COURSE OVERVIEW ME0976-4D
Screw Compressor Theory and Troubleshooting

Course Title
Screw Compressor Theory and Troubleshooting

Course Date/Venue
August 05-08, 2024/Boardroom 3, Southern Sun Abu Dhabi Hotel, Abu Dhabi, UAE

Course Reference
ME0976-4D

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

Compressors are used extensively in the process industries. There are many types with widely varying configurations and applications. They represent a significant part of the capital and operating costs of most plants, and optimizing their selection, operation and maintenance are therefore, of major economic importance. The course deals with efficiencies, operating characteristics, reliability, maintenance and troubleshooting implications of compressors.

This course is designed to provide participants with a detailed and up-to-date overview of compressor maintenance. It covers the volume ratio and variable speed of screw compressor; the capacity control, oil systems separation and cooling, water cooled oil cooling and thermosyphon oil cooling; the liquid injection oil cooling and troubleshooting; the economizers, sideloads, installation requirements, low discharge temperature and high discharge temperature; and the auxiliary equipment and functions.

During this interactive course, participants will learn the troubleshooting, diagnostics, seasonal start-up and shutdown; the dismantling, inspection and assembly procedures on screw compressors; the pressure testing of screw compressor, setting the loading and unloading pressures, routine maintenance and problem troubleshooting; and the servicing, troubleshooting and maintenance of compressors.

Course Objectives

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

- Apply and gain a comprehensive knowledge on screw compressor in industrial application
- Discuss screw compressor theory covering its construction, oil injection, fundamentals of operation, suction process compression and discharge process
- Identify the volume ratio, variable speed and employ capacity control, oil systems separation and cooling, water cooled oil cooling and thermosyphon oil cooling
- Carryout liquid injection oil cooling and troubleshooting
- Recognize economizers and sideloads, installation requirements, low discharge temperature and high discharge temperature
- Describe auxiliary equipment and functions
- Perform troubleshooting, diagnostics, seasonal start-up and shutdown
- Employ dismantling, inspection and assembly procedures on screw compressors
- Perform pressure testing of screw compressor and set the loading and unloading pressures including routine maintenance and problem troubleshooting
- Service, troubleshoot and maintain compressors

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of compressor maintenance for plant and maintenance engineers, maintenance managers and supervisors and compressor specialists. It should be valuable to senior maintenance mechanics and those who are involved with compressors' operation, maintenance, troubleshooting and overhaul.

Course Fee

US$ 4,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), 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 **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.

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. Andrew Ladwig is a **Senior Process & Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Crude Oil Distillation**, **Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation**, **Ammonia Storage & Loading** Systems, **Ammonia Plant** Operation, Troubleshooting & Optimization, **Ammonia Recovery**, **Ammonia Plant Safety**, Hazard of **Ammonia Handling**, Storage & Shipping, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Wax Sweating & Blending**, **Petrochemical & Fertilizer** Plants, **Nitrogen Fertilizer** Production, **Petroleum Industry Process** Engineering, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, Safe **Refinery Operations**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, Gas Liquor Separation, **Industrial Liquid Mixing**, **Wax Bleachers**, **Extractors**, **Fractionation**, Operation & Control of **Distillation**, Process of **Crude ATM & Vacuum Distillation** Unit, **Water Purification**, **Water Transport** & Distribution, **Steam & Electricity**, **Flame Arrestors**, **Coal Processing**, **Environmental Emission Control**, R&D of **Wax Blending**, **Wax** Molding/Slabbing, **Industrial Drying**, Principles, Selection & Design, Certified **Process Plant** Operations, Control & Troubleshooting, **Operator** Responsibilities, **Storage Tanks Operations** & Measurements, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, Efficiency & Optimization, Continuous Improvement & Benchmarking, **Process Troubleshooting** Techniques, Oil & Gas Operation/Introduction to **Surface Facilities**, **Pressure Vessel** Operation, **Process Equipment** Performance & Troubleshooting, **Plant Startup & Shutdown**, **Startup & Shutdown** the Plant While Handling Abnormal Conditions, **Flare & Relief** System, **Process Gas Plant** Start-up, Commissioning & Problem Solving, **Process Liquid** and **Process Handling & Measuring** Equipment. Further, he is also well-versed in **Compressors & Turbines** Operation, Maintenance & Troubleshooting, **Heat Exchanger** Overhaul & Testing Techniques, Balancing of **Rotating Machinery** (**BRM**), **Pipe Stress** Analysis, **Valves & Actuators** Technology, Inspect & Maintain **Safeguarding Vent & Relief System**, Certified Inspectors for **Vehicle & Equipment**, Optimizing **Equipment Maintenance** & Replacement Decisions, Certified Maintenance Planner (**CMP**), Certified Planning and Scheduling Professional (**AACE-PSP**), **Tank Design**, Construction, Inspection & Maintenance, **Material Cataloguing**, Specifications, Handling & Storage, **Steam Trap** Design, Operation, Maintenance & Troubleshooting, **Steam Trapping & Control**, **Column**, **Pump & Exchangers**, Troubleshooting & Design, **Rotating Equipment** Operation & Troubleshooting, **Control & ESD** System, **Detailed Engineering Drawings**, Codes & Standards, **Budget** Preparation, Allocation & Cost Control, Root Cause Analysis (**RCA**), **Production Optimization**, Permit to Work (**PTW**), Project Engineering, **Data** Analysis, **Process Hazard** Analysis (**PHA**), **HAZOP** Study, Sampling & Analysis, **Training** Analysis, **Job Analysis** Techniques, Storage & Handling of **Toxic Chemicals & Hazardous Materials**, **Hazardous Material** Classification & Storage/Disposal, **Dangerous Goods**, **Risk** Monitoring Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), Personal Protective Equipment (**PPE**), Fire & Gas, First Aid and Occupational Health & Safety.

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer**, **Project Engineer**, **Reliability & Maintenance Engineer**, **Maintenance Support Engineer**, **Process Engineer**, **HSE Supervisor**, **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **Mechanical Technician**, **Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma** in **Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, workshops, seminars, courses 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 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: ***Monday, 05th of August 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Screw Compressor***
0930 – 0945	*Break*
0945 – 1100	***Screw Compressor Theory*** *Construction • Oil Injection • Fundamentals of Operation • Suction Process • Compression • Discharge Process*
1100 – 1215	***Screw Compressor Theory (cont'd)*** *Volume Ratio • Capacity Control • Variable Speed • Oil Systems: Separation & Cooling • Water Cooled Oil Cooling • Thermosyphon Oil Cooling*
1215 – 1230	*Break*
1230 – 1420	***Screw Compressor Theory (cont'd)*** *Liquid Injection Oil Cooling • Economizers & Sideloads • Installation Requirements • Troubleshooting • Low Discharge Temperature • High Discharge Temperature*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 06th of August 2024***

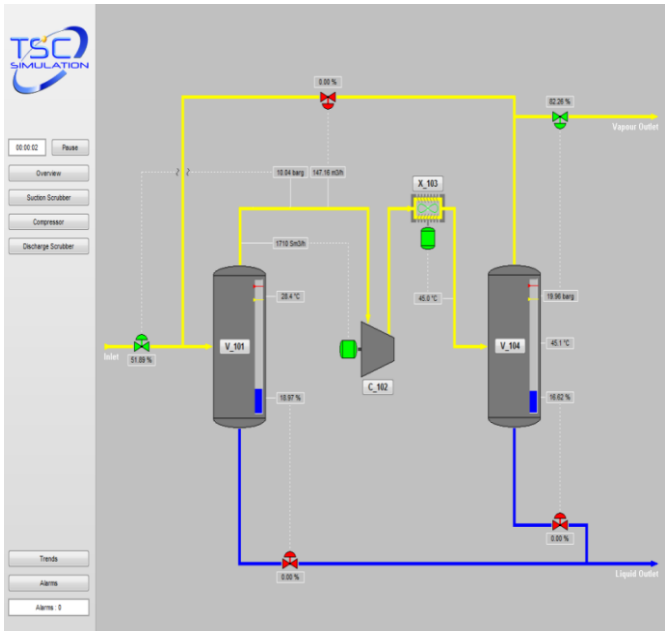
0730 – 0930	***Compressor Auxiliary Equipment & Functions***
0930 – 0945	*Break*
0945 – 1100	***Unit Troubleshooting & Diagnostics***
1100 – 1215	***Seasonal Start-Up & Shutdown***
1215 – 1230	*Break*
1230 – 1420	***Seasonal Start-Up & Shutdown (cont'd)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3:	***Wednesday, 07th of August 2024***
0730 – 0930	***The Dismantling, Inspection & Assembly Procedures on a Screw Compressor***
0930 – 0945	*Break*
0945 – 1100	***The Dismantling, Inspection & Assembly Procedures on a Screw Compressor (cont'd)***
1100 – 1215	***Perform Pressure Testing of the Screw Compressor & Setting of the Loading & Unloading Pressures***
1215 – 1230	*Break*
1230 – 1420	***Perform Pressure Testing of the Screw Compressor & Setting of the Loading & Unloading Pressures (cont'd)***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

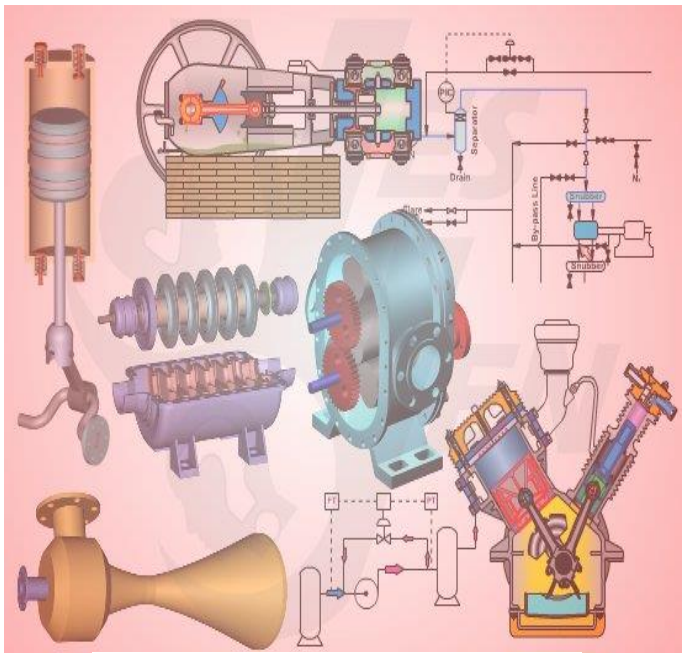
Day 4:	***Thursday, 08th of August 2024***
0730 – 0930	***Perform Routine Maintenance & Troubleshoot Problems on a Screw Compressor***
0930 – 0945	*Break*
0945 – 1100	***Perform Routine Maintenance & Troubleshoot Problems on a Screw Compressor (cont'd)***
1100 – 1215	***Compressor Servicing, Troubleshooting Tips & Maintenance***
1215 – 1230	*Break*
1230 – 1345	***Compressor Servicing, Troubleshooting Tips & Maintenance (cont'd)***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*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 simulators "SIM 3300 Centrifugal Compressor" and "CBT on Compressors".



SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors

Course Coordinator

Kamel Ghanem Tel: +971 2 30 91 714, Email: kamel@haward.org