COURSE OVERVIEW IE0780
Compressor Control & Protection

Course Title
Compressor Control & Protection

Course Date/Venue
February 09-13, 2025/Meeting Plus 6, City Centre Rotana Doha, Doha, Qatar

Course Reference
IE0780

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 delegates with a detailed and up-to-date overview of compressor control and protection. It covers the various types of compressors and their functions; the characteristics of surge including its consequences; the key aspects of compressor control and anti-surge protection and preventions; and the various applications of advanced compressor control and how to control using loop decoupling.

The course will also discuss the effects of operating conditions and improves knowledge on surge curve plotting methods; the turbine control objectives and principles according to actuator speed kW droop control; and the turbine system availability objectives and the correct level of redundancy.

During this interactive course, participants will learn to apply several integrated turbine and compressor control approaches as well as the technology updates and distinguish the functions of various control and protection devices in relation to internal relief value, internal motor temperature sensors and crankcase heaters.

Course Objectives

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

- Apply and gain an in-depth knowledge on compressor control and protection
- Identify the various types of compressors as well as their functions
- Determine the characteristics of surge including its consequences
- Employ the key aspects of compressor control and anti-surge protection and preventions
- Recognize the various applications of advanced compressor control and train how to control using loop decoupling
- Illustrate the effects of operating conditions and improves knowledge on surge curve plotting methods
- Implement the turbine control objectives and principals according to actuator speed and kW droop control
- Recognize the turbine system availability objectives and choose the correct level of redundancy
- Apply several integrated turbine and compressor control approaches as well as the technology updates
- Distinguish the functions of various control and protection devices in relation to internal relief value, internal motor temperature sensors, and crankcase heaters

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 compressor control and protection for engineers and other technical and operation staff who are responsible for the implementation and efficient operation, control and protection of compressors.

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 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.

Course Fee

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.

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. Said Ghanem, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with almost **20 years** of wide experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utilities** industry. His extensive experience widely covers in the areas of **Process Control & Instrumentation**, **Pressure & Temperature** Measurement, **Level & Flow** Measurement, **Control Valve & Actuator**, Distributed Control System (**DCS**), Programmable Logic Controllers (**PLC**), **Control System & Instrumentation**, **GE Steam Turbines**, **Speedtronic Mark II**, **V & VIe**, Control Systems, **GE Gas Turbine Frame V**, **Combined Cycle Power Plant**, **ABB DCS Control**, **Ansaldo Gas Turbine**, **Field Instrumentation & Calibration**, PLC Step7 Control Systems, **Transducers & Control Valves**, **Switches**, **Transmitters**, Proximity Sensors, Control Systems Cards, **Analog & Digital Multi-meters**, Druck DPI 610, Hand Pump, Hart Communicator 475, Two Ansaldo Gas Turbine Model AE94.2, Process, Control Philosophy ,Logic & Wiring Diagrams, Instrument Specifications & Data Sheets For Sensors, Control Valves, PRVs, Electrostatic Discharge (**ESD**), Digital & Microprocessor Based Instruments, Mark VI Control System Software Program (**Toolbox ST**), **Compact PCI Controller**, IO NET, IO Packs & Terminal Boards & Sulzer Turbines. Further, he is also well-served in Firefighting Systems, Smoke Detectors & Gas Detectors, Model Predictive Control (**MPC**) & Adaptive Control Strategies, **Control System** Optimization, **Real-Time Control System** Monitoring, **RCA** Methodologies, **Control Loops**, **Lean** Methodologies, Statistical Process Control (**SPC**), **Energy Efficiency & Process** Optimization, **Automation & Control** Systems, **Process** Safety & Troubleshooting, **Process** Safety Controls & Mitigation Strategies, **Rotating Equipment** (**Pumps**, **Turbines**, **Compressors**), Preventive Maintenance & Reliability-Centered Maintenance (RCM) and **Steam Generation** Systems.

During his career life, Mr. Said has held various significant positions as the **Instrumentation & Control Maintenance Engineer**, **Instrument Field Maintenance Engineer**, **Senior Instrument Maintenance Engineer**, **Lead Instrument & Control Engineer** and **Senior Trainer/Lecturer** from the Ministry of Electrical Energy, Egyptians Maintenance Company (EMC) and Belayim Power Station Petroleum Company (Petrobel).

Mr. Said has a **Master's** degree in **Electrical Engineering** and a **Bachelor's** degree in **Electrical**, **Communication & Electronic Engineering**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, workshops and conferences worldwide.

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 ***Sunday, 09th of February 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Compressors*** *General Types ● Centrifugal Compressors ● Axial Compressors*
0930 – 0945	*Break*
0945 – 1145	***Overview of Surge*** *Surge versus Stall ● Static Instability ● Dynamic Instability ● Characteristics of Surge ● Consequences of Surge*
1145 – 1230	***Compressor Control Introduction & Principals*** *Defining Compressor Surge and its Consequences ● Anti-Surge Protection and Prevention ● Surge Detection and Recovery● Compressor Control ● Performance Control*
1230 – 1245	*Break*
1245– 1420	***Case Studies***
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, 10th of February 2025***

0730 – 0930	***Advanced Compressor Control*** *The Surge Parameter ● Changing Parameter Considerations ● Compressor Load sharing ● Anti-Surge Control Challenges and Solutions ● Train Control Using Loop Decoupling*
0930 – 0945	*Break*
0945 – 1100	***Effect of Operating Conditions*** *Surge Curve Plotting Method ● Suction Pressure ● Suction Temperature● Molecular Weight ● Specific Heat Ratio*
1100 – 1230	***Effect of Operating Conditions (cont'd)*** *Compression Ratio● Speed ● Vane Position*
1230 – 1245	*Break*
1245 – 1420	***Case Studies***
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*

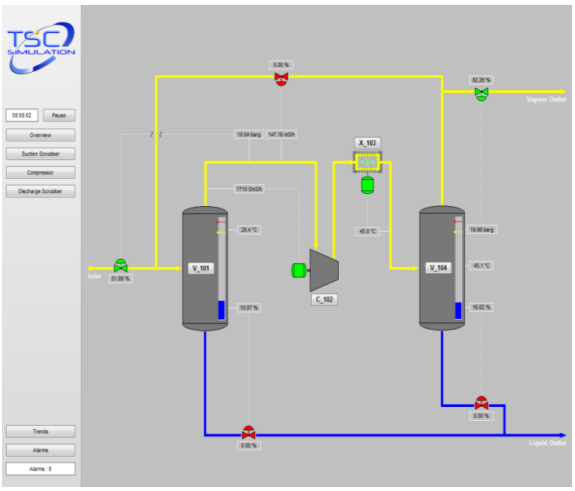
Day 3	Tuesday, 11th of February 2025
0730 – 0930	***Turbine Control Objectives & Principals*** *Speed Control ● Actuator Interface and Control ● Speed and kW Droop Control ● Header Pressure Control*
0930 – 0945	*Break*
0945 – 1100	***Turbine Control System Availability Objectives*** *System Reliability and Availability Basics*
1100 – 1230	***Turbine Control System Availability Objectives (cont'd)*** *Choosing the Correct Level of Redundancy ● Control Philosophy Considerations (Integration, Distribution, etc.)*
1230 – 1245	*Break*
1245 – 1420	***Case Studies***
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, 12th of February 2025
0730 – 0930	***Integrated Turbine & Compressor Control Approaches*** *DCS, PLC, and Dedicated Controller Philosophies ● Compressor-Loop Response Analysis-How Fast is Fast Enough?*
0930 – 0945	*Break*
0945 – 1100	***Integrated Turbine & Compressor Control Approaches (cont'd)*** *Case Study: Control Recursion Rates and their Effect on Performance*
1100 – 1230	***Integrated Turbine & Compressor Control Approaches (cont'd)*** *Technology Update: Upcoming Technologies in Turbine Control*
1230 – 1245	*Break*
1245 – 1420	***Case Studies***
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*

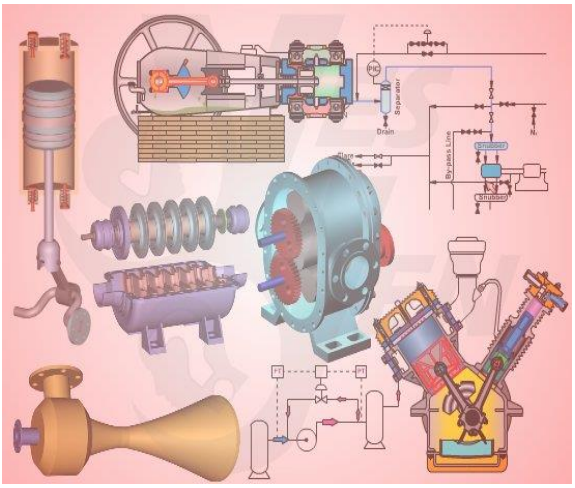
Day 5	Thursday, 13th of February 2025
0730 – 0830	***Control & Protection Devices*** *High and Low Pressure Controls ● Oil Failure Control ● Internal Relief Value*
0830 – 0930	***Control & Protection Devices (cont'd)*** *Motor Starters and Overload ● Internal Motor Temperature Sensors ● Crankcase Heaters*
0930 – 0945	*Break*
0945 – 1215	***Practical Sessions***
1215 – 1230	*Break*
1230 – 1345	***Practical Sessions (cont'd)***
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

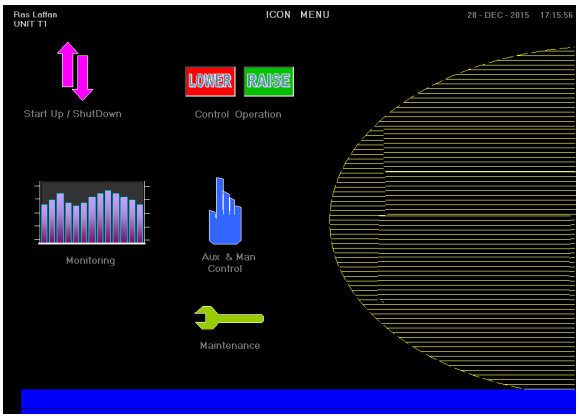
Practical session will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "SIM 3300 Centrifugal Compressor", "CBT on Compressors" and "MARK V" video simulator.

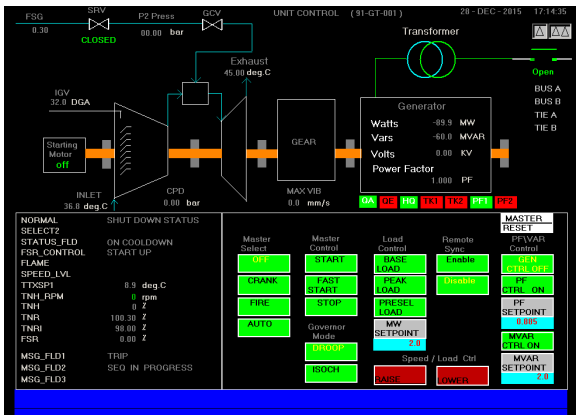


SIM 3300 Centrifugal Compressor Simulator



CBT on Compressors





Course Coordinator
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