

## **COURSE OVERVIEW PE0390**

### **Distillation - Optimization & Troubleshooting**

#### **Course Title**

Distillation-Optimization & Troubleshooting

#### **Course Date/Venue**

September 06-10, 2026/Meeting Room F,  
Centro Corniche Al Khobar by Rotana, Al  
Khobar, KSA

#### **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/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
- 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. Henry Beer** is a **Senior Process Engineer** with over **30 years** of indepth industrial experience within the **Petrochemical, Oil & Gas** industries specializing in **Catalyst Selection**, Evaluation & Performance **Optimization**, **Catalyst** Manufacturing Techniques & Production **Optimization**, **Polymerization Catalysts: Selection & Process Optimization**, **Distillation Process Operation, Optimization & Troubleshooting**, Refinery **Distillation & Fractionation Process Optimization**, **Distillation Column Performance & Efficiency Improvement**, **Hydrocarbon Process Equipment, DOX Unit Operation & Troubleshooting**, **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.

### **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\$ 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.

### **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:

| <b>Day 1:</b> | <b>Sunday, 06<sup>th</sup> of September 2026</b>                                                                                                                                                      |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0730 – 0800   | Registration & Coffee                                                                                                                                                                                 |
| 0800 – 0815   | Welcome & Introduction                                                                                                                                                                                |
| 0815 – 0830   | <b>PRE-TEST</b>                                                                                                                                                                                       |
| 0830 – 0930   | <b>Theory of Distillation</b><br>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><br>Flash Distillation • Steam Distillation • Rectification • Combination Rectification & Stripping • Exercise • Solution • Distillation Basic Definition |
| 1100 – 1230   | <b>Distillation Process</b><br>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><br>Flash Stages • Process Design Basic • Reflux Ratio • Minimum Reflux Ratio • Minimum Number of Plates • Optimum Reflux                                   |
| 1330 – 1420 | <b>How Trays Work</b><br>Down Common Backup & Flooding • Dumping & Weeping • Optimizing Tower Pressure                                                                                |
| 1420 -1430  | <b>Recap</b><br>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, 07<sup>th</sup> of September 2026**

|             |                                                                                                                                                                                               |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0730 – 0930 | <b>Reboilers Function</b><br>Reboilers Function • The Reboiler • Heat-Balance Calculations                                                                                                    |
| 0930 – 0945 | Break                                                                                                                                                                                         |
| 0945 – 1100 | <b>Types of Reboiler</b><br>Thermosyphon, Gravity Feed & Forced • Thermosyphon Reboilers • Forced Circulation Reboilers • Kettle Reboilers • Don't Forget Fouling                             |
| 1100 – 1230 | <b>Condensers</b><br>Flooded Condenser Control • Subcooling, Vapor Binding, & Condensation • Condensation & Condenser Design • Pressure Control                                               |
| 1230 – 1245 | Break                                                                                                                                                                                         |
| 1245 – 1330 | <b>Instrumentation</b><br>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><br>Heat of Evaporation • Stripper Efficiency                                                                                                                            |
| 1420 - 1430 | <b>Recap</b><br>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, 08<sup>th</sup> of September 2026**

|             |                                                                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0730 - 0930 | <b>Pumparound</b><br>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><br>Theory of Operation • Measuring Deep Vacuums                                                                                                    |
| 1100 – 1230 | <b>Packed Towers</b><br>How Packed Towers Work • Maintaining Functional & Structural Efficiency in Packed Towers                                                        |



|             |                                                                                                                                                                                                                                                                                                                                    |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1230 – 1245 | Break                                                                                                                                                                                                                                                                                                                              |
| 1245 – 1420 | <b>Distillation Column Packing</b><br>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><br>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, 09<sup>th</sup> of September 2026**

|             |                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0730 – 0930 | <b>Inspection, Troubleshooting &amp; Case Studies</b><br>Tray Deck Levelness • Loss of Downcomer Seal due to Leaks                                                                    |
| 0930 – 0945 | Break                                                                                                                                                                                 |
| 0945 – 1100 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Effect of Missing Caps • Repairing Loose Tray Panels                                                                |
| 1100 – 1230 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Improper Downcomer Clearance • Inlet Weirs                                                                          |
| 1230 – 1245 | Break                                                                                                                                                                                 |
| 1245 – 1420 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Seal Pans                                                                                                           |
| 1420 - 1430 | <b>Recap</b><br>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: Thursday, 10<sup>th</sup> of September 2026**

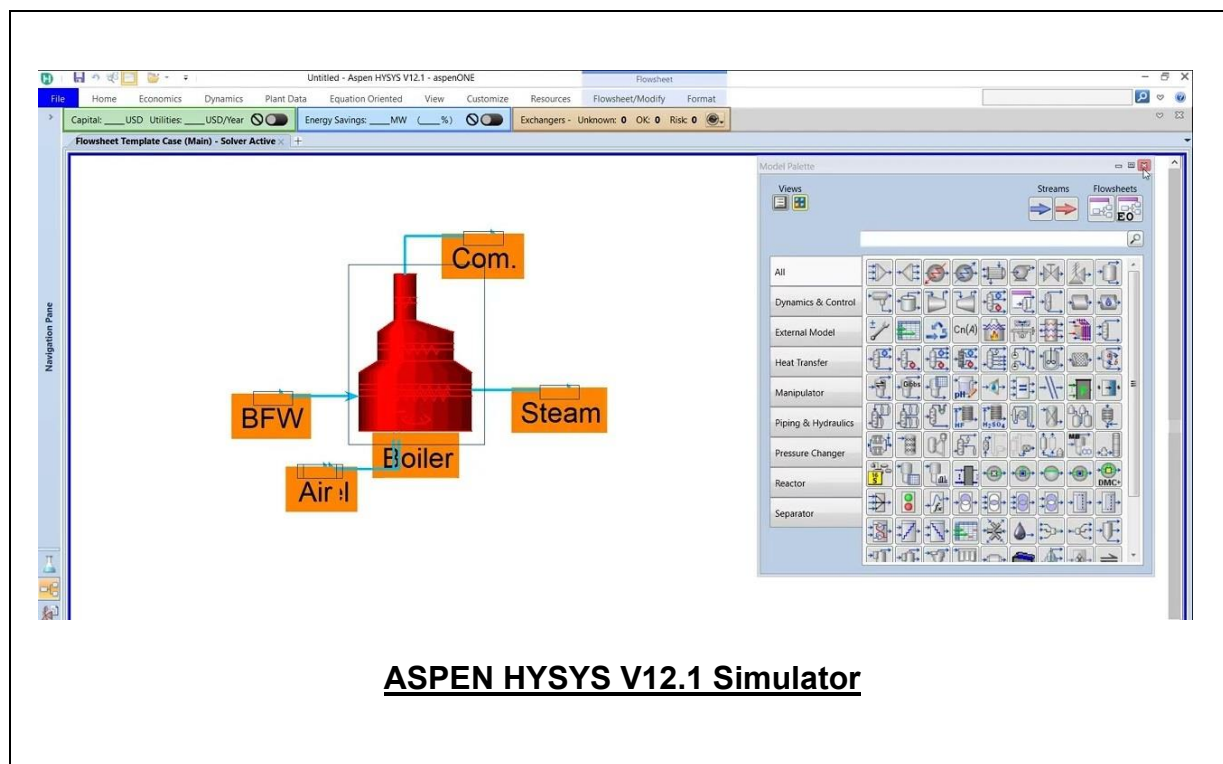
|             |                                                                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0730 – 0930 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Drain Holes • Vortex Breakers                                                               |
| 0930 - 0945 | Break                                                                                                                                                         |
| 0945 – 1100 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Chimney Tray Leakage                                                                        |
| 1100 – 1230 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Shear Clips                                                                                 |
| 1230 – 1245 | Break                                                                                                                                                         |
| 1245 – 1345 | <b>Inspection, Troubleshooting &amp; Case Studies (cont'd)</b><br>Bubble-Cap Trays • Final Inspection                                                         |
| 1345 - 1400 | <b>Course Conclusion</b><br>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course |
| 1400 – 1415 | <b>POST-TEST</b>                                                                                                                                              |
| 1415 - 1430 | Presentation of Course Certificates                                                                                                                           |
| 1430        | Lunch & End of Course                                                                                                                                         |



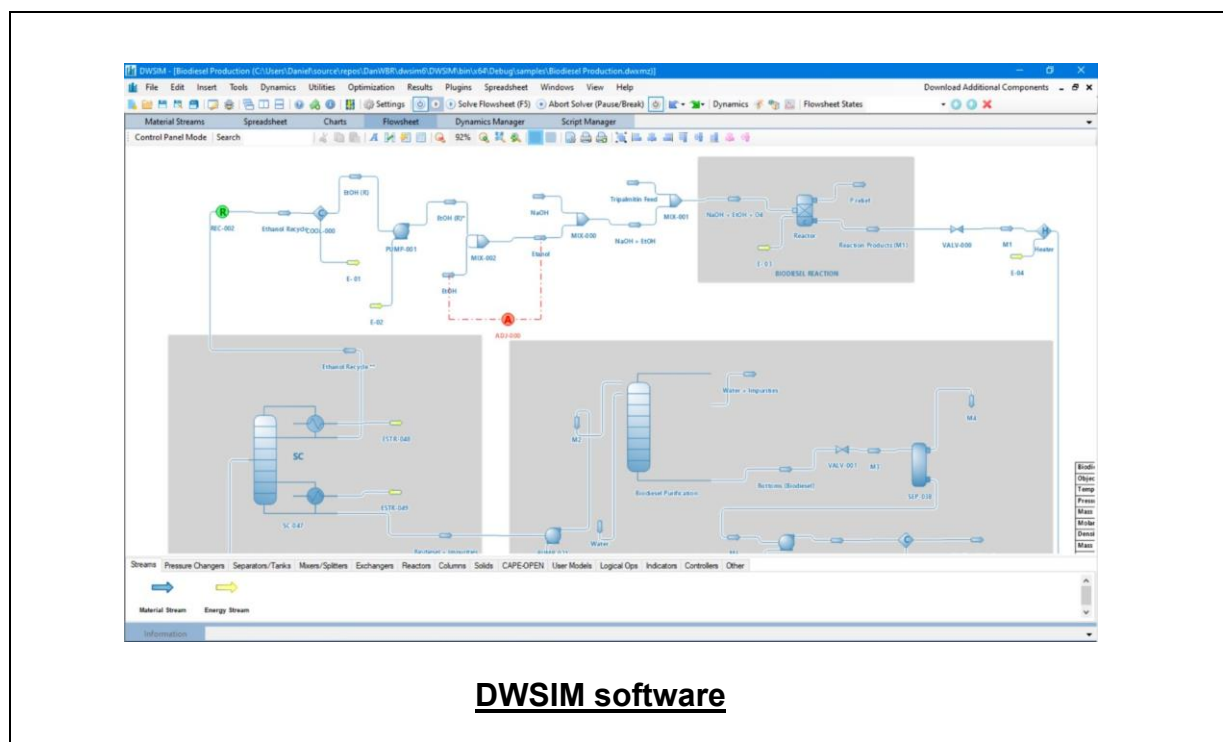


### **Simulator (Hands-on Practical Sessions)**

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 and “DWSIM software”.



**ASPEN HYSYS V12.1 Simulator**



**DWSIM software**

### **Course Coordinator**

Mari Nakintu, Tel: +971 2 30 91 714, Email: [mari1@haward.org](mailto:mari1@haward.org)