



Training Program:
**INSTRUMENTATION AND CONTROLS FUNDAMENTALS FOR
FACILITIES ENGINEERS**

INTRODUCTION

The control of processes in today's oil, gas and chemicals industries requires accurate knowledge of process conditions and this in turn means accurate measurement of those conditions. Without measurement there can be no control and no information as to the state of the process.

A greater understanding of the measuring equipment and the instruments can improve the performance of the operator and this in turn will improve plant performance. Better knowledge of how equipment is selected and how it is constructed and how it works also helps an operator to identify the cause of problems and prevent there

Recurrence, Hence, the economic benefits of properly trained and informed operators can be readily quantified.

WHO SHOULD ATTEND?

All those working on process plants who are familiar with the general purpose of process measuring instruments and control equipment. This will include process operators and trainee instrument technicians and engineers on all types of oil, gas and chemical plants. This short intensive course is aimed at operators, technicians and engineers who are currently employed in these industries and require further information on the equipment that they will use.

METHODOLOGY

This interactive Training will be highly interactive, with opportunities to advance your opinions and ideas and will include;

- Lectures
- Workshop & Work Presentation
- Case Studies and Practical Exercise
- Videos and General Discussions

CERTIFICATE

BTS attendance certificate will be issued to all attendees completing minimum of 80% of the total course duration.

COURSE OBJECTIVES:

To provide the participants with a better understanding of the control instrument and the problems related to their use.

At completion of the course, the participants:

- Know the main types of instruments and their working principle.
- Understand the working principle of the different types of control loops.
- Know the typical DCS architecture and the typical Safety System layout.
- Specify and design instrumentation systems for pressure, level, temperature and flow.
- Correctly select and size control valves for any particular application.
- Troubleshoot and identify problems with instrumentation systems.
- Isolate control loops and identify a faulty instrument.

COURSE OUTLINE

- THE CONTROL LOOP: Function and constitution of control loops and on/off control systems, Pneumatic, electrical and digital control loops. Power supply, signal transmission (tubes, cables, bus, optical fibers,) and conversion. Tags and symbols.
- SENSORS: Accuracy and tuning of measuring devices.
- Temperature measurement: temperature scales, non-electrical thermometers, electrical measuring devices.
- Pressure measurement: measurement units, devices for local reading or for transmission, pressure gauge installation.

- Flow measurement: measurement units, head meters, other principles and devices: electromagnetic and ultrasonic meters, vortex effect, Coriolis Effect.
- Level measurement: level glass, float-actuated and displacer devices.
- Other principles and devices: radioactive, capacitance, ultrasonic and radar devices, differential pressure cells.
- Safety devices: two-position sensors, position sensors, temperature and pressure sensors.
- TRANSMITTERS
 - ✓ Pneumatic transmitters: transformation of force into a pneumatic signal and amplification, technology and transmitter tuning - Operation of the sensor-transmitter combination.
 - ✓ Electric and electronic transmitters: operating principle of strength equilibrium and displacement transmitters.
 - ✓ Digital and programmable transmitters.
- CONTROL VALVES
 - ✓ Linear displacement valves: technology, different plug types, characteristic curves (linear, exponential and quick opening), safety position (AO, AC, FC, FO...).
 - ✓ Positioners: operating principle, types (pneumatic, electro pneumatic,).
 - ✓ Other types of control valves: simple and double seat valves, cage valves, "Complex" type valves, tree-way valves,
 - ✓ On/off sensors: position sensors, electro-valves,
 - ✓ Safety valves: types, simple and double actuators,
- CONTROL LOOP IMPLEMENTATION
 - ✓ Simple, override, and split-range loops.
 - ✓ Fractionation, calculated variable, feedforward control systems.

- DISTRIBUTED CONTROL SYSTEM (DCS)
- SAFETY SYSTEM LAYOUT

- ✓ Network architecture and constitution - Examples.
- ✓ Emergency Shut-Down (ESD) systems: role, examples of typical architectures.
- ✓ Fire and gas system: role, typical arrangements.
- ✓ High Integrity Pressure Protection Systems (HIPPS): role, specificities, typical arrangements.