COURSE OVERVIEW PE0197-4D
Troubleshooting Distillation Towers

Course Title
Troubleshooting Distillation Towers

Course Date/Venue
December 19-21 & 24, 2023/Samiya Meeting Room, Double Tree by Hilton Doha – Al Sadd, Doha, Qatar

2.4 CEUs (24 PDHs) AWARD

H-STK© INCLUDED

Course Reference
PE0197-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of Troubleshooting Distillation Towers. It covers the basics and importance of distillation towers in the petrochemical industry; the distillation tower components covering trays, packing, reboilers and condensers; the fundamentals of vapour-liquid equilibrium (VLE) including the concepts of dew point, bubble point and phase diagrams and how they guide distillation; the different types of trays and packing; the hydraulics of distillation towers covering flow regimes, flooding and weeping; the importance of reflux ratio and its effects; and the safety aspects during hazardous scenarios and distillation tower safety precautions and best practices.

Further, the course will also discuss the factors that can cause foaming and the symptoms and causes of flooding and weeping; the common signs of damage and reasons for mechanical failures including the common causes of abnormal temperature and pressure profiles; the product purity issues, reboiler and condenser performance and process simulation tools; and the gamma scans and radiography, tower pressure drop measurements and sampling and lab analysis.

During this interactive course, participants will learn the differential temperature analysis, vibration analysis, monitoring and diagnostic tools and defoaming agents and antifoam strategies; optimizing reflux ratios and repairing methodologies for trays and packings; the process control strategies, the need for a revamp and upgrading increased capacity or improved separation; and the standard operating procedures and training and skill development for operators.

Course Objectives

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

- Apply and gain an in-depth knowledge on troubleshooting distillation towers
- Discuss the basics and importance of distillation towers in the petrochemical industry
- Identify the distillation tower components covering trays, packing, reboilers and condensers
- Explain the fundamentals of vapour-liquid equilibrium (VLE) including the concepts of dew point, bubble point and phase diagrams and how they guide distillation
- Recognize the different types of trays and packing and discuss the hydraulics of distillation towers covering flow regimes, flooding and weeping
- Explain the importance of reflux ratio and its effects and employ safety aspects during hazardous scenarios and distillation tower safety precautions and best practices
- Identify the factors that can cause foaming as well as the symptoms and causes of flooding and weeping
- Recognize the common signs of damage and reasons for mechanical failures including the common causes of abnormal temperature and pressure profiles
- Determine product purity issues, reboiler and condenser performance and process simulation tools
- Apply gamma scans and radiography, tower pressure drop measurements and sampling and lab analysis
- Carryout differential temperature analysis, vibration analysis, monitoring and diagnostic tools and defoaming agents and antifoam strategies
- Optimize reflux ratios and apply repair methodologies for trays and packings
- Employ process control strategies, identify the need for a revamp and upgrade increased capacity or improved separation
- Implement standard operating procedures and training and skill development for operators

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 troubleshooting distillation towers for process engineers, production engineers, operations engineers, maintenance engineers and other technical staff.

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:-

- 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 **2.4 CEUs** (Continuing Education Units) or **24 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. Jamal Khaled is a **Senior Process & Petroleum Engineer** with over **25 years** of practical experience within the **Oil** & **Gas**, industry. His experience covers **Operation** of **Upstream & Midstream Process Facilities**, **Operation** of **Process Equipment** (Fired Heaters, Heat Exchangers, Air Coolers, Piping, Pumps, Compressors and Process Control & Troubles hooting), **Heat Exchanger** Design, Operation & Maintenance, **Surface Production** Operations, Advanced **Oil Wells**, Separation & Oil Treatment , Treatment of Oily Produced Water, **Gas Dehydration & Sweetening**, **Compressors & Utilities** System, **Flare & Disposal Systems** Operation & Troubleshooting, **Heat Exchangers**, **Fired Heaters**, **Process Plant Startup**, Commissioning & Troubleshooting, **Oil Movement** Storage & Troubleshooting, **Gas Compression** & Foundation, **Gas Compression Train** Operations & Maintenance, **Gas Dehydration** (**TEG**) Principles, Operations & Maintenance, **Gas Dehydration** (**Mole Sieve**) Operations & Maintenance, **Acid Gas Removal** (**AGRU**) Operations & Maintenance, **Gas Fractionation & Separation** Operations Principles & Practices, **Gas Processing** Chemical Treatment Principles, Advanced **Distillation** Operation, Control, Design & Troubleshooting, Troubleshooting **Process Operation** & Problem Solving, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Equipment** Operation, **Process Plant** Operation, **Process Plant** Optimization, **Oil & Gas Field** Operation, **Oil Movement**, Storage & Troubleshooting, **Petroleum Refinery** Process, **Process Reactor** Operation & Troubleshooting, **LNG & LPG** Plants Gas Processing, **Refinery Process** Operations Technology, **Distillation Column** Design & Operation, **Gasoline & Diesel Fuel** Technology, **Gas Sweetening & Sulfur Recovery**, **Gas Dehydration** Units, **Gas Sweetening** Units, **Fractionation Towers**, **Gas Compressors**, **Sulphur Recovery** (**SRU**) & Utilities, **Steam & Heat Recovery** Systems, **Flare & Pressure Relief Systems**, **NGL Recovery & Fractionation** and **Refrigerant & NGL Extraction**. Further, he is also well-versed in Oil & Gas **Producing Wells**, **Well Head** Design & Selection H2S, Sour Gas Compatible Material **X-Mas Tree**, **Electrical Submersible Pumping** (**ESP**) Operations, Design & Troubleshooting, **Sucker Rod Pumping System** Application, Operation, Troubleshooting & Maintenance, **Well Integrity Management** System, **X-Mass Tree & Wellhead** Operation & Testing, **Artificial Lift Systems**, Selection & Operation, **Artificial Lift Surface Equipment**, Advanced **Stuck Pipe Prevention & Fishing** Operation, **Well Completion** Design & Operations, **Casing**, **Cementing & Fluid**, **Pipeline & Pigging** Operations, **HP/IP/LP** Separation, Industrial **Water Treatment** System & Operations, **H2S**, **Confined Space Entry**, Permit To Work (**PTW**) and **Authorized Gas Tester**. He is currently the **On Job Instructor/Trainer** of Majnoon Oil Field.

During his career life, Mr. Jamal has gained his practical and field experience through his various significant positions and dedication as the **Oil & Gas Operation Instructor**, **OJT Operation Trainer**, **Operation & HSE Instructor**, **Operation & Competency Assessor/Internal Verifier**, **Operation Engineer**, **Operation Supervisor**, **Operation Section Head**, **Production Supervisor**, **Senior Operator** and **Senior Instructor/Trainer** from various international companies such as the AlFurat Petroleum Company (AFPC), ADCO, Basrah Gas Company-Iraq, North Rumaila NGL Plant, Anton Oilfield Services and Majnoon Oil Field-Iraq, just to name a few.

Mr. Jamal has a **Bachelor's** degree in **Petroleum Engineering**. Further, he is a **Certified Training of Trainer** (**ToT**), an **Authorized H2S Trainer**, a **Certified OPITO Competency Assessor**, an **Authorized Assessor/Verifier** in **Oil & Gas Operation**, a **Certified Instructor/Trainer** and has further delivered numerous trainings, courses, seminars, conferences and workshops 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. 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: ***Tuesday, 19th of December 2023***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Distillation Overview*** *Definition • Basics and Importance in the Petrochemical Industry*
0900 – 0930	***Distillation Tower Components*** *Trays, Packing, Reboilers, Condensers, etc. • Functionality and Importance of each Component*
0930 – 0945	*Break*
0945 – 1030	***Fundamentals of Vapour-Liquid Equilibrium (VLE)*** *Concepts of Dew Point and Bubble Point • Phase Diagrams and How they Guide Distillation*
1030 – 1130	***Tower Internals & Their Significance*** *Different Types of Trays (e.g., Sieve, Valve, Bubble Cap) • Types of Packing (Random, Structured)*
1130 – 1215	***Hydraulics of Distillation Towers*** *Flow Regimes, Flooding and Weeping • Importance of Reflux Ratio and its Effects*
1215 – 1230	*Break*

1230 – 1330	***Safety Aspects*** *Hazardous Scenarios • Distillation Tower Safety Precautions and Best Practices*
1330 – 1420	***Foaming & Its Causes*** *How to Identify and Measure • Factors that can Cause Foaming*
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: Wednesday, 20th of December 2023

0730 – 0800	***Flooding & Weeping*** *Symptoms and Causes • Effect on Separation Efficiency*
0800 – 0830	***Tray Damage & Mechanical Failures*** *Common Signs of Damage • Reasons for Mechanical Failures*
0830 – 0930	***Temperature & Pressure Anomalies*** *Abnormal Temperature and Pressure Profiles • Common Causes and Identification*
0930 – 0945	*Break*
0945 – 1030	***Product Purity Issues*** *Off-Specification Products • Reasons Behind the Deviations*
1030 – 1130	***Reboiler & Condenser Performance*** *Common Issues and their Impact on the Tower • Methods to Identify Problems*
1130 – 1215	***Process Simulation Tools*** *Introduction to Software Like Aspen Plus, HYSYS • Role in Troubleshooting*
1215 – 1230	*Break*
1230 – 1330	***Gamma Scans & Radiography*** *Basics and Application in Identifying Problems • Safety Precautions During Operation*
1330 – 1420	***Tower Pressure Drop Measurements*** *Importance and Methods • Interpretation of Results*
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: Thursday, 21st of December 2023

0730 – 0800	***Sampling & Lab Analysis*** *Taking Representative Samples • Lab Procedures to Identify Issues*
0800 – 0830	***Differential Temperature Analysis*** *Identifying Tray Activity • Pinpointing Mal-Distribution or Inactive Zones*
0830 – 0930	***Vibration Analysis*** *Causes and Implications of Vibrations • Monitoring and Diagnostic Tools*
0930 – 0945	*Break*
0945 – 1030	***Defoaming Agents & Antifoam Strategies*** *Selection, Usage and Effectiveness*
1030 – 1130	***Optimizing Reflux Ratios*** *Achieving Balance Between Separation Efficiency and Energy Consumption*

1130 – 1215	***Maintenance & Repair Techniques*** *Proactive versus Reactive Maintenance • Repair Methodologies for Trays and Packings*
1215 – 1230	*Break*
1230 – 1330	***Process Control Strategies*** *Control Loops and their Significance • PID Tuning for Distillation Towers*
1330 – 1420	***Revamps & Upgrades*** *Identifying the Need for a Revamp • Upgrading for Increased Capacity or Improved Separation*
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: ***Sunday, 24th of December 2023***

0730 – 0830	***Operational Best Practices*** *Standard Operating Procedures • Training and Skill Development for Operators*
0830 – 0930	***Case Study 1: Tower Flooding*** *Problem Identification • Steps Taken for Remedy*
0930 – 0945	*Break*
0945 – 1030	***Case Study 2: Off-spec Product Production*** *Diagnostics Used • Solution Implementation*
1030 – 1130	***Case Study 3: Mechanical Failures & Their Impact*** *Analysis of the Failure • Preventive Measures for the Future*
1130 – 1230	***Case Study 4: Challenges in Crude Distillation Units*** *Unique Problems in CDUs • Approaches to Troubleshooting*
1230 – 1245	*Break*
1245 – 1345	***Case Study 5: Issues in Vacuum Distillation*** *Identification of Problems Specific to Vacuum Operation • Solutions and Takeaways*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes the following real-life case studies and exercises:-

Course Coordinator

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