PRACTICAL DISTRIBUTED CONTROL SYSTEMS (DCS) FOR ENGINEERS AND TECHNICIANS

WHAT YOU WILL LEARN:

- Fundamentals of the architecture and operation of Distributed Control Systems (DCSs)
- How to design the overall DCS and process control system
- Techniques to specify DCSs
- Methods to optimise the performance of your plant
- Understanding of the key ergonomic issues in design of operator displays
- How to apply advanced control strategies to your plant control system
- More effective use of your existing DCS process control capabilities
- How to design and create a consistent and effective alarm philosophy for your installation
- How to recognise and deal with human problems in interfacing to alarm systems

WHO SHOULD ATTEND:

- Process Control Engineers and Technicians
- Automation Engineers
- Operations Managers
- Operators and Control Room Personnel
- Metallurgists
- Production Engineers
- Process Engineers
- Plant Engineers
- IT Managers working with Networks
- Electrical Engineers
- Project Engineers
- Electrical and Instrumentation Technicians
- Maintenance Engineers and Supervisors

Petra Training Group

The Workshop

This workshop will cover the practical applications of the modern distributed control system (DCS). Whilst all control systems are distributed to a certain extent, 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 PLCs 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 system is easy and quick. To design and implement the base layer control on a refinery using a SCADA/PLC system can be challenging without a highly skilled team of industrial automation engineer and technicians.

Abnormal Situation Management and Intelligent Alarm Management is a very important DCS issue that provides significant advantages over PLC and SCADA systems. Few DCSs do justice to the process; in terms of controlling for superior performance - most of them merely do the basics and leave the rest to the operators. Operators tend to operate within their comfort zone; they don't drive the process "like Schumacher drives his Ferrari". If more than one adverse condition developed at the same time and the system is too basic to act protectively, the operator would probably not be able to react adequately and risk a major deviation.

Operators have little feedback on their own performance and exceptional adverse conditions are often not handled as well as they should be. Why are DCSs generally so under utilised? Often because the vendor minimises the applications software development costs to be sure of winning the job, or because he does not know enough about the process or if it is a green-field situation, enough could not be known at commissioning time but no allowance was made to add the missing functionality during the ramp-up phase.

This workshop examines all these issues and gives suggestions in dealing with them and whilst by no means exhaustive, provides an excellent starting point for you in working with DCSs.

loop

- Advanced process control - configuration and testing

The Program

INTRODUCTION

SUMMARY OF TYPICAL DISTRIBUTED CONTROL SYSTEMS

DCS VERSUS SCADA VERSUS PLCS

- Comparison
- The smart instrument as the key component in a DCS system

DCS SYSTEM ELEMENTS

- Main differences between a distributed control system and PLC/SCADA systems
- Requirements of the operator interface within the DCS
- Layout of a DCS system with data highway communications paths
- Redundancy in the DCS

DATA COMMUNICATIONS IN A DCS

- Overview of DCS and SCADA Communications (field/operator/long distance)
- Network topologies
- Foundation Fieldbus
- Profibus
- Devicenet
- Industrial Ethernet
- Routers, switches, hubs
- TCP/IP
- Industrial Network security
- Links to MES and ERP

THE BASIC CONTROLLER

- Identification of the PCBs, which make up the controller
- Function of the central processing unit (CPU)
- The types of memory
- Discrete and logic control
- Sequential and batch control

BASIC DCS CONTROLLER CONFIGURATION

- Control modes available within each controller slot
- Tracking and initialisation in control slots used for cascade control
- Control algorithms
- The use of diagnostics

PROGRAMMING OF DCS SYSTEMS

- Block configuration
- IEC 61131-3 "open" programming languages (structured text, function block, ladder, sequential)
- Tips and tricks in programming

THE OPERATOR INTERFACE

- The operators process 'window'
- The various operator display configurations
- The requirement for keyboard entry of data
- Ergonomic requirements in the operator environment

ALARM SYSTEM MANAGEMENT FOR DCSS

- Philosophies of alarm management
- Human and ergonomic factors
- Structure of good alarm system
- Safety Integrity Level (SIL)
- Design of alarm system
- Measurement of performance

DISTRIBUTED CONTROL SYSTEM REPORTING

- Alarm reporting, types of alarms generated and acceptance of alarms
- The different types of logs and reports which can be configured on a DCS system
- Data history use in logs, reports and trend displays

DISTRIBUTED CONTROL SYSTEM CONFIGURATION

- The organisation of system data files
- Data configuration procedures necessary for setting up the DCS area database
- The need for different security levels attached to various operating parameters
- Configuration control procedures adopted to ensure data integrity

ADVANCED CONTROL STRATEGIES MAINTENANCE CONSIDERATIONS

- Maintenance requirements of system and system elements
- The requirements for in-built diagnostics and for maintenance diagnostic routines
- The requirements for installation of UPS system
- Recovery of a DCS following a power outage

THREE TYPICAL APPLICATIONS

SUMMARY AND CLOSURE