COURSE OVERVIEW PE0390
Distillation-Column Operation, Control & Troubleshooting

Course Title
Distillation-Column Operation, Control & Troubleshooting



Course Date/Venue
Session 1: July 18-22, 2027/Meeting Plus 9, City Centre Rotana Doha Hotel, Doha, Qatar
Session 2: December 12-16, 2027/Meeting Plus 9, City Centre Rotana Doha Hotel, Doha, Qatar



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 Course Objectives/Outcomes & Benefits for the Participants

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 "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 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.

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. 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.

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

Course Fee

US$ 6,000 per Delegate. 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 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	***Theory of Distillation*** *Introduction ● Boiling Point Diagram ● Roault's Law ● Vapor – Liquid Equilibrium ● Exercise ● Solution ● Azeotropic Mixture*
0930 – 0945	*Break*
0945 – 1100	***Distillation Methods & Definition*** *Flash Distillation ● Steam Distillation ● Rectification ● Combination Rectification & Stripping ● Exercise ● Solution ● Distillation Basic Definition*

1100 – 1230	***Distillation Process*** *Normal Operation of Bubble Plate ● Vapor Velocity ● Velocity Distribution ● Factors Influencing Plate Efficiency ● Sieve-plate Towers*
1230 – 1245	*Break*
1245 – 1330	***Distillation Column*** *Flash Stages ● Process Design Basic ● Reflux Ratio ● Minimum Reflux Ratio ● Minimum Number of Plates ● Optimum Reflux*
1330 – 1420	***How Trays Work*** *Down Common Backup & Flooding ● Dumping & Weeping ● Optimizing Tower Pressure*
1420 -1430	***Recap*** *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

0730 – 0930	***Reboilers Function*** *Reboilers Function ● The Reboiler ● Heat-Balance Calculations*
0930 – 0945	*Break*
0945 – 1100	***Types of Reboiler*** *Thermosyphon, Gravity Feed & Forced ● Thermosyphon Reboilers ● Forced Circulation Reboilers ● Kettle Reboilers ● Don't Forget Fouling*
1100 – 1230	***Condensers*** *Flooded Condenser Control ● Subcooling, Vapor Binding, & Condensation ● Condensation & Condenser Design ● Pressure Control*
1230 – 1245	*Break*
1245 – 1330	***Instrumentation*** *Levels, Pressures, Flows & Temperatures ● Pressure Control ● Flow Control ● Level Control ● Crude Tower Kerosene Side Stream Control ● Cascade Level – Flow Control*
1330 – 1420	***Steam Stripper*** *Heat of Evaporation ● Stripper Efficiency*
1420 - 1430	***Recap*** *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

0730 - 0930	***Pumparound*** *Closing the Tower Enthalphy Balance ● Pumparound Heat Removal ● Purpose of a Pumparound ● Do Pumparounds Fractionate? ● Vapor Flow ● Fractionation*
0930 – 0945	*Break*
0945 – 1100	***Vacuum System*** *Theory of Operation ● Measuring Deep Vacuums*

1100 – 1230	***Packed Towers*** *How Packed Towers Work ● Maintaining Functional & Structural Efficiency in Packed Towers*
1230 – 1245	***Break***
1245 – 1420	***Distillation Column Packing*** *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	***Recap*** *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

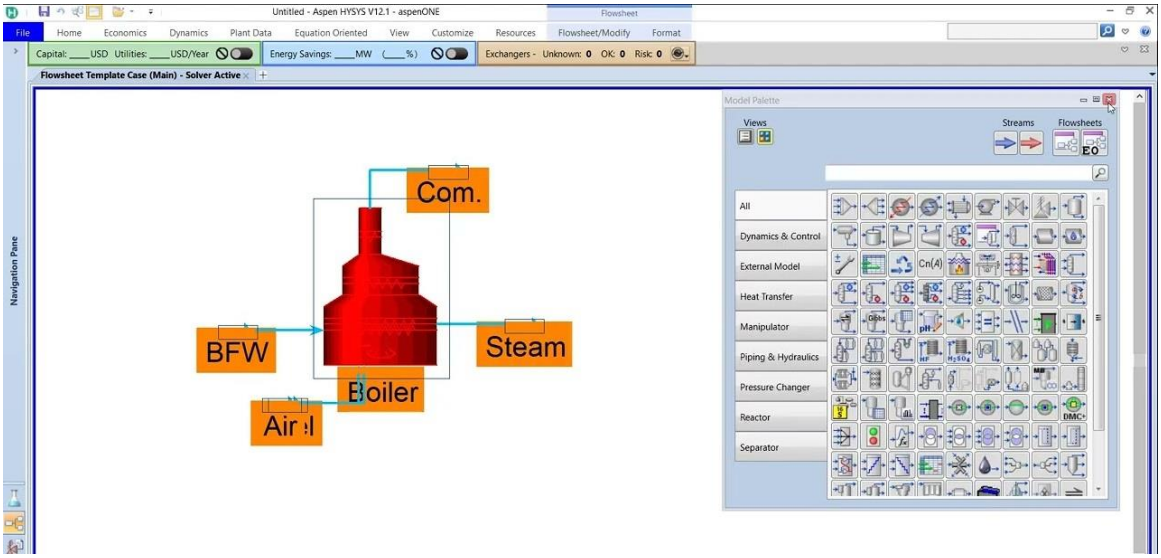
0730 – 0930	***Inspection, Troubleshooting & Case Studies*** *Tray Deck Levelness ● Loss of Downcomer Seal due to Leaks*
0930 – 0945	*Break*
0945 – 1100	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Effect of Missing Caps ● Repairing Loose Tray Panels*
1100 – 1230	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Improper Downcomer Clearance ● Inlet Weirs*
1230 – 1245	*Break*
1245 – 1420	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Seal Pans*
1420 - 1430	***Recap*** *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 Four*

Day 5

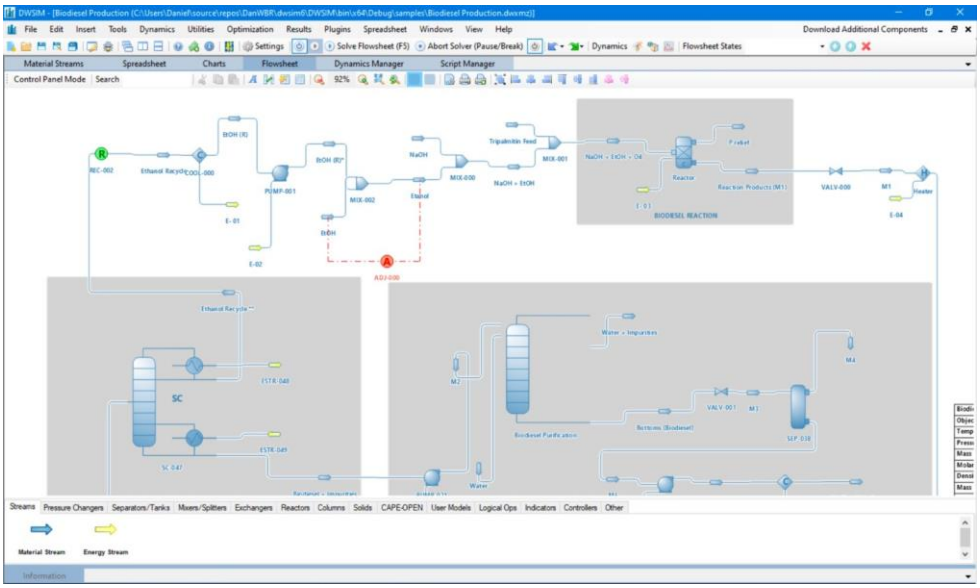
0730 – 0930	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Drain Holes ● Vortex Breakers*
0930 - 0945	*Break*
0945 – 1100	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Chimney Tray Leakage*
1100 – 1230	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Shear Clips*
1230 – 1245	*Break*
1245 – 1345	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Bubble-Cap Trays ● Final Inspection*
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*

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 and "DWSIM software".



ASPEN HYSYS V12.1 Simulator



DWSIM software

Course Coordinator

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