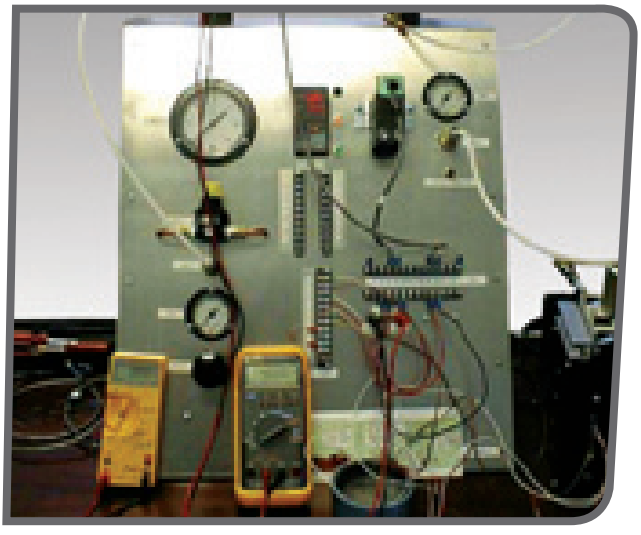
INTRODUCTION TO INSTRUMENTATION AND PROCESS CONTROL

Understand instrumentation and process control to become more valuable as your multi-skill set expands. You'll spend approximately 50% of the time working with various instruments and controllers. You will learn to program, connect input/output devices, as well as how to troubleshoot process controls including sensors, transmitters, controllers and final elements.

Use various instruments to measure temperature, pressure, flow rate, level and position, pH and analysis and weight and density. Understand the differences between open and closed-loop controls, feedback and feed forward controls, PLC, DCS and stand-alone controllers.

Find out how analog signals are produced, processed, and protected from noise and differences in proportional, PI and PID control strategies. Understand what causes errors in instruments and how to minimize and troubleshoot them. Learn to calibrate transmitters and tune controller.



CLASS FORMAT:

Lab + classroom

The participant is able to "learn-by-doing" in the course; this knowledge can be transferred to the workplace.

STANDARD CLASS SIZE:

NTT recommends a class of 12 participants to obtain the best results.

NTT PROVIDES:

- 3 days (24 contact hours) of on-site instruction
- Textbooks, "Introduction to Instrumentation and Process Control," "Instrumentation and Process Control Lab Manual"
- "Supertech" (a pocket reference for instrument technicians)
- Classroom consumables
- Completion certificates
- Shipping, instructor fees and travel expenses

CLIENT PROVIDES:

- Classroom, with easy access, of 750 square feet or greater
- Projection screen, white board and/or flip chart(s)
- Tables and seating for participants
- Tables for hands-on trainers (two 8' tables or four 6' tables)
- A dock facility or a forklift to unload the training equipment
- A pallet jack to move the crates after they have been unloaded may also be needed
- The equipment should be placed in the training room for the NTT instructor to set up and test prior to the start of training

SHIPPING:

- 3 crates at 1,150 lbs
  - 1 crate @ 54" x 49" x 38" = 600 lbs
  - 1 crate @ 58" x 37" x 28" = 375 lbs
  - 1 crate @ 35" x 35" x 27" = 175 lbs

NTT Training

INTRODUCTION TO INSTRUMENTATION AND PROCESS CONTROL

COURSE AGENDA

BASIC CONCEPTS

- Purposes for control systems
- Terminology
- Signal types
- Shielding and grounding
- Signal conversion
- Final control elements

PIPING AND INSTRUMENT DIAGRAMS (P AND IDS)

- Line symbols
- Instrument identification tags
- Instrument bubbles
- Loop diagrams

CONTROL TECHNOLOGIES

- Local manual, remote electrical
- Local pneumatic
- Remote analog/digital

BASIC ELECTRICAL AND MATH CONCEPTS

- Applications to instruments
- Electrical principles and symbols
- Series/parallel circuits

PRESSURE INSTRUMENTATION & MEASUREMENTS

- Pressure measurement devices
  - U-tube manometer, bourdon gauge, bellows gauge, piezoelectric

TEMPERATURE INSTRUMENTATION AND MEASUREMENTS

- Measurement devices and techniques
- Bimetallic temperature measurement
- Filled capillary and bulb, thermocouple, resistance temperature detector (RTD), thermistors, thermowells, infrared

FLOW INSTRUMENTATION AND MEASUREMENTS

- Flow measurement methods
- Factors influencing flow measurement
- Flow measurement devices—orifice plates, venturi tube, flow nozzle, elbow taps, pitot tube, parshall flume, magnetic flowmeter (Mag meter), vortex shedding meter, turbine meter, target flowmeter, ultrasonic, variable area rotameter, coriolis meter, nutating disc

LEVEL INSTRUMENTATION AND MEASUREMENTS

- Level measurement methods—sight glass, differential pressure level measurement, bubbler, displacer level sensor, float level sensors, capacitance, radiation-based, radar and ultrasonic level sensors

DENSITY, SPECIFIC GRAVITY AND ANALYSIS

- Density and specific gravity measurement
- Monitoring and analyzing pH, conductivity

MANIPULATING THE PROCESS

- Final control element
- Actuators, valve positioners, I/P, valves
- Variable frequency drives

TROUBLESHOOTING

- Testing for open/short circuits
- Troubleshooting/maintenance suggestions

CONTROLLERS

- Control modes—proportional, integral, derivative
- Tuning feedback controllers—¼ decay, Zeigler-Nichols, damped oscillation
- Ratio, cascade and feed-forward control

CONTROL SYSTEMS

- Overview of PLCs, DCS and SCADA systems

HANDS-ON EXERCISES

- Density and specific gravity measurement
- Sensor checkout
- Hookup to calibration stands
- Transmitter calibration check
- Program/tune controller
- Set up of differential pressure, temperature, and other process-simulation devices
- Calibration or set up with hand-held calibrator
- Checking current output with VOM & tracing around loop
- Simulate and source 4-20mA-DC signals

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