COURSE OVERVIEW PE0966
Air Liquefaction System Startup, Shutdown, Normal Operations & Troubleshooting

Course Title

Air Liquefaction System Startup, Shutdown, Normal Operations & Troubleshooting

Course Date/Venue

Session 1: April 07-11, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Session 2: August 24-28, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

PE0966

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.

This course is designed to provide delegates with a detailed and up-to-date overview of cryogenic air separation plants operation and maintenance. For further treatment of primary and intermediate materials, large amounts of oxygen and nitrogen are required by many industries, such as chemical and petrochemical, metal, semiconductor and food industry, in machine construction and many others. Oxygen and nitrogen are, together with Argon, the main constituents of ambient air. They are obtained from there by means of the air separation technology in highly automated air separation plants.

Further, the course will also discuss the overview for cryogenic and ASU history; the process of cryogenic air separation; the cryogenic air separation process in boiling points of the components to separate air into the desired products oxygen, nitrogen and argon; the basic principal for ASU process and rectification (theory, formula, thermodynamics); and the filtering compressing and purifying of ambient air during cryogenic air separation.

During this interactive course, participants will learn the rectification (separation) and the process detail for production of various gaseous (O_2, N_2, Ar) with ASU; the process detail, technology, description and operational parameters for ASU units (compression, Filtration, refrigerant unit, purification unit, expander unit and cooling engine, main exchanger, rectification, condenser, storage); the basic control principal for ASU process; the system for HC, CO_2, water, O_2; and the risk and safety items for ASU process, product and storage.

Course Objectives

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

- Apply and gain a comprehensive knowledge on cryogenic air separation plants operation and maintenance
- Discuss the overview for cryogenic and ASU history
- Illustrate the process of cryogenic air separation
- Describe the cryogenic air separation process in boiling points of the components to separate air into the desired products oxygen, nitrogen and argon
- Identify the basic principal for ASU process and rectification (theory, formula, thermodynamics)
- Filter, compress and purify ambient air during cryogenic air separation
- Illustrate rectification (separation) and the process detail for production of various gaseous (O_2, N_2, Ar) with ASU
- Explain the process detail, technology, description and operational parameters for ASU units (compression, Filtration, refrigerant unit, purification unit, expander unit and cooling engine, main exchanger, rectification, condenser, storage)
- Discuss the basic control principal for ASU process and analyse system for HC, CO_2, water, O_2
- Identify the risk and safety items for ASU process, product and storage

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 cryogenic air separation plants operation and maintenance for chemists, chemical engineers, maintenance engineers and industrial gas producers, HSE engineers and managers.

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:

- 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.

- 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.

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:

Mr. Yasser Almasood is a **Senior Process & Petroleum Engineer** with almost **20 years** of industrial experience within the, **Oil & Gas**, **Refinery** and **Petrochemical** industries. His wide expertise covers in the areas of **Gas Processing** Calculation, **Process Reactor** Operation & Troubleshooting, **Catalytic Reactors**, **Heat Exchanger**, **Distillation Columns**, **Pumps**, Distributed Control System (**DCS**), **Catalytic Reformer Unit**, **Polymerization**, **Dehydrogenation**, **Gas Processing Plant** Operations & Control, **Gas Processing** Monitoring & Troubleshooting, **Process Plant Start-up** Commissioning & Troubleshooting, **Process Plant** Optimization & Energy Conservation, **Process Equipment** Design & Troubleshooting, **Advanced Operation Skills**, **Refinery Process Yield Optimization**, **Oil & Gas Processing**, Troubleshooting Oil & Gas Processing Facilities, **Polymers & Polymerization**, Applied **Process Engineering**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process** Plant Performance & Efficiency, **Flare Blowdown & Pressure Relief Systems**, **Polypropylene** Manufacturing, **Polyethylene** & Process Troubleshooting, **Ammonia**, **Ethylene**, **Solvents**, **Gas Feed**, **EDC**, **VCM**, **PP**, **PVC**, **Chlorine**, **Fluidized Bed Reactor**, **Oil Movement & Storage**, **Power Plant Chemistry**, **Catalyst** Manufacturing Techniques, **Fuel Systems** Management, **Process Design & Optimization**, **Desalination Processes**, **Reverse Osmosis** and **Molecular Sieves**. Further, he is also well-versed in **HAZOP**, Advanced **Process Hazard Analysis**, **Safety** Management, **Environmental Safety** Management, **LOPA & SIL**, Process Safety Management (**PSM**), **Incident investigation & Root Cause Analysis**, **Emergency & Crisis Management**, **Safety Audit & Site**, Inspection, Inspection of Fire Equipment & Tools, **Fire Protection & Prevention**, Worker Protection from Radiation Work Permits, IGC International General Certificate in Occupational Safety & Health, **Risk Assessment**, **Risk Associated** with Low Level Radiation Exposure, Hydrogen Sulfide (**H2S**) Safety, **Personal Protective Equipment**, **Lock-Out & Tag-Out**, **OSHA** Occupational Safety & Health, Radiation & Contamination, Scientific Notation, Exposure Rate & Shielding Calculations, **Excavations & Trenching**, **Permit-to-Work**, Aspentech, Aspen HYSYS, Pro II, exSILentia, OLGA, Flare System Analyzer, Aspen PIMS, DYNSIM, RiskWISE, MS Office and IBM Maximo.

During his career life, Mr. Yasser has gained his practical and field experience through his various significant positions and dedication as the **Senior Process Engineer**, **Process Engineer**, **Oil & Gas Process & Safety Instructor**, **On-Job Instructor**, **Process Senior Operator**, **Acting DCS Operator** and **Shift Controller** for various multi-national companies such as the ADNOC Gas Processing (**GASCO**), Conoco Phillips Gas Plant and Syrian Gas Company (SGC).

Mr. Yasser has 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.

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.

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 – 0930	***Overview for Cryogenic & ASU History***
0930 – 0945	*Break*
0945 – 1100	***Overview for Cryogenic & ASU History (Cont'd)***
1100 – 1230	***Cryogenic Air Separation: The Process***
1230 – 1245	*Break*
1245 – 1420	***Cryogenic Air Separation: The Process (Cont'd)***
1420 -1430	***Recap***
1430	*Lunch &End of Day One*

Day 2

0730 – 0930	***Cryogenic Air Separation Processes Use Differences in Boiling Points of the Components to Separate Air into the Desired Products Oxygen, Nitrogen & Argon***
0930 – 0945	*Break*
0945 – 1100	***Cryogenic Air Separation Processes Use Differences in Boiling Points of the Components to Separate Air into the Desired Products Oxygen, Nitrogen & Argon (Cont'd)***
1100 – 1230	***Basic Principle for ASU Process & Rectification (Theory, Formula, Thermodynamic)***
1230 – 1245	*Break*
1245 – 1420	***Basic Principle for ASU Process & Rectification (Theory, Formula, Thermodynamic) (Cont'd)***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Cryogenic Air Separation: Filtering, Compressing & Purifying of Ambient Air***
0930 – 0945	*Break*
0945 – 1100	***Cryogenic Air Separation: Filtering, Compressing & Purifying of Ambient Air (Cont'd)***
1100 – 1230	***Ambient Air is Sucked in Through a Filter and Compressed to Approximately 6 Bar. Then by Passing the Air Stream through a Cooler and a Mole Sieve, Contaminants Including Water Vapor, Carbon Dioxide (which would Freeze in the Process) and Hydrocarbons are Removed from the Process Stream***
1230 – 1245	*Break*
1245 – 1420	***Ambient Air is Sucked in Through a Filter & Compressed to Approximately 6 Bar. Then by Passing the Air Stream through a Cooler & a Mole Sieve, Contaminants Including Water Vapor, Carbon Dioxide (which would Freeze in the Process) and Hydrocarbons are Removed from the Process Stream (Cont'd)***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Rectification (Separation)***
0930 – 0945	*Break*
0945 – 1100	***Separation of Air Into its Components is Performed in a Two-Column Rectification System Comprising a High-Pressure and a Low-Pressure Column***
1100 – 1230	***Process Detail for Production of Various Gaseous (O2,N2,Ar) with ASU***
1230 – 1245	*Break*
1230 – 1420	***Process Detail, Technology, Description & Operational Parameter for ASU Units (Compression, Filtration, Refrigerant Unit, Purification Unit, Expander Unit & Cooling Engine, Main Exchanger, Rectification, Condenser, Storage)***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Basic Control Principal for ASU Process***
0930 – 0945	*Break*
0945 – 1100	***Basic Control Principal for ASU Process (Cont'd)***
1100 – 1230	***Analyze System for HC, CO_2, Water, O_2***
1230 – 1245	*Break*
1230 – 1345	***Risk & Safety Items for ASU Process, Product & Storage***
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

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