COURSE OVERVIEW PE0390
Distillation Design, Operation, Control & Troubleshooting

Course Title
Distillation Design, Operation, Control & Troubleshooting

Course Date/Venue
September 21-25, 2025/Pierre Loti Meeting Room, Mövenpick Hotel Istanbul Golden Horn, Istanbul, Turkey

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 "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:

Dr. Emad Al-Hasany, PhD is a **Senior Process & Petroleum Engineer** with **Offshore & Onshore** experience within the **Oil & Gas**, **Refinery** and **Petrochemical** industries. His wide expertise covers in the areas of **Process Plant Commissioning**, **Cost Estimation**, **Process Plant Start-Up Management**, **Clean Fuel** Technology & Standards, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Heat Medium Fired Heater** Troubleshooting & Maintenance, **Process Reactor** Operation & Troubleshooting, **Process Equipment** Design, Sizing, Selection, Applications & Troubleshooting, **Process Engineering Calculations**, **Gas Processing Plant** Operations & Control, **Gas Processing** Monitoring & Troubleshooting, **Process Plant** Optimization & Energy Conservation, **Hydro-Treating** Technology, **Oil & Gas** Field Operations, **Oil Movement**, Storage & Troubleshooting, **Start-Up & Shutdown**, **Gas/Oil Separates**, **Surge Vessels**, **Sludge Catcher**, **Knockout LP & HP Flare System**, **Close & Open Drain System**, **Skimmer Pit Evaporation Pit System**, **Filters**, **Driers**, **Pumps**, **Turbines**, **Compressors**, **York Refrigeration Compressors**, **Heaters & Combustion Gases Fire**, **Emergency Diesel Generators**, **Electrical & Diesel Fire Water Pumps**, **Gas & Fire Detectors**, **Pig Launcher**, **Purging Pipelines**, **Pressurized Vessels**, **Heat Exchangers**, **Atmospheric**, **Flash**, **Vacuum**, **Azeotrpic**, **Weiss Fractional Distillation**, **Oil & Gas Treatment**, **Separators**, **Filtration**, **Dehydration (Glycol & Molecular Sieves System)**, **Fire Tube Heaters**, **Combustion Gas**, **Temperature Level**, **Control Valves**, **Solenoid Valves**, **Cascade Control**, **Switches**, **Transmitter**, **Transducer**, **RTD Sensitivity**, **Orifice Plat**, **I/P Converter**, **Rot Meter**, **Floating**, **Displacer**, **DP Cells**, **PIDs**, **Flare Blowdown & Pressure Relief Systems**, **Pumps**, **Compressors**, **Turbines** & Troubleshooting, **Centrifugal Compressor & Steam Turbine**, **Valves**, **Safety Relief Valve Sizing**, Selection, Operation, Inspection, Maintenance & Troubleshooting, **Tank & Tank Farms**, **Hydraulic Pump**, **Well Engineering**, **Acidation**, **Wellheads** Preparing & Maintenance, **Well Operations & Surveys**, **Well Stimulation**, **Logging** and **Reservoir Engineering**. Further, he is also well-versed in **HYSYS**, **PRO II**, **OLGA**, **PIPESIM, PETREL**, **Artificial Lift**, **First Aid & Firefighting**, **Environment Protection**, **NORM Awareness**, **SHOC** (**Safe Handling of Chemicals**), **Permit to Work** (**PTW**), **HSE** Auditing & Reporting, **Emergency Response**, **Defensive Driving**, **H2S**, **Accident/Incident Investigation**, **Process Safety Management**, **Root Cause Analysis**, **OSHA** General Industry, **Water Injection**, **Water Treatment**, **HAZOP**, **Risk Assessment**, **Gas Chromatography**, **Corrosion** and **Cathodic Protection**.

During his career life, Dr. Emad has gained his practical and field experience through his various significant positions and dedication as the **Production Main Station Manager**, **Manager**, **Production Superintendent**, **Production Supervisor**, **Production Engineer**, **HAZOP Consultant**, **Instructor** and **Lecturer** for various companies and universities such as the AL-Euphrates University, Dero Oilfields, Syrian Petroleum Company (SPC), Kokab Co. and Alharratah Oilfield.

Dr. Emad has a **PhD** in **Reservoir Management**, a **Master** degree in **Production Engineering** and a **Bachelor** degree in **Petroleum Engineering**. Further, he is a **Certified Instructor/Trainer** and has further delivered numerous training, courses, workshops, seminars and conferences worldwide.

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$ 6,000 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 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, 21st of September 2025***

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: Monday, 22nd of September 2025

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: Tuesday, 23rd of September 2025

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: Wednesday, 24th of September 2025

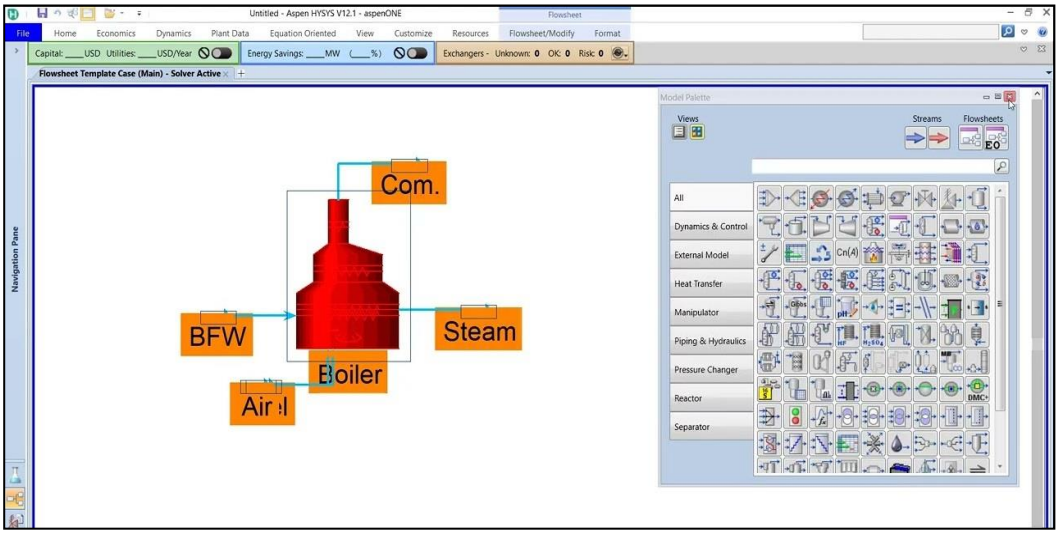
0730 – 0930	***Inspection, Troubleshooting & Case Studies*** *Tray Deck Levelness ● Loss of Downcomer Seal due to Leaks*
0930 – 0945	*Break*
0945 – 1100	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Effect of Missing Caps ● Repairing Loose Tray Panels*
1100 – 1230	***Inspection, Troubleshooting & 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***
1430	*Lunch & End of Day Four*

Day 5: Thursday, 25th of September 2025

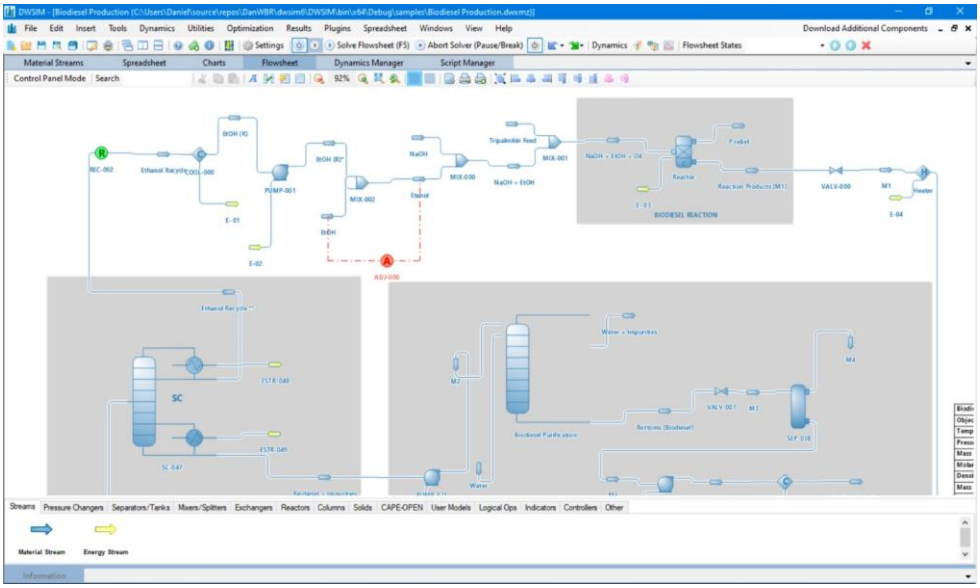
0730 – 0930	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Drain Holes ● Vortex Breakers*
0930 - 0945	*Break*
0945 – 1100	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Chimney Tray Leakage*
1100 – 1230	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Shear Clips*
1230 – 1245	*Break*
1245 – 1345	***Inspection, Troubleshooting & Case Studies (cont'd)*** *Bubble-Cap Trays ● Final Inspection*
1345 - 1400	***Course Conclusion***
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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