COURSE OVERVIEW PE0422
Refinery SRU, Tail Gas Treating, Sour Water & Amine Recovery Units

Course Title
Refinery SRU, Tail Gas Treating, Sour Water & Amine Recovery Units

Course Date/Venue
Session 1: February 25-29, 2024/Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
Session 2: March 03-07, 2024/Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey

Course Reference
PE0422

Course Duration/Credits
Five days/3.0 CEUs/30 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.

Hydrogen sulfide, carbon dioxide, mercaptans and other contaminants are often found in natural gas streams. H_2S is a highly toxic gas that is corrosive to carbon steels. CO_2 is also corrosive to equipment and reduces the Btu value of gas. Gas sweetening processes remove these contaminants so the gas is suitable for transportation and use.

Acid gases that are produced from the low-temperature methanol absorption and the sour water stripping processes from the sour water stripping and amine absorption-regeneration processes in the refining industry contain highly concentrated gaseous H_2S and organosulfur compounds.

The tail gas treating unit converts the small amount of sulfur compounds (< 5%), which were not converted in the sulfur recovery unit (SRU), into hydrogen sulfide (H_2S) and recycles it back to the SRU for additional processing. The SRU tail gas is heated and sent to the catalytic reactor where essentially all of the sulfur compounds are converted into H_2S. The gas from the catalytic reactor is cooled in the waste heat exchanger and the quench tower. Excess water is removed in the cooling process and is sent to the sour water stripper.

The dramatic increase in the use of selective amines for gas sweetening has resulted from the inherent economic benefits including smaller equipment sizes, lower circulation rates, and higher overall amine concentration. Selective amines absorb H_2S in the presence of CO_2, either from thermodynamic solubility or kinetic effects. Mixtures containing selective amines can be formulated to allow a certain amount of CO_2 to remain in the processed gas.

This course is designed to provide participants with a detailed and up-to-date overview of refinery SRU, tail gas treating, sour water and amine recovery units. It covers the key elements associated with the design, operation and control of refinery sulphur recovery, TGTU, amine regeneration unit and sour water stripping unit; some valuable insight on how to optimize, debottleneck and troubleshoot sulphur block units; the gas processing, sulphur recovery, and tail gas treating units; the safety hazard H_2S, pyrophoric iron and others in sulphur recovery unit; the startup, shutdown and normal operations of sulphur recovery unit and TGTU unit; the SRU claus furnace design and controls; the SRU reactor and TGTU reactor catalysts and its process parameter; and the SRU process control loops principle, sulphur leg and degassing pit design, process, reactions and principle.

During this interactive course, participants will learn the sulphur liquid handling; the amine regeneration process principle and design consideration; the ARU filtrations, activated carbon and amine regeneration unit feed sources; the amine regeneration unit startup, shutdown, normal operations and monitoring; the ARU process control loops principle, amine regeneration unit troubleshooting, impurities, limits foaming, corrosion and amine losses; the amine unit degreasing and other special procedures; the chemicals, sour water stripping process principle and sour water stripping unit design considerations; the sour water stripping unit equipment's and design considerations; the sour water stripping unit startup, shutdown, normal operations and monitoring; the water stripping unit process control loops principle, troubleshooting and corrosion; and the sour gas flare header and utilities.

Course Objectives

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

- Apply and gain an in-depth knowledge on refinery SRU, tail gas treating, sour water and amine recovery units
- Gain a solid understanding of the key elements associated with the design, operation and control of refinery sulphur recovery, TGTU, amine regeneration unit and sour water stripping unit. This will include the impact of feed quality, catalyst, operation conditions and unit design on the unit.
- Gain some valuable insight into how to optimize, debottleneck and troubleshoot their sulphur block units
- Carryout gas processing, sulphur recovery and tail gas treating units
- Discuss the safety hazard H_2S, pyrophoric iron and others in sulphur recovery unit
- Employ startup, shutdown and normal operations of sulphur recovery unit and TGTU unit
- Monitor and describe the major process parameter and its significances of sulphur recovery and TGTU unit
- Apply SRU claus furnace design and controls, claus process and TGTU, considerations and modifications
- Describe sulphur recovery chemistry, TGTU unit, sulphur recovery stages, efficiency and calculations
- Identify SRU reactor and TGTU reactor catalysts and its process parameter

- Discuss SRU process control loops principle, sulphur leg and degassing pit design, process, reactions and principle
- Illustrate sulphur liquid handling and recognize SRU steam generations and utility system as well as incinerator including its principal and control
- Troubleshoot and explain reliability, air blowers and major equipments
- Describe amine regeneration process principle and amine regeneration design consideration
- Discuss amine chemistry and type of amine as well review generator and other equipment's design considerations
- Identify ARU filtrations, activated carbon and amine regeneration unit feed sources
- Carryout amine regeneration unit startup, shutdown, normal operations and monitoring including major process parameter and its significances
- Discuss ARU process control loops principle, amine regeneration unit troubleshooting, impurities, limits foaming, corrosion and amine losses
- Apply amine unit degreasing and other special procedures
- Determine chemicals, sour water stripping process principle and sour water stripping unit design considerations
- Review sour water stripping unit equipment's and design considerations
- Identify sour water stripping unit feed sources and product specifications
- Employ sour water stripping unit startup, shutdown, normal operations and monitoring
- Describe sour water stripping unit process control loops principle, troubleshooting and corrosion
- Identify sour gas flare header and utilities

Who Should Attend

The course will be highly valuable to all engineers and operations personals involved in the operation and design of refinery Sulphur recovery, TGTU, amine regeneration unit and sour water stripping unit.

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**.*

Course Fee

Doha	**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.
Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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 **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.

- British Accreditation Council (BAC)

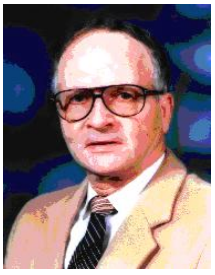
  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

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. Fahim Jauhary, PhD, BSc, is a **Senior Chemical Engineer & Analytical Chemist** with over **40 years** of practical experience in **power & water utilities**, **oil & gas** and **petrochemical** industries. His extensive experience covers **Water Network Distribution System**, **Water System Components**, **Water Treatment Technology**, **Water Desalination Technology**, **Water Injection Treatment**, **Water Treatment Technology**, **Laboratory Quality Management** (**ISO 17025**), **Modern Laboratory Management**, **Water Analysis**, **Statistical Analysis**, **Chemical Analysis**, **Lab Data Analysis**, **HAZOP**, **HAZMAT**, **HAZCOM**, **HAZWOPER**, **MSDS**, **Confined Space Safety and Gas Testing**, **Root Cause Analysis**, **Heat Exchanger**, **Tank & Tank Farms**, **Process Plant** as well as the **Risk Assessment**, **Corrosion Protection Systems**, **failure analysis**, **failure prevention**, **metallurgy** and **operation** of **water desalination plants**, **oil/gas fields**, **boilers**, **oil refineries**, **gas plants** and **fertilizer manufacturing**. Presently, he is a **highly regarded Industrial Consultant** for major **international companies**. With his broad expertise, he is an authority in **Corrosion & Metallurgy**, **Boiler & Steam Management**, **Condensate Storage Tank**, **Process Equipment**, **Process Plant Troubleshooting & Rehabilitation**, **Process Safety Management** (**PSM**), **Industrial Mixing**, **Refinery Technology**, **Process Plant Performance & Efficiency**, **Fertilizer Manufacturing Process Technologies**, **Metallurgical Failure Analysis & Prevention**.

Previously, Dr. Fahim had worked with several **international companies** as the **Executive Manager**, **Process Engineering Head**, **Engineering Design Head**, **Refinery Operations Manager**, **Production Planning & Control Superintendent** and a **Technical Adviser**. His experience was not only confined to the industry alone. He was also able to **largely contribute his expertise** and **impart his knowledge** in the **academe** as a prestiged professor with the **University of Technology** in **Vienna**, **Austria**. He has engaged himself with **researches** and **lectures** in **University.** He is also a **respected inventor** and has **authored** numerous **chemical engineering books**. He has also largely contributed in the success of several important international conferences and seminars like the **Environment Pollution & Control** in **Vienna**, the **Industrialization Conference**, **Energy Conservation in Chemical Plants**, **International Chemical Engineering Conferences** and for the **3rd International Mining Conference**.

Dr. Fahim has **PhD** and **Diploma** in **Chemical Engineering** from the **University of Technology** in **Vienna**, **Austria**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), a member of the **Engineering Association** and prominent committees doing **industrial training programs**, **discussions** for **chemical engineers**, **industrial project evaluation** and **lectures** worldwide. Moreover, he is a **respected inventor** and has **authored** numerous **chemical engineering books**. He has also largely contributed in the success of several important international conferences and seminars like the **Environment Pollution & Control** in **Vienna**, the **Industrialization Conference**, **Energy Conservation in Chemical Plants**, **International Chemical Engineering Conferences** and for the **3rd International Mining Conference**.

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 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 – 0900	***Introduction to Gas Processing***
0900 – 0930	***Sulphur Recovery & Tail Gas Treating Units***
0930 – 0945	*Break*
0945 – 1015	***SRU-Safety Hazard H_2S, Pyrophoric Iron & Others***
1015 – 1045	***Sulphur Recovery, TGTU Unit, Startup, Shutdown, Normal Operations***
1045 – 1115	***Sulphur Recovery, TGTU Unit Monitoring, Major Process Parameter & its Significances***
1115 – 1215	***SRU Claus Furnace Design & Controls***
1215 – 1230	*Break*
1230 – 1330	***Claus Process & TGTU, Considerations & Modifications***
1330 – 1420	***Chemistry of Sulphur Recovery, TGTU Unit***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Sulphur Recovery Stages, Efficiency & Calculations***
0830 – 0900	***SRU Reactor & TGTU Reactor Catalysts its Process Parameter***
0900 – 0930	***SRU Process Control Loops Principle***
0930 – 0945	*Break*
0945 – 1100	***Sulphur Leg & Degassing Pit Design, Process, Reactions & Principle***
1100 – 1130	***Sulphur Liquid Handling***
1130 – 1215	***SRU Steam Generations & Utility System***
1215 – 1230	*Break*
1230 – 1330	***Incinerator & its Principal & Control***
1330 – 1420	***Troubleshooting***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Reliability***
0830 – 0900	***Air Blowers & Major Equipment's***
0900 – 0930	***Amine Regeneration Process Principle***
0930 – 0945	*Break*
0945 – 1100	***Amine Regeneration Design Considerations (Lean/Rich Feed Characteristic)***
1100 – 1130	***Amine Chemistry & Type of Amine***
1130 – 1215	***Regenerator & Other Equipment's Review & Design Considerations***
1215 – 1230	*Break*
1230 – 1330	***ARU Filtrations, Activated Carbon***
1330 – 1420	***Amine Regeneration Unit Feed Sources & in Present Work***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Amine Regeneration Unit, Startup, Shutdown, Normal Operations***
0830 – 0900	***Amine Regeneration Unit Monitoring, Major Process Parameter & its Significances***
0900 – 0930	***ARU Process Control Loops Principle***
0930 – 0945	*Break*
0945 – 1100	***Amine Regeneration Unit Troubleshooting, Impurities, Limits Foaming, Corrosion, Amine Losses***
1100 – 1130	***Amine Unit Degreasing & Other Special Procedures***
1130 – 1215	***Chemicals***
1215 – 1230	*Break*
1230 – 1330	***Sour Water Stripping Process Principle***
1330 – 1420	***Sour Water Stripping Unit Design Considerations***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Sour Water Stripping Unit Equipment's Review & Design Considerations***
0830 – 0900	***Sour Water Stripping Unit Feed Sources & in Present Work***
0900 – 0930	***Sour Water Stripping Unit Feed & Product Specifications***
0930 – 0945	*Break*
0945 – 1100	***Sour Water Stripping Unit, Startup, Shutdown, Normal Operations***
1100 – 1130	***Sour Water Stripping Unit Monitoring, Major Process Parameter & Its Significances***
1130 – 1215	***Sour Water Stripping Unit Process Control Loops Principle***
1215 – 1230	*Break*
1230 – 1300	***Sour Water Stripping Unit Troubleshooting, Corrosion***
1300 – 1345	***Sour Gas Flare Header & Utilities***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises.

Course Coordinator

Jaryl Castillo, Tel: +974 4423 1327, Email: jaryl@haward.org