

**COURSE OVERVIEW PE0390**  
**Distillation Design, Operation, Control & Troubleshooting**

**Course Title**

Distillation Design, Operation, Control & Troubleshooting

**Course Date/Venue**

November 03-07, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

**Course Reference**

PE0390

**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.***



The Distillation Process is used in many industries to separate mixtures into components. It is defined as a process in which a liquid or vapor mixture of two or more substances is separated into its component fractions of desired purity by the application and removal of heat. The application and removal of heat makes the distillation process energy intensive as it consuming up to 50 percent of a refinery's operating costs due to intense heating and cooling cycles. Having accurate measurements to feed the control system is critical for energy efficient, safe and reliable operation.



Improving distillation columns has always been challenging as problems can occur when operators and engineers have insufficient information about operating conditions. Failing to properly monitors and control process variables can result in decreased product quality and throughput, increased energy costs and unsafe operations that put employees and capital equipment at risk.

This course is designed to provide delegates with a detailed and up-to-date knowledge on the operation, design and troubleshooting of distillation process. It covers distillation technology; different distillation methods; and distillation process that involve normal operation of bubble plate, vapor velocity and velocity distribution.

The course will also discuss the factors influencing plate efficiency; the scope of distillation column including flash stages, process design basic and reflux ratio; how tray works; the various types and function of reboilers; features and use of condensers in the operation of distillation columns; instrumentation and control application; the importance of steam stripper and its efficiency; the purpose of pump around; as well as pump around heat removal, vapor flow and fractionation.

At the completion of the course, participants will be able to operate the vacuum system; explain the functional and structural efficiency of packed towers; employ distillation column packing as well as tray columns; recognize the guidelines and methods on how to determine the column diameter; and troubleshoot various distillation column problems.

### **Course Objectives**

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

- Operate, control and troubleshoot distillation process in a professional manner
- Apply and gain an in-depth knowledge on distillation technology
- Identify the different distillation methods and implement distillation process involving the normal operation of bubble plate, vapor velocity and velocity distribution
- Determine the factors influencing plate efficiency and explain the scope of distillation column including flash stages, process design basic and reflux ratio
- Demonstrate how tray works and explain the types & function of reboilers
- Discuss the features & use of condensers in the operation of distillation columns and apply instrumentation & control
- Enumerate the importance of steam stripper and emphasize its efficiency
- Discuss the purpose of pump around and become familiar with pump around heat removal, vapor flow and fractionation
- Demonstrate the operation of the vacuum system and explain the functional and structural efficiency of packed towers
- Employ distillation column packing as well as tray columns and recognize the guidelines & methods on how to determine the column diameter
- Troubleshoot various distillation column problems

### **Exclusive Smart Training Kit - H-STK®**



*Participants of this course will receive the exclusive “Howard 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 process for those who are involved in the operation, control and troubleshooting of such system. Process engineers, production engineers, operations engineers, maintenance engineers and other technical staff will definitely benefit from the technical and operational aspects of the course.

### **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\$ 5,500** per Delegate + **VAT**. This rate includes H-STK® (Howard 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.



- 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. 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 **Process Troubleshooting, Distillation Towers, Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation, 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, Process Engineering Manager, Project Engineering Manager, Construction Manager, Site Manager, Area Manager, Procurement Manager, Factory Manager, Technical Services Manager, Senior Project Engineer, Process 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's 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: Sunday, 03<sup>rd</sup> of November 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Theory of Distillation</b> Introduction • Boiling Point Diagram • Raoult's Law • Vapor – Liquid Equilibrium • Exercise • Solution • Azeotropic Mixture
0930 – 0945	Break
0945 – 1100	<b>Distillation Methods &amp; Definition</b> Flash Distillation • Steam Distillation • Rectification • Combination Rectification & Stripping • Exercise • Solution • Distillation Basic Definition
1100 – 1230	<b>Distillation Process</b> Normal Operation of Bubble Plate • Vapor Velocity • Velocity Distribution • Factors Influencing Plate Efficiency • Sieve-plate Towers
1230 – 1245	Break
1245 – 1330	<b>Distillation Column</b> Flash Stages • Process Design Basic • Reflux Ratio • Minimum Reflux Ratio • Minimum Number of Plates • Optimum Reflux
1330 – 1420	<b>How Trays Work</b> Down Common Backup & Flooding • Dumping & Weeping • Optimizing Tower Pressure
1420 -1430	<b>Recap</b> Using this Course Overview, the instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

#### Day 2: Monday, 04<sup>th</sup> of November 2024

0730 – 0930	<b>Reboilers Function</b> Reboilers Function • The Reboiler • Heat-Balance Calculations
0930 – 0945	Break
0945 – 1100	<b>Types of Reboiler</b> Thermosyphon, Gravity Feed & Forced • Thermosyphon Reboilers • Forced Circulation Reboilers • Kettle Reboilers • Don't Forget Fouling
1100 – 1230	<b>Condensers</b> Flooded Condenser Control • Subcooling, Vapor Binding, & Condensation • Condensation & Condenser Design • Pressure Control
1230 – 1245	Break
1245 – 1330	<b>Instrumentation</b> Levels, Pressures, Flows & Temperatures • Pressure Control • Flow Control • Level Control • Crude Tower Kerosene Side Stream Control • Cascade Level – Flow Control
1330 – 1420	<b>Steam Stripper</b> Heat of Evaporation • Stripper Efficiency
1420 - 1430	<b>Recap</b> Using this Course Overview, the instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two



**Day 3: Tuesday, 05<sup>th</sup> of November 2024**

0730 - 0930	<b>Pumparound</b> Closing the Tower Enthalphy Balance • Pumparound Heat Removal • Purpose of a Pumparound • Do Pumparounds Fractionate? • Vapor Flow • Fractionation
0930 - 0945	Break
0945 - 1100	<b>Vacuum System</b> Theory of Operation • Measuring Deep Vacuums
1100 - 1230	<b>Packed Towers</b> How Packed Towers Work • Maintaining Functional & Structural Efficiency in Packed Towers
1230 - 1245	Break
1245 - 1420	<b>Distillation Column Packing</b> Tray Columns - Packings • Tray Columns - Type of Packings • Tray Columns - Packings Correlations • Comparison Trays versus Packing • Randomly Packed Towers Sizing • Determine the Column Diameter • Randomly Packed Towers Column Height • Randomly Packed Towers Pressure Drop Correlation
1420 - 1430	<b>Recap</b> Using this Course Overview, the instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

**Day 4: Wednesday, 06<sup>th</sup> of November 2024**

0730 - 0930	<b>Inspection, Troubleshooting &amp; Case Studies</b> Tray Deck Levelness • Loss of Downcomer Seal due to Leaks
0930 - 0945	Break
0945 - 1100	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Effect of Missing Caps • Repairing Loose Tray Panels
1100 - 1230	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Improper Downcomer Clearance • Inlet Weirs
1230 - 1245	Break
1245 - 1420	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Seal Pans
1420 - 1430	<b>Recap</b>
1430	Lunch & End of Day Four

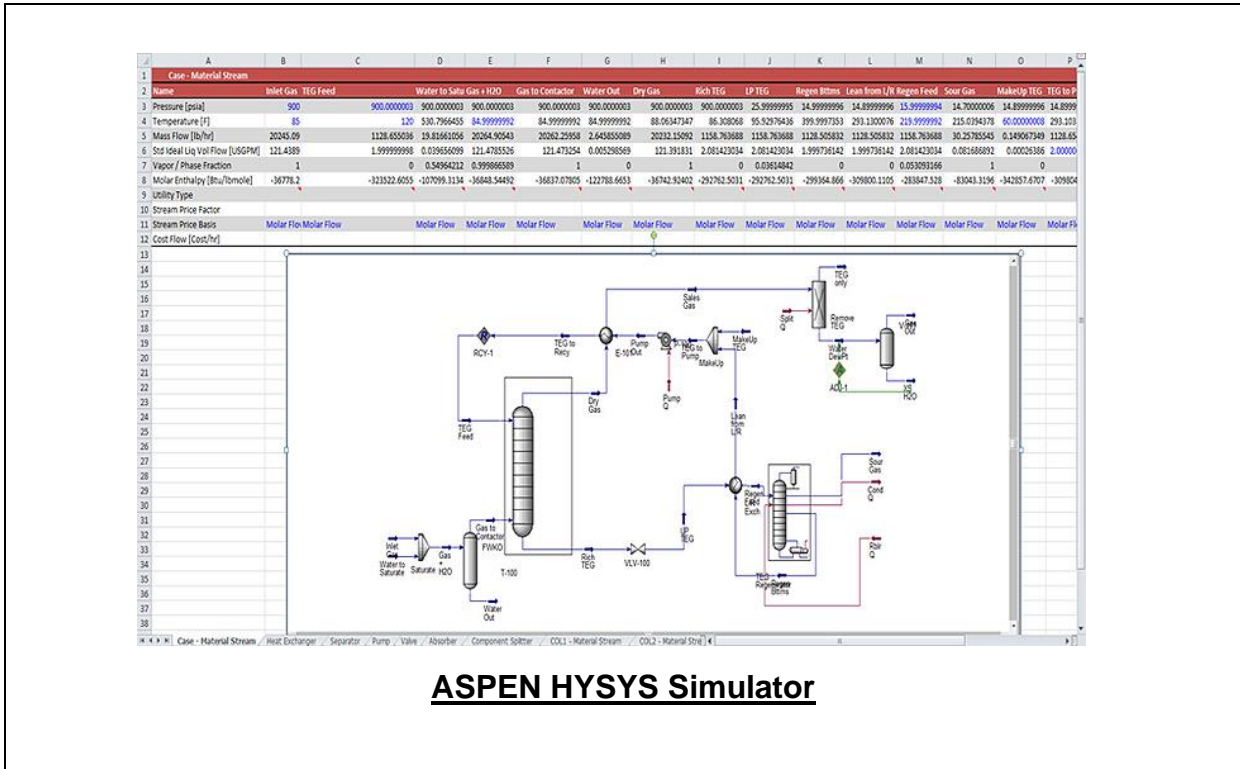
**Day 5: Thursday, 07<sup>th</sup> of November 2024**

0730 - 0930	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Drain Holes • Vortex Breakers
0930 - 0945	Break
0945 - 1100	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Chimney Tray Leakage
1100 - 1230	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Shear Clips
1230 - 1245	Break
1245 - 1345	<b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b> Bubble-Cap Trays • Final Inspection
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.



**ASPEN HYSYS Simulator**

### Course Coordinator

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