Distributed Control Systems

Functions in an International Setting

Introduction

The distinctions between supervisory control and data acquisition (SCADA) and distributed control systems (DCS) are becoming more hazy due to recent developments in globalisation, mobile devices, remote operations, and system integration. Some vendors label their products as DCS or SCADA depending on the actual application, which further complicates things. The most crucial parts of a DCS are covered in detail in this course, which has been created with these current trends in mind. The operation of the DCS, networking, HMI, and alarms are highlighted. Important subjects like maintenance and troubleshooting that affect field engineers and operators are discussed. Lastly, the newest developments and cutting edge advanced process controllers are also discussed.

- Networking, HMI, and Alarms in the DCS Organisation and Operation
- Upkeep and Issue Resolution Advanced Process Controllers Current Patterns

Objectives

To examine process control, instrumentation, and sensors

- To discuss the operation and organisation of DCS
- To list the key DCS networking, HMI, and alarm functionalities in brief
- To emphasise the steps and problems involved in maintenance and troubleshooting
- To examine DCS Advanced Process Controllers
- To discuss the most recent DCS-related trends

Training Methodology

There will be a highly interactive instructor presentation covering the key ideas, processes, and concerns along with a set of slides and a training manual. In addition, the course will make use of a number of interactive exercises and workshops. Furthermore, a specific amount of videos that are highly suitable will be screened. Lastly, a series of hands-on exercises will be offered, including setting up a Process Simulator and Test Bed with DCS hardware and software components.

Organizational impacts

When workers return to their company, they will have:

- A working understanding of DCS-related sensors, instrumentation, and process control.
- A practical understanding of DCS operation and organisation
- Practical understanding of DCS alarm features, HMI, and networking
- Understanding the problems and how to solve them practically in order to do DCS maintenance and troubleshooting
- Sensibility in practice DCSs's Advanced Process Controllers
- A useful summary of the most recent DCS-related trends

Personal Imapct

Participants will obtain a thorough comprehension of:

- DCS-related sensors, instrumentation, and process control.
- DCS Structure and Function
- The DCS's alarm, HMI, and networking features
- Problems and steps for carrying out DCS maintenance and troubleshooting
- DCSs's Advanced Process Controllers
- Current DCS-related trends

Who should attend?

Managers, engineers, and technicians who need to understand automation, control, sensors, and instrumentation in a distributed control system are the target audience for this course. There's also a section on maintenance and troubleshooting techniques. Operations staff will also find this to be a very helpful course.

Course Outline

Day 1

Process Control Overview and DCS Overview

- Sensor, instrument, and process control system reviews
- Algorithms for Control
- Rational (P)
- Integral and Proportional (PI)
- Introduction to Proportional, Integral, and Derivative (PID) Distributed Control Systems
- Summary, attributes, benefits, When applied
- Functions, Components, Hardware, Software, I/O, Architecture, and System Interfacing
- Controller using Programmable Logic (PLC) A synopsis
- Direct digital control and supervisory control
- An overview of Supervisory Control and Data Acquisition (SCADA)

- Comparing DCS, PLC, and SCADA

Day 2

DCS Networking and Configuration

- Structure and Configuration of Distributed Control Systems
- DCS block diagrams, parts, architecture, and ideas about redundancy
- DCS hardware setup
- Internals of DCS Hardware and Software
- Tags, software variables, and process variables
- HMI (Human-Machine Interface) Alerts and Patterns
- Databases
- Basic Configuration of a DCS Controller
- Controllers in Sequence for Batch Processing
- Continuous Process Controllers: Blocks of Function
- Structure of Control Systems Hierarchy: ISA-95
- Networking and Data Communications
- Transmission of Signals
- Structures of Physical Networks
- Structures of Logical Networks
- Communication Guidelines
- Foundation Fieldbus and Profibus Fieldbus Operation: Wide Area Network (WAN) communications Field-Based Modbus Control (CIF)
- Applications of DCS and a case study: Oil and Gas

Day 3

Human Machine Interfaces (HMI), Alarms, and DCS Operation: Overview, features, and prerequisites

- Plant imitation and movement
- Interface Categories for DCS Operator Stations: Recorders, Loggers, Trend Displays, and Data Archiving
- HMI in the Field and Control Room: Devices that are mobile and remote
- Alarm Procedures
- Important prerequisites
- Functions of Alarm Systems
- Alarm philosophy, control, and administration
- Logs, trends, reports, development, and applications
- DCS Operation The DCS operational perspective
- Operators' role
- DCS Configuration Integration and Optimisation
- DCS Coordination

Day 4

Upkeep and Problem-Solving

- Considerations for Maintenance
- Upkeep Needs: System and Elements
- How to Check Control Loop Adjustment
- Determine the appropriate testing apparatus and instruments for troubleshooting.
- Troubleshooting
- Correct troubleshooting techniques
- Determine common errors and breakdowns in communication
- Recognising malfunctions, errors, and failures
- DCS Modules and Programmes (code) for diagnostics
- Utilising Internal Variables and DCS Bits for Diagnostics
- Diagnosing Communication Issues

Day 5

Proficient Process Managers

- Control cascade: feed-forward
- Statistical Methodology
- Fundamentals of sophisticated process optimisation and control
- Current DCS Patterns
- Field monitoring and control, Industrial Internet of Things, Internet of Things, mobile and distant devices
- Processing in the Cloud
- Cloud-based surveillance and management