

COURSE OVERVIEW PE0078
Separator Simulation & Internal Design

Course Title

Separator Simulation & Internal Design

Course Date/Venue

March 02-06, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

PE0078

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs



Course Description

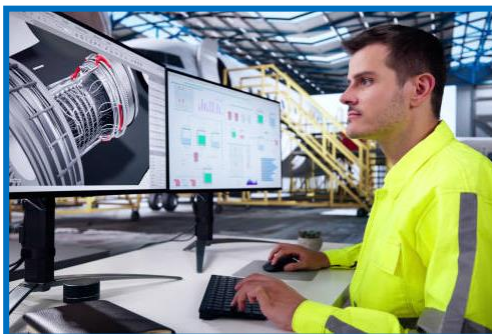


This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Separator Simulation and Internal Design. It covers the separation processes and the role of separators in the oil and gas industry; the principles of gas-liquid-solid separation; the applications of separators in upstream and downstream operations; the basic separator types and configurations; the separator components covering vessel shell, nozzles, internals, mist eliminators, demisters, liquid and gas outlets; the key performance parameters including separation efficiency, flow capacity and pressure drop, emulsion breaking considerations and operational constraints; and the physical properties affecting separation and separator simulation tools.



Further, the course will also discuss the design principles for separator internals, inlet devices, mist eliminators, weirs and baffles and liquid-liquid coalescers; the sizing calculations for separators; the phase behavior and its impact on design; preparing simulation workflow inputs, analyze pressure drop and flow distribution; the dynamic behavior of separators; and the multiphase flow dynamics and emulsion management in separators.



During this interactive course, participants will learn the separator fouling and maintenance, heat integration and thermal effects and specialized separator configurations; troubleshooting common separator issues; the operational monitoring and control covering key performance indicators (KPIs) for separators, process control strategies and predictive maintenance; the safety and regulatory compliance; and the emerging trends in separator design.

Course Objectives

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

- Apply and gain an in-depth knowledge on separator simulation and internal design
- Discuss separation processes and identify the role of separators in the oil and gas industry, the principles of gas-liquid-solid separation and the applications of separators in upstream and downstream operations
- Recognize the basic separator types and configurations as well as the separator components covering vessel shell, nozzles, internals, mist eliminators, demisters, liquid and gas outlets
- Illustrate the key performance parameters including separation efficiency, flow capacity and pressure drop, emulsion breaking considerations and operational constraints
- Discuss the physical properties affecting separation and separator simulation tools
- Identify the design principles for separator internals, inlet devices, mist eliminators, weirs and baffles and liquid-liquid coalescers
- Determine sizing calculations for separators and explain the phase behavior and its impact on design
- Prepare simulation workflow inputs, analyze pressure drop and flow distribution and illustrate the dynamic behavior of separators
- Explain multiphase flow dynamics and emulsion management in separators
- Discuss the separator fouling and maintenance, heat integration and thermal effects and specialized separator configurations
- Troubleshoot common separator issues and discuss the operational monitoring and control covering key performance indicators (KPIs) for separators, process control strategies and predictive maintenance
- Carryout safety and regulatory compliance and discuss the emerging trends in separator design

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 separator simulation and internal design for process engineers, mechanical engineers, chemical engineers, project engineers, operations and maintenance technicians, plant managers, equipment designers and separator specialists.

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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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.

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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.

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. Muhammad Khaleel, MSc, BSc, NEBOSH-IGC, is a Senior Process Engineer with extensive experience within the **Oil, Gas, Refinery, Petrochemical** and **Utilities** industries. His expertise includes HYSYS Simulation, **Aspen HYSYS, Process Plants Simulation** using **Aspen HYSYS, Aspen HYSYS: Design & Rate Shell, Basic Process Modelling Engineering Drawings** using **AutoCAD, Separator Simulation & Internal Design, Process Commissioning, Start-up & Troubleshooting, Process Safety Management (PSM), Metering System Calibration & Validation, Pressure Relief & Flare**

Systems, Process Safety Analysis, SIL Determination & Verification, Energy & Fuel Equivalent Concept, Distillation Processes, Natural Gas Processing Fundamentals, Gas Processing Plants Operation & Troubleshooting, Pressure Control & Flare System Design, Advanced LPG/NGL Technology, Surface Production Facilities, Energy Consumption of Significant Energy, Energy Data Analysis & Benchmarking in Oil & Gas Plant, **Overall Energy Efficiency Improvement Opportunities, Energy Integration** using Pinch Analysis & Load Management, **Technical Energy Audit Methodology, Techno Economic Feasibility, Implementation of Energy Management System (ISO 50001)** and Safety Instrumented Function (**SIS**). Further, he is also well-versed in **NEBOSH International General Certificate in Occupational Health & Safety, HAZOP Studies, HSSE Management System, HSSE Audit & Inspection, HSEQ Procedures, Authorized Gas Testing, Confined Space Entry & Rescue, Risk Management, Quantitative & Qualitative Risk Assessment, HSE Industrial Practices, Manual Handling, Rigging Safety Rules, Machinery & Hydraulic Lifting Equipment, Warehouse Incidents & Accidents Reporting, Incident & Accident Investigation, Emergency Planning, Emergency Response & Crisis Management Operations, Waste Management Monitoring, Root Cause Analysis, Hazard & Risk Assessment, Task Risk Assessment (TRA), Working at Height, Firefighting Techniques, Fire & Gas Detection System, Fire Fighter & Fire Rescue, Fire Risk Assessment, HAZOP & HAZID, HAZMAT, HAZCOM, LOPA & PHA.** He is also proficient with **engineering software** such as Process Simulation Programs (Aspen HYSYS, PIPESIM), Process Safety Software (PHAWorks5 and PHA Pro), CMMS, GMS, AutoCAD Plant 3D, P&ID, Phyton, Macos, Visio, Avocet and HTML.

During his career life, Mr. Muhammad worked as a **Training Instructor, Senior Process Operations Engineer, Process Competence Assessor, Energy Optimization Specialist, Commissioning Engineer, Process Operations Supervisor** and **Senior Instructor/Trainer** from various international companies like El-Wastani Petroleum Company (WASCO), OGS (Oil and Gas Skills), ENPPI Academy, Talent and ITS (Information Technology Specialists), WDDM, WND and Korra Energi-Flared Gas Recovery Project.

Mr. Muhammad has **Master** and **Bachelor** degrees in **Petroleum Engineering**. Further, he has a **Certificate in International General Certificate in Occupational Health and Safety** by the National Examination Board in Occupational Health and Safety (**NEBOSH**). He is also a **Certified Energy Manager (CEM)** by the Association of Energy Engineers (**AEE**), a **Certified Functional Safety Engineer (FSE)** by the TÜV Rheinland, a **Certified Competence Assessor** by the Offshore Petroleum Industry Training Organisation (**OPITO**), a **Certified Training of Trainers (ToT)** and has delivered numerous trainings, courses, workshops, seminars and conferences internationally.

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® (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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: Sunday, 02nd of March 2025

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction To Separation Processes Role of Separators in the Oil & Gas Industry • Types of Separators (Three-Phase, Two-Phase, Horizontal, Vertical) • Overview of Gas-Liquid-Solid Separation Principles • Applications of Separators in Upstream & Downstream Operations
0930 – 0945	Break
0945 – 1030	Basic Separator Types & Configurations Horizontal versus Vertical Separators • Three-Phase versus Two-Phase Separators • Knockout Drums & Scrubbers • Compact Separators
1030 – 1130	Separator Components Vessel Shell & Nozzles • Internals: Baffles, Inlet Diverters, Weirs • Mist Eliminators & Demisters • Liquid & Gas Outlets
1130 – 1215	Key Performance Parameters Separation Efficiency • Flow Capacity & Pressure Drop • Emulsion Breaking Considerations • Operational Constraints
1215 – 1230	Break



1230 – 1330	Physical Properties Affecting Separation Density Differences • Surface Tension • Viscosity & Temperature Effects • Droplet Size Distribution
1330 – 1420	Introduction to Separator Simulation Tools Overview of Simulation Software • Importance of Simulations in Separator Design • Basic Simulation Workflows • Key Input Parameters for Simulations
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, 03rd of March 2025

0730 – 0830	Design Principles for Separator Internals Flow Distribution & Control • Retention Time Considerations • Droplet Settling & Stokes' Law • Minimizing Re-Entrainment
0830 – 0930	Inlet Devices Types: Vane, Cyclonic & Impact Plates • Role in Gas-Liquid Distribution • Performance Optimization • Common Design Challenges
0930 – 0945	Break
0945 – 1100	Mist Eliminators Mesh Pads, Vane Packs & Fiber Beds • Efficiency & Pressure Drop Trade-Offs • Design Criteria for Demisting Equipment • Case Studies of Mist Eliminator Failures
1100 – 1215	Weirs & Baffles Function in Liquid-Liquid Separation • Impact on Flow Stabilization • Design Guidelines for Optimal Performance • Challenges in Maintenance & Fouling
1215 – 1230	Break
1230 – 1330	Liquid-Liquid Coalescers Role in Separating Water from Hydrocarbons • Coalescing Media Types (Fibers, Mesh) • Performance Metrics (Breakthrough Point, Efficiency) • Maintenance & Troubleshooting
1330 – 1420	Case Study: Internal Design Optimization Analyzing a Real-World Separator Design • Identifying Bottlenecks • Proposing & Simulating Internal Improvements • Comparing Results Pre- & Post-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 Two

Day 3: Tuesday, 04th of March 2025

0730 – 0830	Sizing Calculations for Separators Gas & Liquid Handling Capacity • Retention Time Calculations • Settling Velocity & Drag Force Considerations • Influence of Pressure & Temperature
0830 – 0930	Phase Behavior & Its Impact on Design Understanding PVT Properties • Flash Calculations & Phase Envelopes • Impact of Gas-Oil Ratio (GOR) • Dehydration & Dew Point Effects
0930 – 0945	Break





0945 – 1100	Simulation Workflow & Inputs Preparing Simulation Inputs (Fluid Properties, Flow Rates) • Setting Up Boundary Conditions • Understanding Output Parameters • Common Pitfalls in Separator Simulations
1100 – 1215	Pressure Drop & Flow Distribution Analysis Calculating Pressure Drops Across Internals • Impact of Flow Maldistribution • Flow Assurance in Multiphase Streams • Simulation of Flow Dynamics (CFD Applications)
1215 – 1230	Break
1230 – 1330	Dynamic Behavior of Separators Transient Simulation Techniques • Startup, Shutdown & Upset Conditions • Impact of Slug Flow & Foaming • Monitoring Operational Stability
1330 – 1420	Simulation Software Workshop Hands-On Session with Simulation Software • Setting Up a Two-Phase Separator Model • Analyzing & Interpreting Results • Iterative Design Adjustments
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, 05th of March 2025

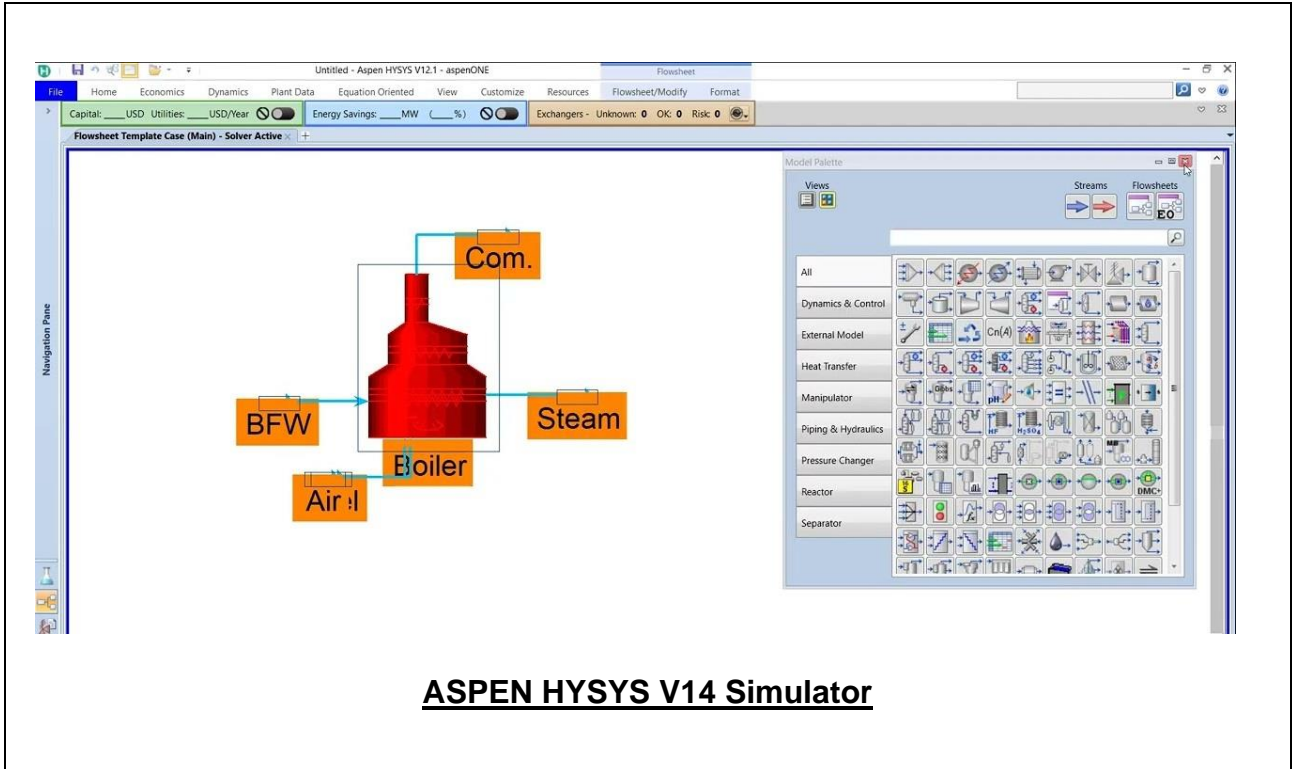
0730 – 0830	Multiphase Flow Dynamics Understanding Slug Flow, Churn Flow & Stratified Flow • Impact on Separator Design & Performance • Modeling Flow Regimes in Simulation Tools • Design Adjustments for Dynamic Flows
0830 – 0930	Emulsion Management in Separators Causes of Emulsions in Oil-Water Separation • Impact on Separator Performance • Chemical & Mechanical Solutions for Demulsification • Designing Separators for Emulsion-Heavy Streams
0930 – 0945	Break
0945 – 1100	Separator Fouling & Maintenance Causes of Fouling (Wax, Scale, Asphaltenes) • Impact on Separator Efficiency • Designing for Fouling Mitigation • Maintenance & Cleaning Strategies
1100 – 1215	Heat Integration & Thermal Effects Role of Temperature in Separation Processes • Heat Exchanger Integration • Thermal Stress on Separator Materials • Simulation of Temperature-Dependent Behavior
1215 – 1230	Break
1230 – 1330	Specialized Separator Configurations Compact Separators for Offshore Applications • Hybrid Separators (E.G., Cyclonic Plus Coalescing) • High-Pressure Separators • Novel Designs & Emerging Technologies
1330 – 1420	Case Study: Advanced Design Simulation Designing a Separator for Challenging Conditions • Handling High GOR & Water Cuts • Simulation-Based Troubleshooting • Validation & 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, 06th of March 2025

0730 – 0830	Troubleshooting Common Separator Issues <i>Causes of Carryover & Carry-Under • Diagnosing Maldistribution Problems • Handling Foaming & Surging • Resolving Demisting Inefficiencies</i>
0830 – 0930	Operational Monitoring & Control <i>Key Performance Indicators (KPIs) for Separators • Advanced Monitoring Techniques (Sensors, AI) • Process Control Strategies • Predictive Maintenance</i>
0930 – 0945	Break
0945 – 1100	Safety & Regulatory Compliance <i>Separator Design Codes & Standards (ASME, API) • Pressure Vessel Safety Considerations • Risk Assessment in Separator Operations • Ensuring Environmental Compliance</i>
1100 – 1230	Emerging Trends in Separator Design <i>Digital Twins for Separator Optimization • AI & Machine Learning in Separator Monitoring • Advances in Separator Materials & Coatings • Future Directions in Simulation Technology</i>
1230 – 1245	Break
1245 – 1345	Group Project: End-to-End Separator Design <i>Designing a Separator for a Real-World Scenario • Sizing, Simulation & Internal Layout • Presenting Design Decisions • Peer & Instructor Feedback</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & Lunch & End of Course

Simulator (Hands-on Practical Sessions)

Practical sessions 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 our state-of-the-art “ASPEN HYSYS” simulator.



ASPEN HYSYS V14 Simulator

Course Coordinator

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