COURSE OVERVIEW IE0131-4D
Understanding and Tuning Controllers and Control Loops

Course Title
Understanding and Tuning Controllers and Control Loops

Course Date/Venue
October 14-17, 2024/Boardroom, Warwick Hotel Doha, Doha, Qatar

Course Reference
IE0131-4D

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.

This course is designed to provide an introduction to process control to engineers and other technical staff. It teaches the base fundamentals, as well as open and closed loop tuning methods. The course is developed with field tuning in mind, not control design.

The course will discuss the control fundamentals and terminology including the principles, control loop as well as the various types and right selection of control valve and describes the process control methods and characteristics of control valve.

It illustrates the different tuning rules available and explains the fundamentals of control systems, proper tuning of PID controllers, the concepts and application of feed forward control, auto tuning and new developments and troubleshooting tuning.

The various types of control valves, actuators and valve selection will also be discussed during the course.

Course Objectives

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

- Apply and gain a good working knowledge on tuning controllers and control loops
- Carryout tuning concepts for controllers based on business need
- Discuss the control fundamentals and terminology including the principles, control loop as well as the various types and right selection of control valve
- Describe the process control methods and characteristics of control valve
- Illustrate the different tuning rules available and explain the fundamentals of control systems
- Demonstrate the proper tuning of PID controllers and the concepts and application of feed forward control
- Identify auto tuning and new developments and employ good practices and troubleshooting tuning
- Discuss the various types of control valves, actuators and valve selection

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 tuning controllers and control loops for senior engineers, engineers, senior foremen, foremen and other technical staff who are willing to learn more about single loop controllers, PID and tuning. The course explains the essence of feedback control without going in-depth into math.

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 accreditation 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)

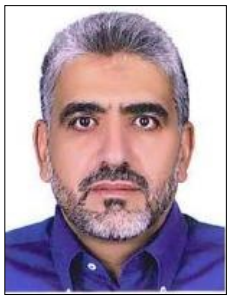
  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. 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, Haward Technology has the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Mr. Ehab Mohamed, BSc, CompEX, ETAP, is a **Senior Electromechanical Engineer** with **30 years** of extensive industrial experience within the **Oil & Gas**, **Refinery**, **Petrochemical** and **Power** industries. He specializes in **Tuning Controllers & Control Loops**, **Maintenance Management** Best Practices, **Rotating Equipment** Reliability Optimization, Practical **Machinery Vibration**, **Vibration** Techniques, Effective **Reliability Maintenance**, Excellence in **Maintenance & Reliability** Management, **Preventive & Predictive Maintenance**, Machinery Failure Analysis (**RCFA**), **Reliability** Optimization & Continuous Improvement, **Maintenance** Planning, Scheduling & Work Control, **Maintenance Management** Strategy, **Mechanical & Rotating Equipment** Troubleshooting, Preventive Maintenance, Predictive Maintenance, Reliability Cantered Maintenance (**RCM**), Condition Based Monitoring (**CBM**), **FMEA**, **Machinery and Rotating Equipment Troubleshooting**, **Turbines, Bearings, Compressors** and **Pumps**. Further he is also well-versed in **Power System Blackouts**, **Power System During Emergency** and **Blackouts**, **Electric Power System** Operation, Electrical Transient Analysis Program (**ETAP**), **Electrical** Installation & Maintenance, **Electrical** Inspection & Testing, **HV/LV** Equipment, **High Voltage Electrical Safety**, **LV & HV Electrical** System, **HV** Equipment Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, **LV Distribution Switchgear & Equipment**, **Substation** Design & Commissioning, **Substation** Maintenance Techniques, **Switchgear** Operation & Maintenance, **Circuit Breakers & Switchgears** Inspection, **Power System** Control & Stability, Industrial **UPS** Systems & **Battery** Power Supplies, **Power Generation & Transmission**, **Power System Protection & Relaying**, **Electric Power** Calculation, **Power Systems Protection**, Distributed Control System (**DCS**) Applications & Troubleshooting, **SCADA & Industrial Communication**, Process Logic Controller (**PLC**), **Load Flow** Calculation, **Cable** Installation, **Transformer** Maintenance, Short Circuit & Protection Coordination, **Harmonic** Analysis Studies, **Earthing & Grounding**, **Power Factor Correction**, **Power System Protection & Relaying**, **Electric Motors & Variable Speed Drives**, **Power Generation**, **Electrical Fault** Detection & Remedies, Electrical **Control Circuits** & Equipment, **Hazardous Area** Classification, **Electrical Hazards**, **Explosion Proof Ex Equipment**, **Hazardous Area Classification & Intrinsic Safety**, **Motor** Testing & Maintenance, Modern **Power System Protective Relaying**, **Generators**, **Transformer**, Office 365, Outlook 365, Visio, ETAP, AutoCAD, RAMS, HRMS, Microsoft BI for Dashboard and Online Reports, Siemens TIA, ABB Drive, Wizard, Window, Composer Suite, SharePoint, NOV Rig Sense all versions, Cond Master Ruby for Condition Monitoring and OSIsoft Data Analytics. He is currently the **Engineering Manager** (Electrical & Controls) in **Weatherford Drilling International**.

During his career life, Mr. Ehab has gained his expertise and thorough practical experience and handling challenging positions such as being the **Engineering Manager**, **Product Manager**, **Acting Project Manager**, **Lead Operation Engineer**, **Plant Engineer**, **Maintenance Engineer**, **Electrical Project Engineer**, **Project Engineer**, **Field Support Engineer**, **Lead Electrical & Automation Engineer**, **Lead Electrical Engineer**, **Field Support Engineer**, **Application Engineer**, **Allen Bradley Rockwell Engineer**, **Lead Technical Assessor**, **Team Leader**, **Principal Teacher**, **Global Field Support Technician**, **Foreman**, **Technical Consultant**, **Technical Trainer** and **Staff Lecturer** for various companies such as the **Weatherford** Drilling International Inc., Daleel Petroleum Company (**DAPECO**), NDSC Drilling Contractor, NOKHBA Energy, Abraj Drilling, American Standard Polymer and Acrylic Plant, Future Technologies Ltd, Industrial Technical College, Ministry of Higher Education and El-Masria Trading & Technical Services.

Mr. Ehab has a **Bachelor's** degree in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership of Management** (**ILM**), a **Certified CompEx Inspector & Installer**, a **Certified Allen Bradley Rockwell Engineer** and a member of the Institution of Engineering & Technology (**IET**). Moreover, he holds a certification in Electrical Power Calculation (**ETAP**) and has delivered numerous trainings, courses, workshops, seminars and conferences internationally.

Course Fee

US$ 5,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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, 14th of October 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Control Fundamentals*** *Terminology ● Principles of Control ● Basic Control Loop ● Advanced Control Loop*
0930 - 0945	*Break*
0945 – 1100	***Control Fundamentals (cont'd)*** *Introduction to Different Types of Control Loops (Open, Close) ● Introduction to Different Types of Complex Control Loops ● Control Algorithm ● Control System*
1100 – 1215	***Control Valve Types*** *Butterfly ● Eccentric ● Rotary Plug ● Ball ● Plug*
1215 – 1230	*Break*
1230 - 1420	***Control Valve Types (cont'd)*** *Linear Valves ● Globe ● Cage ● Double Port ● How to Select the Right Valve?*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 15th of October 2024***

0730 – 0930	***Process Control Methods*** *Open Loop ● Process Behaviour ● Time Lags ● Selection of Type of Controller ● Proportional*
0930 - 0945	*Break*
0945 – 1100	***Process Control Methods(cont'd)*** *Integral ● Derivative ● Feedback ● Cascade ● Ratio ● Feed Forward*
1100 – 1215	***Control Valve Characteristics*** *Selection of Flow Characteristics ● Sizing Steps ● Classification*
1215 – 1230	*Break*
1230 - 1420	***Control Valve*** *Cavitation ● Flashing ● Noise*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: **Wednesday, 16th of October 2024**

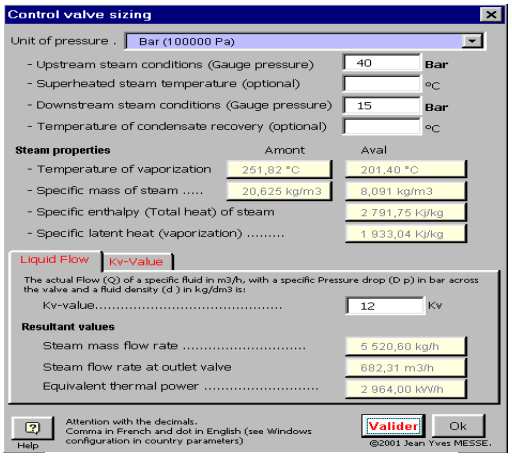
0730 – 0930	***Different Tuning Rules Available*** *Basic Tuning (Proportional, Integral etc.) ● Overshoot ● Lambda Tuning ● Trial Tuning • Cohen Coon Tuning ● Process Controlability ● Suggestions & Rules of Thumb*
0930 - 0945	*Break*
0945 – 1100	***Fundamentals of Control Systems*** *On-Off Control ● Cascade ● Ratio ● FF • FB ● Prop. Band ● Integral ● Derivative ● Direct/Reverse*
1100 – 1215	***Tuning of PID Controllers*** *Open Loop ● Ziegler Nichols ● Continuing Cycling Method • Response Lags ● Closed Loop Control*
1215 – 1230	*Break*
1230 - 1420	***VIDEO Presentation*** *Control Tuning*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: **Thursday, 17th of October 2024**

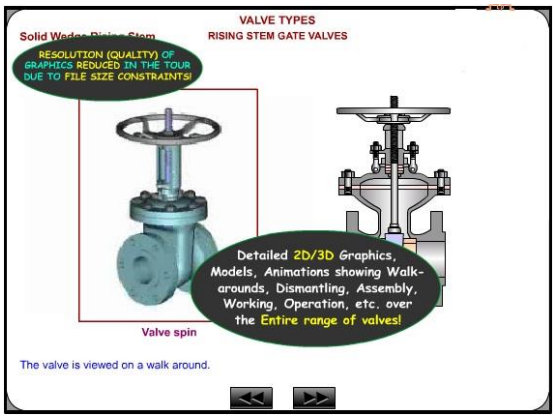
0730 – 0930	***Concepts & Application of Feed Forward Control***
0930 - 0945	*Break*
0945 – 1100	***Auto Tuning & New Developments***
1100 – 1215	***Good Practices & Troubleshooting Tuning***
1215 – 1230	*Break*
1230 - 1345	***Types of Control Valves, Actuators & Valve Selection***
1345 - 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Practical Sessions)

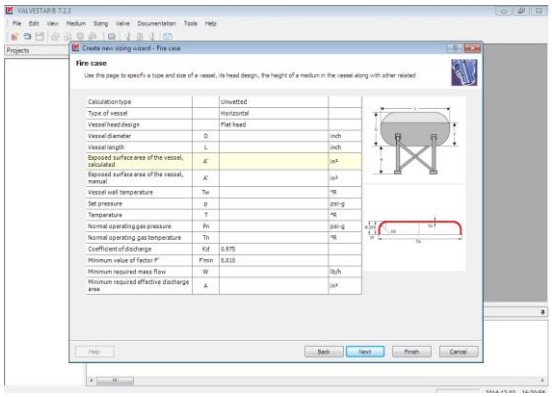
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators "Valve Sizing Software", "Valve Software 3.0", "Valvestar 7.2 Software" and "PRV2SIZE Software".



Valve Sizing Software



Valve Software 3.0



Valvestar 7.2 Software

PRV²SIZE Software

Course Coordinator

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