COURSE OVERVIEW IE0057

Maintenance & Calibration of Field Instruments in Oil & Gas Industry

Course Title

Maintenance & Calibration of Field Instruments in Oil & Gas Industry

Course Date/Venue

February 17-21, 2025/Cubes Business Center Meeting Room, 16th Floor, Cubes Properties Management SP LLC, Al Khazna Tower – Abu Dhabi, UAE

Course Reference

IE0057

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants will visit the instrumentation calibration centre and they will be introduced to various instruments. Practical sessions will be performed in order to apply the theory learnt in the class.

The course is designed to provide delegates with a detailed and up-to-date overview of Maintenance and Calibration of Field Instruments in Oil and Gas Industry. It covers the importance of instrumentation in process control and role of calibration in maintaining system integrity; the purpose of calibration and the difference between calibration and verification; the instrument components and types covering transmitters, controllers, switches, indicators and control valves and actuators; the calibration tools and equipment, maintenance and precautions; the health, safety, environment (HSE) in calibration; and the calibration documentation, pressure instrumentation and temperature instrumentation.

Further, the course will also discuss the flow measurement instrumentation, level measurement instruments and field calibration procedures; the analytical instruments in oil and gas, control valves and actuators, loop calibration, tuning, smart instrumentation and HART protocol; the proper calibration in hazardous areas; and the common instrument faults.

During the interactive course, participants will learn the use of calibration data for trend analysis; the condition monitoring techniques and proper maintenance planning and scheduling; the instrument diagnostics and testing, calibration intervals and frequency; the root cause analysis of calibration failures; the calibration standards and procedures; the internal and external audits and mock calibration tests; the importance of integrity in calibration practices; and the consequence of non-compliance, professional responsibilities of authorized personnel and best practice for ethical documentation.

Course Objectives

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

- Maintain and calibrate oil and gas field instruments in a professional manner
- Discuss the importance of instrumentation in process control and the role of calibration in maintaining system integrity
- Explain the purpose of calibration and the difference between calibration and verification
- Recognize instrument components and types covering sensors, transmitters, controllers, switches, indicators, control valves and actuators
- Identify calibration tools and equipment as well as apply calibration tools maintenance and precautions when handling tools
- Discuss health, safety, environment (HSE) in calibration, calibration documentation, pressure instrumentation and temperature instrumentation
- Describe flow measurement instrumentation, level measurement instruments and field calibration procedures
- Explain analytical instruments in oil and gas, control valves and actuators, loop calibration, tuning, smart instrumentation and HART protocol
- Carryout proper calibration in hazardous areas and identify the common instrument faults
- Use calibration data for trend analysis, implement condition monitoring techniques and apply proper maintenance planning and scheduling
- Carryout instrument diagnostics and testing, calibration intervals and frequency including root cause analysis of calibration failures
- Review calibration standards and procedures, prepare for internal and external audits and perform mock calibration tests
- Discuss the importance of integrity in calibration practices including the consequence of non-compliance, professional responsibilities of authorized personnel and best practice for ethical documentation

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 maintenance and calibration of field instruments in oil and gas industry for instrument technicians, maintenance engineers, control system engineers, operations personnel, quality assurance/quality control (QA/QC) personnel, field supervisors, instrument calibration engineers, project managers, health, safety, and environment (HSE) managers, maintenance planners/schedulers.

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 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. Barry Pretorius is a **Senior Instrumentation Engineer** with almost **30** years of extensive experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of **Cyber Security** Practitioner, **Cyber Security** of Industrial Control System, **IT Cyber Security** Best Practices, **Cybersecurity** Fundamentals, **Ethical Hacking & Penetration Testing**, **Cybersecurity** Risk Management, **Cybersecurity** Threat Intelligence, **OT Whitelisting** for Better Industrial Control System Defense, **NESA** Standard and Compliance Workshop, **OT**, **Cyber Attacks** Awareness - Malware/Ransom Ware / Virus /Trojan/ Philsing, **Information Security Manager**, **Security System** Installation and Maintenance, Security of Distributed Control System (**DCS**), Process Control, Instrumentation, Safeguarding & Security, Programmable Logic Controller (**PLC**), **Siemens PLC** Simatic S7-400/S7-300/S7-200, **PLC & SCADA** for Automation & Process Control, **Artificial Intelligence**, **Allen Bradley PLC** Programing and Hardware Trouble Shooting, Schneider **SCADA System**, **Wonder Ware**, **Emerson**, **Honeywell**, **Honeywell** Safety Manager PLC, **Yokogawa**, Advanced **DCS Yokogawa**, **Endress & Hauser**, Field Commissioning and Start up Testing Pre Operations, System Factory Acceptance Test (**FAT**), System Site Acceptance Test (**SAT**), **SCADA HMI & PLC** Control Logic, Implementation, Systems Testing, Commissioning and Startup, **Foxboro DCS & Triconics, SIS** Systems, **Drives**, Motion Control, **Hydraulics**, **Pneumatics and Control Systems** Engineering, **Electrical & Automation Control Systems**, **HV/MV Switchgear, LV & MV** Switchgears & Circuit Breakers, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipment** Inspection & Maintenance, **LV Distribution Switchgear & Equipment**, **Electrical Safety**, **Electrical** Maintenance, **Transformers**, **Medium & High Voltage Equipment**, **Circuit Breakers**, **Cable & Overhead Line** Troubleshooting & Maintenance, **Electrical Drawing & Schematics**, **Voltage Distribution**, **Power Distribution**, **Filters**, **Automation System**, **Electrical Variable Speed Drives**, **Power** Systems, **Power Generation**, **Diesel Generators**, **Power Stations**, Uninterruptible Power Systems (**UPS**), **Battery Chargers**, **AC & DC Transmission**, **CCTV** Installation, **Data & Fire Alarm** System, **Evacuation** Systems and **Electrical Motors & Variable Speed Drives**, & Control of Electrical and Electronic devices.

During Mr. Pretorius's career life, he has gained his practical experience through several significant positions and dedication as the **Senior Technical Analyst, Team Leader, Pre-operations Startup Engineer, Automation System's Software Manager, Automation System's Senior Project Engineer, PLC Specialist, Site Manager, Senior Project & Commissioning Engineer, Technical Director, Project Engineer, Radio Technician**, **A T E Technician** and **Senior Instructor/Trainer** from various companies like the ADNOC Sour Gas, Ras Al Khair Aluminum Smelter, Johnson Matthey Pty. Ltd, Craigcor Engineering, Unitronics South Africa Pty (Ltd), Bridgestone/Firestone South Africa Pty (Ltd) and South African Defense Force.

Mr. Pretorius's has a Higher Diploma in **Electrical Engineering Heavy Current**. Further, he is a **Certified Instructor/Trainer** and delivered numerous trainings, courses, workshops, seminars 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 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.

Accommodation

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

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, 17th of February 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0900	***Overview of Instrumentation in Oil & Gas*** *Importance of Instrumentation in Process Control • Key Field Instruments Used in the Oil & Gas Industry • Standards & Regulations (ISO, ANSI, IEC, etc.) • Role of Calibration in Maintaining System Integrity*
0900 – 0930	***Calibration Principles*** *Definition & Purpose of Calibration • Traceability & Standards • Understanding Accuracy, Precision, & Uncertainty • Difference Between Calibration & Verification*
0930 – 0945	*Break*
0945 – 1200	***Instrument Components & Types*** *Sensors (RTDs, Thermocouples, Pressure Sensors, etc.) • Transmitters & Controllers • Switches & Indicators • Control Valves & Actuators*
1200 – 1230	***Calibration Tools & Equipment*** *Overview of Calibrators (Multifunction, Pressure, Temperature) • Calibration Software & Data Loggers • Maintenance of Calibration Tools • Safety Precautions When Handling Tools*
1230 – 1245	*Break*

1245 – 1400	***Health, Safety, & Environment (HSE) in Calibration*** *Risk Assessment & Hazard Identification • PPE Requirements & Safe Work Practices • Safety Considerations for Hazardous Areas (ATEX, IECEx) • Handling Pressurized & High-Temperature Instruments*
1400 – 1420	***Calibration Documentation*** *Importance of Calibration Records for Audits • Types of Calibration Certificates • Key Components of a Calibration Inspection Sheet • Regulatory & Audit Compliance Requirements*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 18th of February 2025***

0730 – 0830	***Pressure Instrumentation*** *Types of Pressure Sensors (Gauge, Absolute, Differential) • Calibration Methods for Pressure Instruments • Common Issues in Pressure Measurement • Troubleshooting Pressure Sensors & Transmitters*
0830 – 0930	***Temperature Instrumentation*** *Types of Temperature Sensors (RTDs, Thermocouples) • Calibration Techniques for Temperature Instruments • Influence of Ambient Conditions on Temperature Readings • Maintenance of Temperature Elements*
0930 – 0945	*Break*
0945– 1100	***Flow Measurement Instrumentation*** *Principles of Flow Measurement (Volumetric, Mass Flow) • Types of Flowmeters (Orifice Plates, Coriolis, Ultrasonic) • Flowmeter Calibration Techniques • Causes of Flow Measurement Errors*
1100 – 1230	***Level Measurement Instruments*** *Techniques for Level Measurement (Displacement, Radar, Ultrasonic) • Calibration Procedures for Level Instruments • Common Issues in Level Measurement • Maintenance of Level Sensors*
1230 – 1245	*Break*
1245 – 1300	***Field Calibration Procedures*** *Preparing for Field Calibration (Planning, Isolation) • Zeroing & Spanning Instruments • Managing Calibration in Hazardous Zones • Best Practices for Field Documentation*
1300 – 1420	***Practical Hands-On: Pressure & Temperature Calibration*** *Hands-On Exercises Using Pressure & Temperature Calibrator • Conducting a Complete Calibration Cycle • Recording & Interpreting Calibration Data • Troubleshooting During Practical Sessions*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3: Wednesday, 19th of February 2025

0730 – 0900	***Analytical Instruments in Oil & Gas*** *Overview of Gas Analyzers (GCs, Oxygen, H2S Analyzers) • Calibration of Gas Analyzers • Maintenance Practices for Analytical Instruments • Challenges in Analytical Instrument Calibration*
0900 – 0930	***Control Valves & Actuators*** *Principles of Control Valve Operation • Calibration of Valve Positioners • Actuator Testing & Tuning • Common Faults in Control Valves & Actuators*
0930 – 0945	*Break*
0945 – 1100	***Loop Calibration & Tuning*** *Understanding Control Loops (Open versus Closed Loops) • Testing Transmitters in Control Loops • Loop Tuning Basics (P, I, D Parameters) • Tools for Loop Calibration*
1100 – 1230	***Smart Instrumentation & HART Protocol*** *Overview of Smart Instruments & their Features • Configuring & Calibrating HART-Enabled Devices • Diagnostic Capabilities of Smart Instruments • Troubleshooting Smart Instrument Issues*
1230 – 1245	*Break*
1245 – 1400	***Calibration in Hazardous Areas*** *Intrinsically Safe Tools & Equipment • Special Considerations for Explosive Atmospheres • Compliance with ATEX & IECEx Standards • Practical Calibration in Hazardous Zones*
1400 – 1420	***Practical Hands-On: Flow & Level Instrument Calibration*** *Exercises on Flowmeter & Level Instrument Calibration • Simulating Real-World Scenarios • Common Errors During Calibration & How to Avoid Them • Reviewing Documentation for Audit Readiness*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4: Thursday, 20th of February 2025

0730 – 0830	***Common Instrument Faults*** *Identifying Symptoms of Malfunction • Root Cause Analysis Techniques • Quick Fixes versus Long-Term Solutions • Case Studies of Common Faults*
0830 - 0930	***Predictive Maintenance & Reliability*** *Using Calibration Data for Trend Analysis • Predictive versus Preventive Maintenance • Implementing Condition Monitoring Techniques • Maintenance Planning & Scheduling*
0930 – 0945	*Break*
0945 – 1030	***Instrument Diagnostics & Testing*** *Built-In Diagnostic Tools in Smart Instruments • Manual Vs Automated Diagnostic Methods • Performance Testing of Instruments • Dealing with Intermittent Faults*
1030 – 1130	***Calibration Intervals & Frequency*** *Determining Calibration Frequency Based on Instrument Type • Impact of Operating Conditions on Calibration Intervals • Best Practices for Optimizing Calibration Schedules • Regulatory Guidelines for Interval Determination*
1130 – 1230	***Root Cause Analysis of Calibration Failures*** *Investigating Reasons for Calibration Drift • Environmental Factors Affecting Instrument Performance • Human Errors in Calibration • Corrective Actions to Mitigate Issues*

1230 – 1245	*Break*
1245 – 1420	***Practical Hands-On: Troubleshooting Faulty Instruments*** *Simulation of Common Instrument Faults • Conducting Diagnostic Tests • Applying Corrective Measures • Documenting Troubleshooting Procedures*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5: ***Friday, 21st of February 2025***

0730 – 0930	***Review of Calibration Standards & Procedures*** *Recap of International Standards & Best Practices • Importance of Following Sops • Case Studies on Calibration Compliance*
0930 – 0945	*Break*
0945 – 1030	***Preparing for Internal & External Audits*** *Common Audit Findings & How to Address Them • Organizing Calibration Records • Conducting Pre-Audit Checks • Responding to Auditor Queries*
1030 - 1230	***Mock Calibration Tests*** *Simulated Calibration Scenarios • Evaluating Attendees on Calibration Accuracy & Documentation • Providing Constructive Feedback*
1230 – 1245	*Break*
1245 - 1345	***Ethics & Responsibilities in Calibration*** *Importance of Integrity in Calibration Practices • Consequences of Non-Compliance • Professional Responsibilities of Authorized Personnel • Best Practices for Ethical Documentation*
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*

Practical Sessions/Site Visit

Site visit will be organized during the course for delegates to practice the theory learnt:-

Course Coordinator

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