COURSE OVERVIEW PE1084
Advanced Distillation Technology

Course Title
Advanced Distillation Technology

Course Date/Venue
November 16-20, 2025/Tamra Meeting Room,
Al Bandar Rotana - Creek, Dubai, UAE

Course Reference
PE1084

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 Advanced Distillation Technology. It covers the thermodynamic principles, distillation equipment and mass transfer in distillation; the material and energy balances, column hydraulics, flow regimes and column design methodology; the reboiler and condenser design, tray column design, packed column design and control of conventional columns; the effects of feed flowrate and composition, reflux variation impacts, column pressure and temperature influence; the startup and stabilization techniques and energy integration in distillation; and the multi-effect and thermally coupled columns, dividing wall columns (DWC) and azeotropic and extractive distillation.

During this interactive course, participants will learn the reactive distillation, hybrid distillation systems, advanced process control in distillation and dynamic behavior of distillation columns; the troubleshooting techniques, fouling and corrosion management, optimization strategies and Aspen HYSYS simulation tools; the column revamp and debottlenecking, retrofit design strategies and process safety in distillation systems; the intensified distillation systems, hybrid separation technologies, AI and digital twin applications; and the future industry trends and sustainability

Course Objectives

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

- Apply and gain an advanced knowledge on distillation technology
- Discuss advanced distillation, thermodynamic principles, distillation equipment and mass transfer in distillation
- Recognize material and energy balances, column hydraulics, flow regimes and column design methodology
- Illustrate reboiler and condenser design, tray column design, packed column design and control of conventional columns
- Identify the effects of feed flowrate and composition, reflux variation impacts, column pressure and temperature influence and apply startup and stabilization techniques
- Carryout energy integration in distillation and discuss multi-effect and thermally coupled columns, dividing wall columns (DWC) and azeotropic and extractive distillation
- Recognize reactive distillation, hybrid distillation systems, advanced process control in distillation and dynamic behavior of distillation columns
- Employ troubleshooting techniques, fouling and corrosion management, optimization strategies and Aspen HYSYS simulation tools
- Determine column revamp and debottlenecking, retrofit design strategies and process safety in distillation systems
- Recognize intensified distillation systems, hybrid separation technologies, AI and digital twin applications and future industry trends and sustainability

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 advanced distillation technology for process engineers, operations engineers, shift engineers, process control engineers, production, plant managers, maintenance engineers, chemical, mechanical engineers and other technical staff.

Course Fee

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.

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 **30 years** of indepth industrial experience within the **Petrochemical**, **Oil & Gas** industries specializing in **Hydrocarbon Process** Equipment, **DOX Unit** Operation & Troubleshooting, **Advanced Distillation,** Energy Integration in **Distillation, Azeotropic & Extractive Distillation, Hybrid Distillation System, Fouling & Corrosion** Management**, Polyethylene & Polypropylene** Processing, **Oil Movement** Storage & Troubleshooting, **Power Plant Chemistry**, **Fuel Quality** Monitoring System Fundamentals, **Liquid Bulk Cargo Handling**, **Oil Refinery Cost Management**, **Flare & Blowdown** Operation, **Pressure Relief Systems** Maintenance & Troubleshooting, Refinery **SRU**, **Tail Gas** Treating, **Sour Water & Amine Recovery** Units, **Propylene** Compressor and Turbine, **Clean Fuel** Technology & Standards, Principles of **Operations Planning**, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Plastic Extrusion Technology** Operation & Troubleshooting, **Chemical Engineering** for Non-Chemical Engineers, **Process Plant** Troubleshooting, **Process Plant Optimization** Technology, **Engineering Problem Solving**, **Process Plant** Performance & Efficiency, **Process Plant** Start-up & Shutdown, **Process Plant** Commissioning, **Process Plant** Turn-around & Shutdown, **Pumps & Compressors** Troubleshooting, **Fired Heaters & Air Coolers** Maintenance, **Pressure Vessels & Valves** Repair, **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 **Water Hydraulic Modelling**, **Efficient** Shutdowns, Turnaround & Outages, **Pump** Selection and Installation, Operation and Maintenance of **Pumps**, **Demand & Supply** Management, **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**, **Process Engineering 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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday, 16th of November 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Advanced Distillation*** *Overview of Distillation Processes and Applications • Key Terminologies and Definitions • Review of Conventional versus Advanced Distillation • Industry Relevance and Process Integration*
0930 – 0945	*Break*
0945 – 1030	***Thermodynamic Principles*** *Vapor-Liquid Equilibrium (VLE) Fundamentals • Raoult's Law, Dalton's Law, and Deviations • Phase Diagrams and Azeotropes • Impact of Non-Ideal Behavior on Design*
1030 – 1130	***Distillation Equipment Overview*** *Columns, Trays, and Packing Systems • Reboilers and Condensers • Internals and Auxiliary Systems • Selection Criteria and Design Considerations*
1130 – 1215	***Mass Transfer in Distillation*** *Concept of Mass Transfer and Driving Forces • Enthalpy Balance and Relative Volatility • Diffusion and Transfer Units • Height of Transfer Unit and Packing Efficiency*
1215 – 1230	*Break*
1230 – 1330	***Material & Energy Balances*** *M&E Balance Fundamentals for Distillation • Multicomponent Systems and Enthalpy Curves • McCabe-Thiele and Ponchon-Savarit Method Review • Application in Process Simulation*
1330 – 1420	***Column Hydraulics & Flow Regimes*** *Tray Hydraulics and Flooding • Pressure Drop Considerations • Downcomer Design and Tray Spacing • Packed Column Hydraulics and Limitations*
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, 17th of November 2025

0730 – 0830	***Column Design Methodology*** *Determination of Theoretical Stages • Minimum Reflux and Total Reflux • Feed Condition and Q-Line Analysis • Design Margin Considerations*
0830 – 0930	***Reboiler & Condenser Design*** *Types of Reboilers and Condensers • Duty Calculation and Temperature Approach • Heat Transfer Considerations • Startup and Shutdown Strategies*
0930 – 0945	*Break*
0945 – 1100	***Tray Column Design*** *Tray Types and Selection Criteria • Weir, Downcomer, and Hole Sizing • Efficiency Calculation • Troubleshooting Tray Malfunctions*
1100 – 1215	***Packed Column Design*** *Structured versus Random Packing • Pressure Drop and Capacity Curves • Mass Transfer Coefficients and HETP • Installation and Maintenance Guidelines*
1215 – 1230	*Break*
1230 – 1330	***Control of Conventional Columns*** *Reflux Ratio Control and Temperature Profiles • Pressure and Level Control Strategies • Bottom and Overhead Composition Control • Troubleshooting Control Instabilities*
1330 – 1420	***Operational Parameters & Sensitivities*** *Effects of Feed Flowrate and Composition • Reflux Variation Impacts • Column Pressure and Temperature Influence • Startup and Stabilization Techniques*
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, 18th of November 2025

0730 – 0830	***Energy Integration in Distillation*** *Concept of Energy Integration • Heat Recovery Systems and Pinch Analysis • Column Sequencing and Optimization • Utility Minimization Strategies*
0830 – 0930	***Multi-Effect & Thermally Coupled Columns*** *Principles of Multi-Effect Distillation • Thermally Coupled (Petlyuk) Systems • Energy Efficiency Gains • Practical Applications and Case Studies*
0930 – 0945	*Break*
0945 – 1100	***Dividing Wall Columns (DWC)*** *Concept and Configuration • Design Considerations and Internals • Operational Benefits and Challenges • Real-World Implementation Examples*
1100 – 1215	***Azeotropic & Extractive Distillation*** *Azeotrope Characteristics and Challenges • Solvent Selection for Extractive Distillation • Process Schemes and Solvent Recovery • Industrial Examples (Ethanol Dehydration, etc.)*
1215 – 1230	*Break*
1230 – 1330	***Reactive Distillation*** *Principle of Combining Reaction and Separation • Column Design and Catalyst Placement • Process Intensification Benefits • Examples in Chemical and Petrochemical Processes*

1330 – 1420	***Hybrid Distillation Systems*** *Membrane-Distillation Hybrids • Pervaporation + Distillation Integration • Distillation with Adsorption/Absorption • Potential for Debottlenecking Existing Plants*
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, 19th of November 2025***

0730 – 0830	***Advanced Process Control in Distillation*** *Feedforward and Cascade Control • Model Predictive Control (MPC) • Advanced Temperature/Composition Control • Control Loop Optimization*
0830 – 0930	***Dynamic Behavior of Distillation Columns*** *Column Response to Disturbances • Start-Up and Shutdown Dynamics • Transient versus Steady-State Behavior • Modeling of Dynamic Operations*
0930 – 0945	*Break*
0945 – 1100	***Troubleshooting Techniques*** *Identifying Operational Bottlenecks • Tray Damage, Flooding, Weeping, Entrainment • Feed Quality and Hydraulics Issues • Systematic Troubleshooting Procedure*
1100 – 1215	***Fouling & Corrosion Management*** *Causes of Fouling in Reboilers and Internals • Monitoring and Mitigation Techniques • Corrosion Mechanisms and Protection • Cleaning Strategies and Maintenance Plans*
1215 – 1230	*Break*
1230 – 1330	***Optimization Strategies*** *Energy Optimization Through Reflux Ratio Tuning • Column Pressure Optimization • Product Purity versus Energy Trade-Off • Real-Time Optimization Techniques*
1330 – 1420	***Use of Simulation Tools*** *Process Simulation Using Commercial Software (e.g., Aspen HYSYS, Aspen Plus) • Sensitivity and Case Study Analysis • Model Calibration and Validation • Scenario Testing for Optimization*
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, 20th of November 2025***

0730 – 0830	***Column Revamp & Debottlenecking*** *Identifying Limiting Factors • Hardware versus Operational Debottlenecking • Tray and Packing Upgrades • Capacity versus Efficiency Improvements*
0830 – 0930	***Retrofit Design Strategies*** *Design Modifications for Energy Savings • Integration of DWC and Hybrid Systems • Internals Replacement and Revamp Options • Project Execution and Safety Considerations*
0930 – 0945	*Break*

0945 – 1100	***Industrial Case Studies*** *Refineries and Petrochemical Plants Examples • DWC and Extractive Distillation Projects • Energy and Cost Savings Analysis • Lessons Learned and Best Practices*
1100 – 1230	***Process Safety in Distillation Systems*** *Overpressure Protection and PSV Sizing • Column Relief System Design • Flare System Integration • Emergency Shutdown Procedures*
1230 – 1245	*Break*
1245 – 1345	***Emerging Technologies in Distillation*** *Intensified Distillation Systems • Hybrid Separation Technologies • AI and Digital Twin Applications • Future Industry Trends and Sustainability*
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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