natural Gas Processing**, Dehydration & Advanced Rotating Equipment, **Gas Processing & Compression**, **Process Equipment** Design & Troubleshooting, **Process Plant** Optimization & Continuous Improvement, **Production Process** Optimization, **Operations Planning** Optimization, **Process Equipment** Design, **Process Plant** Performance & Efficiency, **Process** Integration & Optimization, Root Cause Analysis (**RCA**) Methods, **Root Cause Analysis**, **Process Equipment & Piping** System, **Rotating Equipment Reliability** Optimization & Continuous Improvement, **Material Cataloguing**, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Rotating Equipment** for Process Industry, **Rotating Machinery** Best Practices, **Centrifugal Pumps** Operation, **Positive Displacement Pumps** Repair, **Pump** Maintenance & Troubleshooting, **Heat Exchanger** Maintenance & Repair, **Heat Exchanger** Inspection & Troubleshooting, **Fin-fan Coolers**, Fundamentals of **Engineering Drawings**, **Codes & Standards**, **P&ID Reading Interpretation & Developing**, **Boiler Design**, **Boiler** Inspection & Maintenance, **Boiler** Operation & Control, **Boiler** Troubleshooting & Inspection, **Boiler Instrumentation & Control**, **Steam Boiler** Maintenance, **Boiler & Steam Generation System**, **Boiler** Failure Analysis & Prevention, **Boiler** Burner Management, **Boiler** Water Treatment Technology, **Machinery Failure Analysis**, **Preventive & Predictive Maintenance**, **Condition Monitoring**, Root Cause Analysis (**RCA**), Root Cause Failure Analysis (**RCFA**), Reliability Centred Maintenance (**RCM**), Risk Base Inspection (**RBI**), **Metallurgical Failure Analysis**, **Corrosion Failure Analysis**, **Steam Generation**, **Steam Turbines**, **Power Generator Plants**, **Gas Turbines**, **Combined Cycle Plants**, **Boilers**, **Process Fired Heaters**, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, Heat Transfer, Coolers, **Pumps**, Turbo-Generator, Turbine **Shaft Alignment**, **Lubrication**, **Mechanical Seals**, **Packing**, **Blowers, Bearings**, **Couplings**, **Clutches** and **Gears**. Further, he is also versed in **Wastewater Treatment Technology**, **Networking System**, **Water Network Design**, **Industrial Water Treatment** in Refineries & Petrochemical Plants, **Piping System**, **Water Movement**, **Water Filtering**, **Mud Pumping**, **Sludge Treatment** and **Drying**, **Aerobic Process** of **Water Treatment** that includes **Aeration**, **Sedimentation** and **Chlorination Tanks**. His strong background also includes **Design** and **Sizing** of all **Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps**, **Filters**, **Metering Pumps**, **Aerators** and **Sludge Decanters**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager**, **Plant Manager**, **Area Manager**, **Maintenance Manager**, **Engineering Manager**, **Technical Consultant & Trainer**, **Head of Capital Projects**, **Refractory Specialist**, **Construction Superintendent**, **Maintenance Supervisor**, **Project Engineer**, **Process Engineer**, **Maintenance Engineer** and **Thermal Design Engineer** of various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has **Master's** and **Bachelor's** degree in **Mechanical Engineering** with **Honours** from the **Purdue University** and **Southern Illinois University** (**USA**) respectively as well as an **MBA** from the **University of Phoenix** (**USA**). Further, he is a **Certified Instructor/Trainer**, **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**), a member of the **American Society of Heating, Refrigeration and Air-Conditioning Engineers** and delivered various trainings, courses, seminars and workshops worldwide.

Course Program

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

Day 1: ***Sunday, 28th of September 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Fundamentals of Isomerization*** *Definition and Industrial Importance • Types of Isomerization (Light and Heavy Paraffins) • Reaction Thermodynamics and Kinetics • Role in Octane Enhancement*
0930 – 0945	*Break*
0945 – 1030	***Overview of UOP PENEX Technology*** *PENEX Process Configuration and Flow • Key Advantages and Commercial Success • PENEX versus Other Isomerization Technologies • Typical Feedstock and Product Slate*
1030 – 1130	***Feed Preparation & Pretreatment*** *Feedstock Quality and Contaminants • Chloride and Sulfur Removal • Hydrotreating and Drying • Impact of Impurities on Catalyst Life*
1130 – 1215	***Reaction Chemistry & Mechanism*** *Paraffin Isomerization Reactions • Catalytic Reactions and Intermediates • Reaction Thermodynamics and Equilibrium • Product Selectivity and Octane Improvement*
1215 – 1230	*Break*
1230 – 1330	***Catalyst Technology in PENEX*** *Types of Catalysts Used (Chlorided Platinum Alumina) • Role of Promoters and Additives • Catalyst Activation and Reduction • Poisoning and Regeneration Principles*
1330 – 1420	***Process Flow Diagram (PFD) Familiarization*** *Key Sections: Feed Pretreatment, Reactor, Separator • Major Equipment and Interconnections • Typical Control Loops and Instrumentation • Material and Energy Balance Overview*
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	*Lunch & End of Day One*

Day 2: ***Monday, 29th of September 2025***

0730 – 0830	***Feed Drying & Hydrotreating Units*** *Purpose and Design Considerations • Sulfur and Water Removal Methods • Reactor and Separator Configuration • Performance Monitoring*
0830 – 0930	***Isomerization Reactor Design*** *Fixed-Bed Reactor Design • Temperature Control and Gradients • Pressure Drop and Catalyst Loading • Heat Integration and Exchangers*
0930 – 0945	*Break*
0945 – 1100	***Product Separation & Recovery*** *Flash Drums and Stabilizers • Hydrogen Recovery Systems • Recycle Gas Compressors • Product Rundown and Storage*

1100 – 1215	***Utility Systems & Ancillaries*** *Hydrogen Supply and Purification • Instrument Air and Nitrogen Systems • Process Water and Steam Integration • Cooling and Heating Utilities*
1215 – 1230	*Break*
1230 – 1330	***Process Control & Instrumentation*** *Control Philosophies (Temperature, Pressure, Flow) • Distributed Control System (DCS) Integration • Alarms and Safety Interlocks • Advanced Process Control (APC)*
1330 – 1420	***Safety & Environmental Considerations*** *Process Safety Analysis (HAZOP) • Management of Change (MOC) • Effluent Treatment and Emissions • Handling of Chlorides and Hazardous Waste*
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	*Lunch & End of Day Two*

Day 3: ***Tuesday, 30th of September 2025***

0730 – 0830	***Catalyst Loading & Start-Up Procedures*** *Inert Loading Practices • Pre-Treatment and Reduction • Reactor Warm-Up and Activation • Monitoring During Start-Up*
0830 – 0930	***Normal Operation & Monitoring*** *Performance Indicators and Optimization • Catalyst Bed Temperature Profiling • Recycle and Purge Rates • Hydrogen-to-Hydrocarbon Ratio*
0930 – 0945	*Break*
0945 – 1100	***Catalyst Deactivation & Poisoning*** *Causes of Deactivation (Chlorides, Water, Sulfur) • Rate of Deactivation and Life Expectancy • In-Situ versus Ex-Situ Regeneration • Mitigation Techniques*
1100 – 1215	***Troubleshooting Process Upsets*** *Temperature Excursions and Pressure Drops • Catalyst Fouling and Coking • Contaminant Breakthrough • Systematic Root Cause Analysis*
1215 – 1230	*Break*
1230 – 1330	***Shutdown & Catalyst Regeneration*** *Controlled Shutdown Procedures • Cool-Down and Purging • Catalyst Regeneration Methods • Re-Commissioning*
1330 – 1420	***Performance Optimization Techniques*** *Octane Number Maximization • Feed Composition Management • Hydrogen Management Strategies • Energy Recovery and Cost Reduction*
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	*Lunch & End of Day Three*

Day 4: ***Wednesday, 01st of October 2025***

0730 – 0830	***Industrial Case Studies*** *Start-Up Success Stories and Learnings • Common Operational Issues and Fixes • Benchmarking Against Industry Norms • Lessons Learned from Troubleshooting*

0830 – 0930	***Simulation & Modeling*** *Using Simulation Software for PENEX • Model Calibration and Validation • Scenario Analysis (Feed Variations, Pressure Drop) • Predictive Performance Modeling*
0930 – 0945	*Break*
0945 – 1100	***Integration with Other Refinery Units*** *Connection with Naphtha Hydrotreating Unit • Blending into Gasoline Pool • Integration with Reforming and Aromatics Units • Hydrogen Balancing with Other Processes*
1100 – 1215	***Economic Evaluation & Margin Impact*** *Cost-Benefit Analysis of Isomerization • Margin Improvement and Yield Assessment • Impact of Crude Slate Variation • Optimization for Profitability*
1215 – 1230	*Break*
1230 – 1330	***Energy & Utility Optimization*** *Heat Recovery and Exchanger Networks • Utility Consumption Benchmarking • Steam and Fuel Savings • Environmental KPIs and Carbon Footprint*
1330 – 1420	***Digitalization & Automation Trends*** *Smart Sensors and Real-Time Analytics • Predictive Maintenance Tools • Digital Twin Concepts • AI-Assisted Operations in Refining*
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	*Lunch & End of Day Four*

Day 5: ***Thursday, 02nd of October 2025***

0730 – 0830	***Advanced Process Control (APC) Applications*** *APC Design for PENEX Units • Benefits and Implementation Challenges • Closed-Loop Optimization • Case Examples from Industry*
0830 – 0930	***Reliability & Asset Integrity*** *Inspection and Testing Methods • Pressure Vessels and Exchanger Integrity • Risk-Based Inspection (RBI) • Maintenance Strategies (CBM versus TBM)*
0930 – 0945	*Break*
0945 – 1100	***Debottlenecking & Revamp Strategies*** *Bottleneck Identification • Reactor and Separator Upgrades • Catalyst Technology Upgrades • Capacity Expansion Planning*
1100 – 1230	***Hands-On PFD/P&ID Analysis*** *Reading and Interpreting Real Diagrams • Identifying Instrumentation and Control Points • Troubleshooting Exercises • Modification Proposal Exercise*
1230 – 1245	*Break*
1245 – 1345	***Emergency Procedures & Risk Mitigation*** *Emergency Shut-Down (ESD) Systems • Fire and Gas Detection • Chloride/Hazardous Chemical Handling • Scenario-Based Drills and Response Plans*
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	*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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