
FUNDAMENTALS OF INSTRUMENTATION, PROCESS CONTROL, PLCs AND SCADA FOR PLANT OPERATORS AND OTHER NON-INSTRUMENT PERSONNEL



WHAT YOU WILL LEARN HOW TO:

- The fundamentals of instrumentation and process control
- The basics of PLCs and SCADA systems
- An ability to troubleshoot simple problems with instruments, PLCs and SCADA systems
- An ability to understand simple plant documentation such as P&IDs
- How to work effectively with your instrumentation plant colleagues

WHO SHOULD ATTEND:

Anybody with an interest in gaining know-how in the full range of instrumentation, process control, PLCs, SCADA and P&ID documentation. This can range from operators, trades personnel, procurement staff, sales staff, technicians and engineers from other backgrounds/disciplines, such as mechanical, electrical and civil. Even the plant secretary who is keen to have a good understanding of the key concepts would benefit. Managers who are keen to understand the key workings and the future of their plants would also benefit from this course.



Technology Training that Works

The Workshop

Have you ever wondered about getting a thorough introduction to the fundamentals of instrumentation, industrial automation and control; thus allowing you to work and perform simple tasks in this key area? In attending this course, this could be the opportunity to walk out with a great grounding in the basics of this exciting field which is rapidly changing the way all plants operate. The constant drive to cut costs means that as an operator you will be increasingly having to have more skills and know-how in the plant instrumentation and process control area.

This course represents a tremendous opportunity to gain expertise in all the key areas of the fast growing area of industrial automation in 2 days. Presented by an expert in the area but who is passionate with getting the key chunks of know-how and expertise across to you in a simple understandable manner which you can immediately apply to your job. This is most definitely not a boring lecture style presentation but an intensive learning experience where you will walk away with real skills as a result of the hands-on practical exercises, calculations, case studies and group sessions to ensure an understanding of the concepts and ideas discussed. You will undertake practical sessions at approximately 20 to 30 minute intervals to maximise the absorption rate.

The topics covered commence on day 1 with an introduction to instrumentation and measurement ranging from pressure, level, temperature and flow devices followed by a review of process control including the all important topic of PID loop tuning. Day 2 is occupied with PLC and SCADA systems where the important topic of industrial data communication networks are also examined – again from a very simple understandable point of view. Finally, the course is rounded off with a hands-on review of reading and interpreting simple plant documentation such as P&IDs so that you can see and understand the operation of the plant through the documentation.

You will leave this workshop with a strong understanding of the key concepts in instrumentation, process control, SCADA and PLCs.

Pre-requisites

The course is presented in easy to understand practical language. All you need to benefit from this course is a very basic understanding of mathematics and some electrical theory. Contact us for comprehensive pre-course reading and preparation if you are unsure about your level of understanding.

Practical Sessions

We firmly believe that no one learns by simply listening to an instructor. So we have added in numerous activities to "liven up the show" and to make it a truly memorable and enjoyable course for you. You will thus engage in:

- Twelve hands-on practical instrumentation, PLC and SCADA labs with real equipment to demonstrate the basics
- Twelve simple instrumentation design exercises using software and calculators
- Two case studies undertaken in groups of your colleagues in assessing real situations with instrumentation and industrial automation

In addition to working with real instruments, we will also make extensive use of video clips, visual effects and simulation software to help you in the understanding of the key concepts.

The Program

DAY ONE - INSTRUMENTATION AND PROCESS CONTROL

INTRODUCTION

- Overview of instrumentation and control
- Key building blocks of PLCs and SCADA systems
- Outline of the course

INTRODUCTION TO PROCESS MEASUREMENT

- Basic measurement concepts
- Definition of terminology
- Measuring instruments and control valves as part of the overall control system

Practical Session

PRESSURE MEASUREMENT

- Principle of pressure measurement
- Pressure transducers and elements

Practical Session

LEVEL MEASUREMENT

- Principles of level measurement
- Simple sight glasses
- Hydrostatic pressure
- Ultrasonic measurement
- Electrical measurement
- Density measurement

Practical Session

TEMPERATURE MEASUREMENT

- Principles of temperature measurement
- Thermocouples
- Resistance Temperature Detectors (RTD's)
- Thermistors

Practical Session

FLOW MEASUREMENT

- Principles of flow measurement
- Open channel flow measurement
- Oscillatory flow measurement
- Magnetic flow measurement
- Positive displacement
- Ultrasonic flow measurement
- Mass flow measurement

Practical Session

FUNDAMENTALS OF PROCESS LOOP TUNING

- Processes, controllers and tuning
- PID controllers
- Gain, dead time and time constants
- Process noise
- General purpose closed loop tuning method

Practical Session

INTRODUCTION TO CONTROL VALVES

- Introduction
- Definition of a control valve
- Cavitation
- Flashing

Practical Session

DIFFERENT TYPES OF CONTROL VALVES

- Globe Valves
- Butterfly
- Eccentric disk
- Ball
- Rotary Plug
- Diaphragm and Pinch

Practical Session

DAY TWO – PLCs, SCADA, AND COMMUNICATIONS

FUNDAMENTALS OF PLCs

- Introduction to PLCs
- Alternative control systems – where do PLCs fit in
- Why PLCs have become so widely accepted

Practical Session

FUNDAMENTALS OF PLC HARDWARE

- Block diagram of typical PLC
- PLC processor module – memory organisation
- Input / output section – module types
- Power supplies

Practical Session

FUNDAMENTALS OF PLC SOFTWARE

- Methods of representing Logic
- Ladder Logic basics
- The basic rules for programming
- Simple PLC programs

Practical Session

INTRODUCTION TO SCADA SYSTEMS

- Fundamentals
- Comparison of SCADA, DCS, PLC and smart instruments
- Typical SCADA installations
- Definition of terms

Practical Session

SCADA SYSTEMS HARDWARE

- Fundamentals
- Comparison of SCADA, DCS, PLC and smart instruments
- Typical SCADA installations
- Definition of terms

Practical Session

SCADA SYSTEMS SOFTWARE

- Fundamentals
- Components of a SCADA system
- Software – design of SCADA packages
- Configuration of SCADA systems
- Building the user interface

Practical Session

BASICS OF DATA COMMUNICATIONS BETWEEN PLC AND SCADA SYSTEMS

- Twisted pair cables
- Fibre optic cables
- Public network provided services
- Industrial Ethernet
- TCP/IP
- Fieldbus
- Modbus
- LAN connectivity: bridges, routers and switches
- SCADA network security

Practical Session

DRAWING TYPES AND STANDARDS

- Understanding diagram layouts and formats.
- Cross references
- P&IDs fundamentals

Practical Session

CONCLUSION

- Summing up and revision of key concepts
- The future