

**COURSE OVERVIEW PE0458**  
**Distillation Technology**

**Course Title**

Distillation Technology

**Course Date/Venue**

October 20-24, 2024/Ras Al Khaimah Meeting Room, The Tower Plaza Hotel, Dubai, UAE

**Course Reference**

PE0458

**Course Duration/Credits**

Five days/3.0 CEUs/30 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.***

This course is designed to provide participants with a detailed and up-to-date overview of Distillation Technology. It covers the basic principles of distillation technology and its importance in refining process; the Raoul's law and partial pressure concepts; the modelling techniques for vapour-liquid equilibria; the principles of column modelling, tray efficiency and rate-based models; setting operating conditions covering pressure, temperature limits and operating window; the types, features and limitations of distillation equipment, distillation trays, valves and downcomers; the types and functions of inlet and outlet devices; and the distributors and draw-off trays and design considerations for optimal performance.



Further, the course will also discuss the miscellaneous equipment including liquid ring pumps, drums and accumulators; the types and line-ups of vacuum distillation units including maxwell-Bonnell temperature and its significance; analyzing Conradson carbon residue and the specification requirements for vacuum distillation products; identifying and diagnosing operational problems; the tools and techniques for effective troubleshooting; the stabilizers, LPG splitters and stripper-dryer columns; and the principles of process control in distillation.



During this interactive course, participants will learn the key considerations in the design of distillation units; the principles of heat integration in distillation processes; the maintenance and reliability and optimization techniques; the evaluation of economic impact of operational decisions; the emerging technologies in distillation; and the advanced troubleshooting techniques and process safety considerations in distillation operations.

### **Course Objectives**

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

- Apply and gain an in-depth knowledge on distillation technology
- Discuss the basic principles of distillation technology and its importance in refining process
- Explain Raoul's law and partial pressure concepts and apply modelling techniques for vapour-liquid equilibria
- Identify the principles of column modelling, tray efficiency and rate-based models as well as set operating conditions covering pressure, temperature limits and operating window
- Recognize the types, features and limitations of distillation equipment, distillation trays, valves and downcomers
- Identify the types and functions of inlet and outlet devices and describe the distributors and draw-off trays and design considerations for optimal performance
- Discuss the miscellaneous equipment including liquid ring pumps, drums and accumulators
- Recognize the types and line-ups of vacuum distillation units including maxwell-Bonnell temperature and its significance
- Analyze Conradson carbon residue and the specification requirements for vacuum distillation products
- Identify and diagnose operational problems and apply tools and techniques for effective troubleshooting
- Discuss the stabilizers, LPG splitters and stripper-dryer columns and the principles of process control in distillation
- Explain distillation open clinic, feedstock variability and energy efficiency in distillation
- Discuss the key considerations in the design of distillation units as well as the principles of heat integration in distillation processes
- Apply maintenance and reliability, optimization techniques and the evaluation of economic impact of operational decisions
- Discuss the emerging technologies in distillation and carryout advanced troubleshooting techniques and process safety considerations in distillation operations

### 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, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

### Who Should Attend

This course provides an overview of all significant aspects and considerations of distillation technology for chemical engineers, process engineers, operations personnel involved in operations and troubleshooting of crude distillation and saturation gas unit.

### 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 Fee

**US\$ 7,500** per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### Accommodation

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




**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: -


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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.

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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.

**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. Andrew Ladwig** is a **Senior Process & Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas, Refinery, Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting, Distillation Towers, Crude Oil Distillation, Fundamentals of Distillation** for Engineers, **Distillation Operation and Troubleshooting, Advanced Distillation Troubleshooting, Distillation Technology, Vacuum Distillation, Ammonia Storage & Loading Systems, Ammonia Plant Operation, Troubleshooting & Optimization, Ammonia Recovery, Ammonia Plant Safety, Hazard of Ammonia Handling, Storage & Shipping, Operational Excellence in Ammonia Plants, Fertilizer Storage Management (Ammonia & Urea), Fertilizer Manufacturing Process Technology, Sulphur Recovery, Phenol Recovery & Extraction, Wax Sweating & Blending, Petrochemical & Fertilizer Plants, Nitrogen Fertilizer Production, Petroleum Industry Process Engineering, Refining Process & Petroleum Products, Refinery Planning & Economics, Safe Refinery Operations, Hydrotreating & Hydro-processing, Separators in Oil & Gas Industry, Gas Testing & Energy Isolations, Gas Liquor Separation, Industrial Liquid Mixing, Wax Bleachers, Extractors, Fractionation, Operation & Control of Distillation, Process of Crude ATM & Vacuum Distillation Unit, Water Purification, Water Transport & Distribution, Steam & Electricity, Flame Arrestors, Coal Processing, Environmental Emission Control, R&D of Wax Blending, Wax Molding/Slabbing, Industrial Drying, Principles, Selection & Design, Certified Process Plant Operations, Control & Troubleshooting, Operator Responsibilities, Storage Tanks Operations & Measurements, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Performance, Efficiency & Optimization, Continuous Improvement & Benchmarking, Process Troubleshooting Techniques, Oil & Gas Operation/Introduction to Surface Facilities, Pressure Vessel Operation, Process Equipment Performance & Troubleshooting, Plant Startup & Shutdown, Startup & Shutdown the Plant While Handling Abnormal Conditions, Flare & Relief System, Process Gas Plant Start-up, Commissioning & Problem Solving, Process Liquid and Process Handling & Measuring Equipment. Further, he is also well-versed in Compressors & Turbines Operation, Maintenance & Troubleshooting, Heat Exchanger Overhaul & Testing Techniques, Balancing of Rotating Machinery (BRM), Pipe Stress Analysis, Valves & Actuators Technology, Inspect & Maintain Safeguarding Vent & Relief System, Certified Inspectors for Vehicle & Equipment, Optimizing Equipment Maintenance & Replacement Decisions, Certified Maintenance Planner (CMP), Certified Planning and Scheduling Professional (AACE-PSP), Tank Design, Construction, Inspection & Maintenance, Material Cataloguing, Specifications, Handling & Storage, Steam Trap Design, Operation, Maintenance & Troubleshooting, Steam Trapping & Control, Column, Pump & Exchangers, Troubleshooting & Design, Rotating Equipment Operation & Troubleshooting, Control & ESD System, Detailed Engineering Drawings, Codes & Standards, Budget Preparation, Allocation & Cost Control, Root Cause Analysis (RCA), Production Optimization, Permit to Work (PTW), Project Engineering, Data Analysis, Process Hazard Analysis (PHA), HAZOP Study, Sampling & Analysis, Training Analysis, Job Analysis Techniques, Storage & Handling of Toxic Chemicals & Hazardous Materials, Hazardous Material Classification & Storage/Disposal, Dangerous Goods, Environmental Management System (EMS), Supply Chain, Purchasing, Procurement, Logistics Management & Transport & Warehousing & Inventory, Risk Monitoring Authorized Gas Tester (AGT), Confined Space Entry (CSE), Personal Protective Equipment (PPE), Fire & Gas, First Aid and Occupational Health & Safety.**

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer, Project Engineer, Reliability & Maintenance Engineer, Maintenance Support Engineer, Process Engineer, HSE Supervisor, Warehouse Manager, Quality Manager, Business Analyst, Senior Process Controller, Process Controller, Safety Officer, Mechanical Technician, Senior Lecturer and Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's degree in Chemical Engineering** and a **Diploma in Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and has delivered various trainings, workshops, seminars, courses and conferences internationally.

### 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, 20<sup>th</sup> of October 2024**

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction &amp; Basics of Distillation</b> Overview of Distillation Technology • Basic Principles & Theory of Distillation • Importance of Distillation in the Refining Process
0930 – 0945	Break
0945 – 1030	<b>Modelling of Vapour-Liquid Equilibria</b> Raoul's Law & Partial Pressure Concepts • Modelling Techniques for Vapour-Liquid Equilibria • Application of Equilibrium Models in Distillation
1030 – 1130	<b>Column Modelling &amp; Tray Efficiency</b> Principles of Column Modelling • Tray Efficiency & Rate-Based Models • Setting Operating Conditions: Pressure & Temperature Limits, Operating Window
1130 – 1215	<b>Distillation Equipment</b> Types, Features & Limitations of Distillation Equipment • Distillation Trays, Valves & Downcomers • Random & Structured Packing
1215 – 1230	Break
1230 – 1330	<b>Inlet &amp; Outlet Devices</b> Types & Functions of Inlet & Outlet Devices • Distributors & Draw-Off Trays • Design Considerations for Optimal Performance
1330 – 1420	<b>Exercise 1: Crude Distillation Units</b> Practical Exercise on Crude Distillation Units • Types & Line-Ups of Crude Distillation Units • Operation, Monitoring & Optimization Techniques • Product Specifications: Flash Point, Cloud Points, Distillation (Initial/Final) Boiling Points
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

#### **Day 2: Monday, 21<sup>st</sup> of October 2024**

0730 – 0830	<b>Miscellaneous Equipment</b> Vacuum Sets & their Applications • Liquid Ring Pumps, Drums & Accumulators • Design & Operation of Miscellaneous Equipment
0830 – 0930	<b>Vacuum Distillation Units</b> Types & Line-Ups of Vacuum Distillation Units • Operation, Monitoring & Optimization • Maxwell-Bonnett Temperature & Its Significance
0930 – 0945	Break
0945 – 1100	<b>Product Specifications</b> Cloud Points & their Importance • Conradson Carbon Residue Analysis • Specification Requirements for Vacuum Distillation Products
1100 – 1215	<b>Exercise 2: Troubleshooting Distillation Units</b> Practical Exercise on Troubleshooting Common Issues • Jet Flooding, Foaming, Entrainment, Downcomer Limitations • Column Turndown & Its Impact on Performance



1215 – 1230	Break
1230 – 1330	<b>Troubleshooting Techniques</b> Identifying & Diagnosing Operational Problems • Root Cause Analysis & Corrective Actions • Tools & Techniques for Effective Troubleshooting
1330 – 1420	<b>Interactive Session: Real-World Case Studies</b> Discussion of Real-World Case Studies • Group Problem-Solving & Brainstorming Sessions • Sharing of Best Practices & Lessons Learned
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Two

**Day 3: Tuesday, 22<sup>nd</sup> of October 2024**

0730 – 0830	<b>Other Distillation Units</b> Overview of Stabilizers, LPG Splitters & Stripper-Dryer Columns • Design & Operation of Specialized Distillation Units • Applications & Performance Optimization
0830 – 0930	<b>Process Control Schemes</b> Principles of Process Control in Distillation • Control Strategies & Schemes for Distillation Units • Integration of Control Systems with Plant Operations
0930 – 0945	Break
0945 – 1100	<b>Exercise 3: Process Control Applications</b> Practical Exercise on Process Control Schemes • Case Studies on Control System Optimization • Group Discussions & Problem-Solving
1100 – 1215	<b>Distillation Open Clinic</b> Interactive Session for Discussing Specific Challenges • Analyzing Real-World Issues & Developing Solutions • Sharing Experiences & Best Practices
1215 – 1230	Break
1230 – 1330	<b>Feedstock Variability &amp; its Impact</b> Understanding the Impact of Feedstock Changes • Strategies to Manage Feedstock Variability • Case Studies on Successful Adaptations
1330 – 1420	<b>Energy Efficiency in Distillation</b> Identifying Opportunities for Energy Savings • Implementing Energy-Efficient Technologies • Case Studies on Energy Efficiency Improvements
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Three

**Day 4: Wednesday, 23<sup>rd</sup> of October 2024**

0730 – 0830	<b>Design Aspects of Distillation Units</b> Key Considerations in the Design of Distillation Units • Material Selection & Equipment Sizing • Safety & Environmental Compliance
0830 – 0930	<b>Heat Integration &amp; Recovery</b> Principles of Heat Integration in Distillation Processes • Techniques for Heat Recovery & Utilization • Case Studies on Heat Integration Projects
0930 – 0945	Break
0945 – 1100	<b>Maintenance &amp; Reliability</b> Maintenance Best Practices for Distillation Units • Reliability Engineering Principles • Predictive & Preventive Maintenance Strategies
1100 – 1215	<b>Optimization Techniques</b> Strategies for Optimizing Distillation Performance • Advanced Techniques & Technologies • Cost-Benefit Analysis of Optimization Efforts
1215 – 1230	Break





1230 – 1330	<b>Economic Analysis</b> <i>Economic Considerations in Distillation Operations • Evaluating the Economic Impact of Operational Decisions • Case Studies on Economic Analysis</i>
1330 – 1420	<b>Interactive Workshop: Optimization Projects</b> <i>Group Activity to Develop Optimization Projects • Presentations &amp; Discussions of Project Ideas • Feedback &amp; Improvement Suggestions</i>
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Four

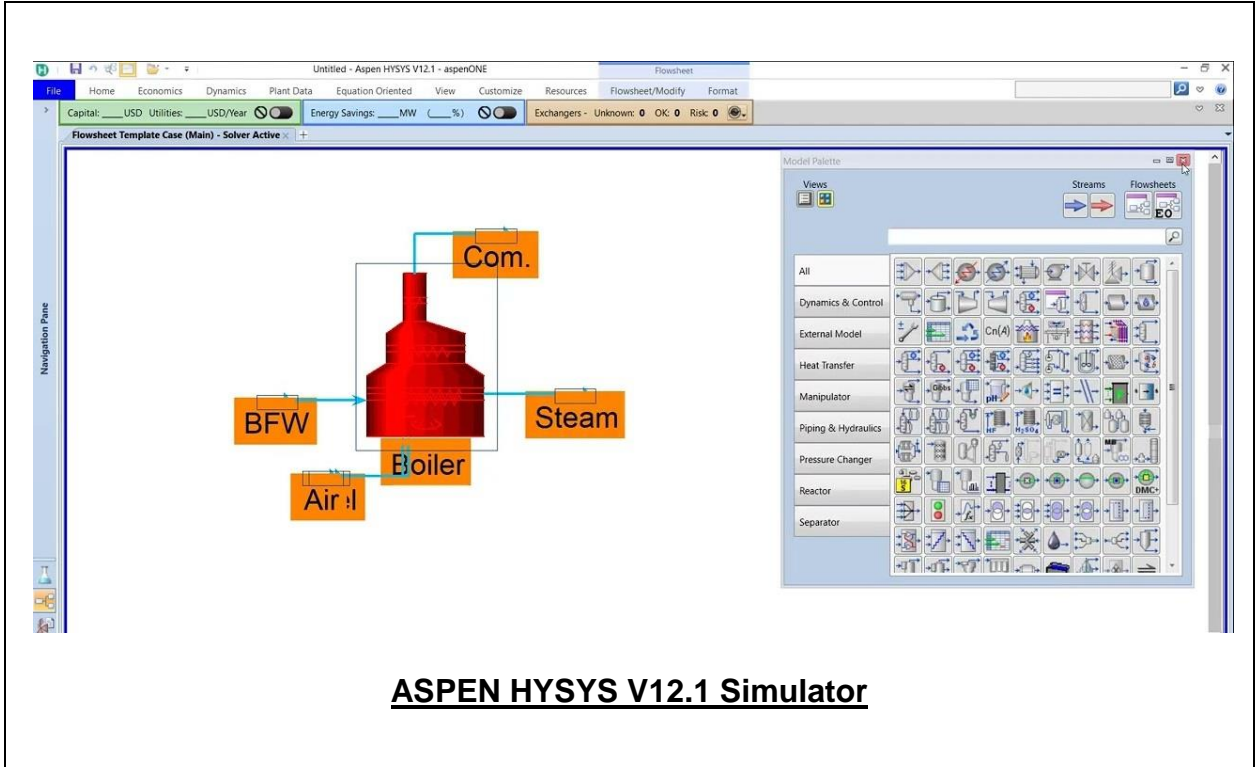
**Day 5: Thursday, 24<sup>th</sup> of October 2024**

0730 – 0830	<b>Emerging Technologies in Distillation</b> <i>Overview of New &amp; Emerging Distillation Technologies • Potential Benefits &amp; Challenges • Case Studies on Technology Adoption</i>
0830 – 0930	<b>Advanced Troubleshooting Techniques</b> <i>Techniques for Troubleshooting Complex Issues • Practical Exercises &amp; Simulations • Sharing of Best Practices &amp; Lessons Learned</i>
0930 – 0945	Break
0945 – 1100	<b>Process Safety &amp; Risk Management</b> <i>Process Safety Considerations in Distillation Operations • Risk Assessment &amp; Mitigation Strategies • Emergency Response Planning &amp; Drills</i>
1100 – 1230	<b>Interactive Clinic Workshop: Problem Solving</b> <i>Participants Present Current Challenges &amp; Issues • Group Discussions &amp; Brainstorming Sessions • Developing Practical Solutions to Real-World Problems</i>
1230 – 1245	Break
1245 – 1345	<b>Workshop Continued: Advanced Troubleshooting</b> <i>Advanced Techniques for Troubleshooting Complex Issues • Practical Exercises &amp; Simulations • Sharing of Best Practices &amp; Lessons Learned</i>
1345 – 1400	<b>Course Conclusion</b>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course



**Simulator (Hands-on Practical Sessions)**

Practical session 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 state-of-the-art simulators “ASPEN HYSYS” simulator.



**Course Coordinator**

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