

ROXBY



Training Solutions

MC02

Measurement and Control
Appreciation

Course Content

Aim

To provide an appreciation of the operation and application of process plant instrumentation used for the measurement and display of the main process variables of pressure, level, flow and temperature. To also provide an appreciation of the principles of industrial automatic process control and the practical applications of this on plant control.

Pre-requisite

Suited to those personnel who require to be acquainted with the actual work carried out by instrument personnel and who are involved with instrumentation personnel on a daily basis.

Course Duration

The course is 10 days in duration.

Optimum Number

A maximum of 8 candidates per course.

Course Language

The course is delivered in English. Therefore candidates must have a good standard of both written and verbal English.

Courses can be delivered in other languages however, this would need to be discussed prior to acceptance on the course. It is the responsibility of the person making the booking to make Roxby aware of this requirement.

Training Aids

Using purpose built rigs and simulators. Use will be made of lecture notes, PowerPoint and discussion. Candidates will complete practical assignments to ensure they have fully understood the concepts delivered.

Assessment

Upon successfully completing, candidates are awarded with A Roxby Training Solutions certificate. Should an accredited option wish to be achieved, an ECITB training certificate can be issued.

Course Syllabus

Week One

Introduction

Course Welcome and Introduction To The Role Of The Instrument Technician

Health and Safety Principles

Health and Safety Principles – Work Safely and Minimise Risk
(If candidates already uphold safety qualifications equivalent to standard this unit is not required)

Pressure Measurement

Pressure Measurement Principles, Units, Types and Conversions
Liquid Head Devices (Manometers)
Elastic Deformation Elements (Diagrams, Capsules, Bellows)
Bourdon Tube Gauges ("C" type, Spiral, Helical, Compound and Duplex)
Installation of Bourdon Tube Gauges
Pressure Calibration Standards (DWT, Venier Manometer and Standard Gauge)
Piezo Electric Devices
Calibration Procedures, Errors and Correction
Capacitance Displacement Transducers
Pressure Switches
Practical Training

Pneumatic & Electronic Transmission Systems

Transmission Signals
The Pneumatic DP Transmitter
Bench Calibration
Flapper & Nozzle
Electronic Display Devices
Two Wire Transmission System
SMART (Hart) Transmission
Transmission Signal Converters (I to P and P to I)
Electronic Transmitter (Force Balance)
Practical Training

Level Measurement

Why Measure Level?
Simple Devices
Sight Glass
Hydrostatic Methods (Wet Leg and Dry Leg)
Interface Level
Purged Dip Pipe Level Measurement Principle
Buoyancy Method (Floats and Displacer)
Capacitor Methods
Ultrasonic Methods
Radar Level Gauges
Radioactive (Nuclear)
Load Cells
Solids

Flow Measurement

Rate and Quantity of Flow
Types of Flow
Laminar, Transient and Turbulent Flow
Quantity Displacement Meters
Constant Area, Variable Pressure Devices
Square Root Law and Extraction
Constant Head, Variable Area Devices
Inferential (Velocity) Flowmeters
The Vortex Flowmeter
Mass Flow
Installation Practices & Flowmeter Selection

Temperature Measurement & Electrical Methods of Temperature Measurement

Temperature Units and Scales
Liquid, Gas and Vapour Filled Systems
Bimetal Thermometers
Resistance Thermometers
The Wheatstone Bridge 2, 3 and 4 Wire Systems
Thermocouples
Reference Junction Compensation
Compensating and Extension Cable

Week Two

Control Valves and Actuators

Introduction to Control Valves Actuators and Positioners
Construction
Valve Components
Control Valve Operation and Action
Control Valve Actuators
Valve Positioners
Forced Balance Positioner
Top Mounted Positioner
Split Range Operation
Spring and Diaphragm Actuators
Single and Double Port Valves
Control Valves Trims and Characteristics
Smart positioners
Control Valve maintenance

Closed Loop Control

The Elements of a Control Loop
Process Control Terms
Principles of the Feedback Loop

Modes of Control

On/Off (2-Step) Control
Proportional Action
Integral Action
P+I Controllers
Derivative Action

Tuning Control Systems

Techniques for Tuning Controllers
Closed Loop Methods
Ultimate Sensitivity Method

Complex Control

Damped Oscillation Method

Cascade Control
Ratio Control
Variable Ratio Control

The importance of Calibration

Calibration Procedures
Calibration Errors and tolerances.
Recording Calibration Documentation

PLC's

Types of PLC
System Scale
Ladder Logic
PLC Basic Programming

Fault Finding on Process Control System

Systematic Fault Diagnosis Checks
Safe Working Procedures
Recording Faults into Maintenance Records

Course Evaluation