



IE234-10D

Instrument Installation and Maintenance

Training Description:

This intensive training course covers the proper methodologies and safety practices during installation, calibration and maintenance procedures of field instruments systems; the wiring in an electronic control loop; the selection and operation of test equipment to measure electrical properties and calibrating instruments; the electronic transmitters and controllers; the importance of maintenance in the proper operation of instruments and control systems; and the manufacturer's guidelines to configure instruments for specific process applications.

During this interactive course, participants will learn the installation considerations and practices for instruments and control systems; the installation of electronic instruments using manufacturer's guidelines and ISA's recommended practices and procedures; and the P&ID and methods for reducing electrical hazards; the fieldbus systems; and the relevance of ISO 9000 standards to maintenance practices and procedures.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply proper methodologies and safety practices during installation, calibration and maintenance procedures of field instruments systems
- ✓ Connect wiring in an electronic control loop
- ✓ Select and operate test equipment to measure electrical properties and calibrate instruments
- ✓ Calibrate electronic transmitters and controllers
- ✓ Recognize the importance of maintenance in the proper operation of instruments and control systems
- ✓ Use manufacturer's guidelines to configure instruments for specific process applications
- ✓ Explain installation considerations and practices for instruments and control systems
- ✓ Install electronic instruments using manufacturer's guidelines and ISA's recommended practices and procedures
- ✓ Use P&ID, wiring, schematic, and installation detail drawings to install, calibrate, and verify proper operation of instruments
- ✓ Explain methods for reducing electrical hazards including intrinsically safe installation
- ✓ Describe the trend toward using fieldbus systems and personal computers in process control
- ✓ Recognize the relevance of ISO 9000 standards to maintenance practices and procedures

Training Designed for:

This course is intended for those engineers and other technical staff who build, modify, test, repair, maintain, install or calibrate field instruments, electric or electronic equipment and apparatus.

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ Introduction
- ❖ Review of Course



- Objectives of Course, Timetables
- ❖ **Standards**
 - Why Standards? What Standards?, Quality, ISO 9000
- ❖ **Instrument Performance**
 - Accuracy, Repeatability, Linearity, Hysteresis, Performance Specifications, Errors, Zero & Span, Basic Control Concepts

DAY TWO:

- ❖ **Review of Electrical Measurements**
 - Typical Multi-Meter, Voltage measurement, Current measurement, Resistance measurement
- ❖ **The 4-20 mA Standard**
 - Live Zero, Current Loop, Standards, The 2-Wire Transmitter, Load Effect, Intrinsic Safety
- ❖ **Digital System Fundamentals**
 - Numbering Systems, Code Numbers, Binary Logic, Ladder Logic, Applications

DAY THREE:

- ❖ **Installation-General**
 - Pressurized Vessels, Use of Still Wells, Straight Pipe Length Considerations, Piping Configuration
- ❖ **Installation-Pressure & Level**
 - Bubble Tube System, Wet Leg Installation, Closed Tank Application, Elevation & Suppression, Blanking Distance, Capacitance Probes, Tuning Fork
- ❖ **Installation-Temperature**
 - Use of Thermowell, Cold Junction Compensation, Thermocouple Cable Coding, Signal Cable Tagging, 3 & 4 Wire RTD's

DAY FOUR:

- ❖ **Installation-Flow**
 - Location of Orifice Tappings, Filled Pipeline, Isolation Valves, Mass Flowmeter Installation, K Factor
- ❖ **Other Installation Considerations**
 - Noise, Electrostatic Coupling, Inductive Coupling, Impedance Coupling, Ground Loops, Linearization, Materials Selection, Ground Loops, Linearization, Materials Selection
- ❖ **Typical Applications**
 - Flowmeter Installations, Radar Level, Split Signal Control, Cascade Control (Computer Simulation)

DAY FIVE:

- ❖ **Calibration**
 - Definition, Standards, ISO 9000, etc.
- ❖ **Calibration-Pressure & Level**
 - Dead Weight Tester, Portable Calibrators, Pressure Transmitters, Differential Pressure Transmitters, Ultrasonic & Radar, Blanking Distances, Laser Measurement Ultrasonic & Radar, Blanking Distances, Laser Measurement
- ❖ **Calibration-Temperature**

- Oil Baths, Thermocouple Construction, Thermocouple Types, Thermocouple Tables, MV Meter, RTD Construction, RTD Types, Wheatstone Bridge, Pyrometry, Black Box

DAY SIX:

- ❖ **Calibration – Flow**
 - Orifice Plate Tapping Points, Averaging Pilot Tube Sizing, Flow Rigs, Portable Ultrasonic Flowmeters, Pulse Measurement
- ❖ **Other Flow Techniques**
 - Variable Area flowmeters, Vortex Flowmeters, Oval Gear, etc
- ❖ **Safety Considerations**
 - Intrinsic Safety Applications, Explosion-Proof Applications, Area Classifications, Approval Standards, Certification, Oxygen Cleaning

DAY SEVEN:

- ❖ **Maintenance Considerations**
 - What is Instrument Maintenance? Knowledge and Skills for Maintenance, Importance of Good Maintenance, Corrective Maintenance, Preventative Maintenance, Predictive Maintenance, Troubleshooting, Summary
- ❖ **Basic Principles of Control Systems**
 - Typical Manual Control, Closed Loop Control, Block Diagrams, On-Off Control
 - Modulating Control, Proportional + Integral + Derivative Control, Application Examples
- ❖ **Digital Controller Configuration**
 - Function Blocks, Configuration, Soft Wiring, Analogue vs Digital, A/D Conversion

DAY EIGHT:

- ❖ **Process Dynamics**
 - The Problem of Long Dead Time in Closed Loops, First Order Lags, Process Gains, Dead Zone, Dead-Time
- ❖ **Analysis of a Digital DP Transmitter**
 - Specification, Configuration, Application of Configuration, Procedure
- ❖ **Review of Current Equipment**
 - Mass Flow-Meter (Video Clip), Local Integrated Controller, Multi Variable Transmitter, Interface Level Transmitter

DAY NINE:

- ❖ **Data Communications**
 - Networking, HART, Profibus, Foundation Fieldbus, Ethernet
- ❖ **P & ID, Wiring Schematics & Diagrams etc**
 - Process Diagrams, P&ID, Loop Drawings, Hook-Up Drawings HAZOP, Instrument Lists Schematics
- ❖ **Practical Sessions**

DAY TEN:

- ❖ **Future Trends**
 - Calibration Services, Test Equipment, Standards, Communications
- ❖ **Loop Checking & Tuning**
 - Zeigler & Nicholls Methods, Application Examples, Computer Simulation

- ❖ Course Conclusion
- ❖ Post-Test and Evaluation

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

As per the course location - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relative: aisha@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615

Training & Career Development Department