

# ROXBY



Training Solutions

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 will be of ten day's duration.

### **Optimum Number**

The optimum number of persons on this course will be eight.

### **Training Aids**

Hands on practicals using purpose build rigs and simulators.  
Use will be made of lecture notes, PowerPoint presentation and discussion.  
Delegates will complete practical assignments to ensure they have fully understood but there are no formal assessments or examinations with this course.

## Course Syllabus

### Week One

<b>Introduction</b>	Course Welcome And Introduction To The Role Of The Instrument Technician
<b>Pressure Measurement</b>	Pressure Measurement Principles, Units and Types. 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
<b>Pneumatic &amp; Electronic Transmission Systems</b>	STD 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
<b>Level Measurement</b>	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 Level Measurement
<b>Flow Measurement</b>	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

**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

**Closed Loop Control**

The Elements of a Control Loop  
Process Control Terms  
Principles of the Feedback Loop  
Open Loop Control  
Controller Actions  
Control Loop Stability

**Modes of Control**

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

**Tuning Control  
Systems**

Techniques for Tuning Controllers  
Closed Loop Methods  
Ultimate Sensitivity Method  
Damped Oscillation Method  
Open Loop Methods  
Reaction Rate Method

<b>Complex Control</b>	Cascade Control Ratio Control Variable Ratio Control
<b>PLC's</b>	Types of PLC System Scale Ladder Logic
<b>The importance Of Calibration</b>	Calibration Procedures Errors Documentation
<b>Flow Metering</b>	Flow Meter Selection
<b>Course Evaluation</b>	