



ICE041

Advanced Distributed Control System (DCS)

Course Introduction:

This workshop will cover the practical applications of the modern distributed control system (DCS). Whilst all control systems are distributed to a certain extent today and there is a definite merging of the concepts of DCS, Programmable Logic Controller (PLC) and SCADA and despite the rapid growth in the use of PLC's and SCADA systems, some of the advantages of a DCS can still be said to be:

Integrity: The expected process down-time caused by a conventional DCS is significantly less than with using a SCADA/PLC. One incident in a refinery can cost more than the difference in price between a DCS and SCADA/PLC. Reasons for this would include redundancy, fault tolerance, diagnostic alarming on I/O errors, system design, and others.

Engineering time: A small SCADA/PLC system is easy to design and configure. As the system grows bigger, the effort involved to properly design and configure the system grows exponentially, and also the risks that things can go wrong. To design and implement a single loop PID controller in a SCADA/PLC is easy and quick. To design and implement the base layer control on a refinery using a SCADA/PLC can be an absolute nightmare.

This workshop examines all these issues and gives suggestions in dealing with them and whilst be no means exhaustive provides an excellent starting point for you in working with DCS's.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- Apply an in-depth knowledge and skills in process control and instrumentation
- List down the different technologies currently in use in pressure, temperature, level flow measurement
- Identify the types of control valve and use a system approach in actuator selection
- Determine the various process considerations for the instrumentation for industrial applications
- Review and apply the different types of control loop strategies and learn the features and application of Distributed Control System (DCS)
- Discuss the system components and operation of the Programmable Logic Controllers (PLC) and learn the configuration of the SCADA systems
- Acquire knowledge on Process Safeguarding including safety instrumented systems (SIS), safety integrity level (SIL) and loop safety considerations
- Identify the various trends in flow calibration and apply meter proving and become acquainted with field communications

Who Should Attend?

This course process control engineers and technicians, process control designers and systems engineers, instrumentation and control system engineers, automation engineers, instrumentation technologists and engineers, operations managers, production engineers, plant engineers, maintenance engineers and supervisors, it managers working with networks, systems engineers, process engineers, electrical engineers, project engineers, design engineers, electrical and instrumentation supervisors and technicians, and those involved in the design, implementation and upgrading of industrial control systems who wish to gain a solid introduction to distributed control systems (dcs's).

Course Outline:

Day 1:

Review of classic computer control with analog system.

- Supervisory set point control
- Direct Digital Control
- Computer /Manual & Computer /Manual /Automatic Station
- Pulse count / pulse Duration computer I/Q

Evolution to DCS

- DCS versus SCADA and PLC System
- The microprocessor and networking technologies

Day 2:

Basic DCS Architecture

- Levels of communication
- Controllers, I/Q
- Operator consoles (HMI)
- Security (redundancy, single loop integrity, etc.
- Error checking and reporting

Network technologies

- Polling, Token Ring
- Exception Reporting
- Others

Day 3:

Controllers

- Basic Control
 - Basic Control Theory

- Types of DCS controller Single / Dual loop Multi loop
- Redundancy Schemes One for none for one
- Memory, Function Code libraries
- Multi-Tasking, scanning priorities, rates
- I/Q Data bus control
- Peer to peer communication
- Communication with HMI
- Control Algorithms, function codes
- Tag Driven vs. Address Driven systems
- Configuration Tools
- Controllers Maintenance
- Controllers Troubleshooting & Repair

Day 4:

Process Control Units

- I/Q Backplanes
- Communication Modules
- Network Redundancy
- I/Q Types
- I/Q Redundancy
- Intrinsic Safety Active & passive barriers Other techniques

Operator Interface (HMI)

- Process Display
- Graphic Displays
- Faceplate Displays
- Trend Displays
- Alarm Displays
- Historical Displays Operator Keyboards
- Layout, functionality
- Pointing devices Touchscreen Mouse, Trackball

Operator Interface Architecture

- Graphical configuration
- Historical Database
- Trending system (Real time, historical)
- Scanning, polling, exception reports
- Open system (Upper network connection)
- Intranet
- Internet
- Ergonomics

- Screen glare
- Operator fatigue
- Alarm management

Day 5:

Interfacing to the DCS

- Computer Interface
- Data throughput rates
- Communication standards Drivers
- PLC Interfaces Drivers OPC Standard Types of data
- Batch controller interfacing Recipes Batch languages Partitioning between computer and controller (recipe storage)
- Power system integrity Configuration retention (Nvram, eeprom, eprom, lithium cells) Initialization, synchronization of system After loss of the power

System diagnostics Error message Problem isolation

System diagnostics

Future DCS evolution and Information Technology convergence

Field controllers, Wireless communication

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Fees:

To be advised as per course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

