DISTRIBUTED CONTROL SYSTEM (DCS)  
Applications, Selection and Troubleshooting  

10 – 12 DECEMBER 2018, KUALA LUMPUR, MALAYSIA

TOPICS COVERED

- Basic Control Concepts
- Introduction to Control Systems
- Modes of Control
- Hardware & Software
- SCADA Systems
- DCS vs. PLC vs. SCADA
- DCS in Petroleum Refining
- DCS Types
- Alarm Management
- Humans in Control

Expert Course Faculty Leader

Our expert has over 45 years of industrial experience, and is currently a Senior Independent Consultant to various petrochemical industries in the UK, USA, Oman, Kuwait and KSA wherein he provides consultancy services on both the application and operational constraints of process equipment in the oil and gas industries.
Introduction

Since the first Distributed Control System was installed in the late 1970’s, the concept of DCS has swept alternative control technologies from the field. The substantial growth, in the construction of plants in the traditional heavy process industries, such as power generation, refining, oil and gas, water and petrochemicals, is driving significant growth in the utilization of DCS. The broad architecture of a solution involved either a direct connection to physical equipment, such as switches, pumps and valves or connection via a fieldbus communication system.

With the advent of high speed data highways and locally collected plant information, DCS are being used to reduce cabling costs, as well as to the implementation of advanced control strategies. This course will cover the practical applications of DCS and is based on a selection of subjects that either have had a strong impact on distributed systems today, or explore novel ideas which may be important in the future. Other topics in the course cover important aspects of distributed systems such as data communications, SCADA and Safety Instrumented Systems plus PLC applications.

The evolution of computer control systems is discussed in this course and the architecture of contemporary DCS offerings is described in general terms. The course covers hardware, configuration, data communications, user interfaces and I/O devices. In addition, the course introduces the general maintenance requirements of DCS. It covers troubleshooting techniques using DCS self-diagnostic displays available to engineers and technicians as well as safe and proper component replacement procedures for cards, modules and power supplies.

The course also looks at the different methods of tuning three term controllers using the various Zeigler-Nichols approaches.

Course Objectives

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

- Apply an in-depth knowledge and skills in DCS systems and implement systematic application, selection and troubleshooting techniques and methods
- Identify the DCS hardware & software, particularly the traditional process controllers, programming, execution time, configuration, etc.
- List the parts and configuration of a SCADA system and determine its basic architecture and levels of hierarchy
- Differentiate DCS from PLC and SCADA and discuss their features and functions
- Determine the types of DCS used in petroleum refining processes and explain their specific function in each process
- Employ the concepts of alarm management systems including the types, features, architecture and functions
- Discuss the concepts of humans in control and identify the factors that contribute in their actions
- Recognize the safety issues involved in DCS such as intrinsic safety, explosion, approval standards, etc.
- Identify types of redundancy and to understand how they work
- Appreciate the principles of analogue and digital field communications and their transmitter classifications, intrinsic safety, fieldbus communications and technologies, etc.
- Discuss the concepts of safety instrumented systems and explain their functions, integration and hazard and risk analysis
- Explain the maintenance considerations of DCS and identify the various types of failures and faults
- Select the proper DCS system for each application and determine the system specification and its functional description

Who Should Attend

This course is intended for managers, engineers and other technical staff who are responsible for the selection, application, and implementation and troubleshooting of distributed control systems. Personnel in technical positions who want to know more about distributed control systems will also benefit from this course.

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About Our Expert Course Trainer

Our trainer is a Senior Mechanical & Instrumentation Engineer with over 45 years of industrial experience in Process Control & Instrumentation, Liquid & Gas Flowmetering, Heat Exchanger Engineering, Pumps, Compressors, Turbines and Control Valve Technology. He is currently a Senior Independent Consultant to various petrochemical industries in the UK, USA, Oman, Kuwait and KSA wherein he provides consultancy services on both the application and operational constraints of process equipment in the oil & gas industries.

During his early career, he has held key positions in Rolls Royce (UK) where he was involved in the design of turbine blading for jet engines, subject to pre-specified distribution of pressure. During this period and since, he has also been closely involved in various aspects of Turbomachinery, Thermodynamics and Fluid Mechanics where he has become a recognized authority in these areas.

Later, he joined the academic staff of University of Liverpool in UK as a Professor in Mechanical Engineering Courses. A substantial part of his work has been concerned with detailed aspects of Flowmetering both of single and multiphase flows. He has supervised doctoral research students in this area in collaboration with various European flowmeter manufacturers.

He joined Haward Technology Middle East in 2002 and was later appointed as European Manager (a post which has since lapsed) and has delivered over 150 training courses in Flowmeasurement (single and multi-phase), Control, Heat Exchangers, Pumps, Turbines, Compressors, Valve and Valve Selection as well as other topics throughout the UK, USA, Oman and Kuwait. During the last two years, he has delivered courses with other training companies operating in the Far and Middle East.

He has published about 150 papers in various Engineering Journals and International Conferences and has contributed to Textbooks on the topics listed above.
### 3 Day Course Outline

#### Session 1: Basic Control Concepts
- Definitions
- Variables
- Basic Elements
- Manual Control
- Feedback Control
- System Responses
- ON – OFF Control
- Three Term Control

#### Session 2: Introduction to Control Systems
- History
- Direct Digital Control
- Centralized Computer Control
- Distributed Control Systems
- Programmable Logic Controllers

#### Session 3: Modes of Control
- Stability
- Ultimate Gain
- Tuning Methods
- Quarter Decay Ratio
- Ratio Control
- Application Examples

#### Session 4: DCS Hardware and Software
- Traditional Process Controllers
- Architecture of Controllers
- Software
- Programming
- Execution Time
- Programming vs. Configuration
- Function Blocks
- Connections to the Controller

#### Session 5: SCADA Systems
- Basic Architecture
- Levels of Hierarchy
- Communication Systems
- SCADA Configuration

#### Session 6: DCS vs. PLC vs. SCADA
- General
- Distributed Control Systems
- Programmable Logic Controllers
- SCADA Systems
- Major Differences
- Hybrid Systems
- Summary

#### Session 7: DCS in Petroleum Refining
- Distillation/Fractionation
- Cracking
- Treatment
- Reforming
- Oil & Gas Applications
- Case Study

#### Session 8: DCS Types
- Main Concepts – General
- Honeywell Experion PKS
- Emerson Delta V
- Yokogawa CENTUM
- Foxboro I/A

#### Session 9: Alarm Management
- Introduction
- Architecture
- Update Times
- Speed of Response
- Operator Considerations
- Alarm Types
- Alarm Displays
- Alarm Priorities
- Alarm Functions
- Hierarchies
- Summaries
- Seven Steps to Alarm Management

#### Session 10: Humans in Control
- The Process of Control
- Touring the Plant with all the Senses
- Control Panel Considerations
- Work Stations
- Look and Feel
- Displays

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Session 11: Safety Considerations
- Intrinsic Safety
- Explosion-proof Standard
- Approval Standards
- Oxygen

Session 12: Redundancy
- General
- How does it Work?
- Device Redundancy
- Network Redundancy
- Port Redundancy
- System Redundancy
- Power Supply Redundancy
- Cable Reliability

Session 13: Analogue Field Communications
- Introduction
- Transmitter Classifications
- Intrinsic Safety
- HART and 4-20mA
- Driving the Circuit

Session 14: Smart Measurement
- Introduction
- Features
- Brief Specification
- Overview
- Application
- Multi-variable Transmitter

Session 15: Digital Field Communications
- Data Highway
- Fieldbus Communications
- Advantages of Fieldbus
- Fieldbus Technologies
- HART
- Foundation Fieldbus
- Profibus

Session 16: Safety Instrumented Systems
- Preview
- Concept
- Safety Instrumented Function (SIF)
- Safety Instrumented Systems (SIS)
- Safety Integrity Level (SIL)
- Hazard and Risk Analysis
- Safety PLC
- General Notes

Session 17: Maintenance Considerations
- Mean Time between Failures
- Spare Parts
- Types of Failures
- Types of Faults
- Diagnostics

Session 18: System Specification
- Functional Description
- Process Diagrams
- P & ID’s
- Loop Diagrams
- HAZOP
- Instrument Index

Session 19: Work Example on a Multi-pass Heat Exchanger
- Introduction
- Application
- Installation
- Network Architecture
- System Integrity
- Wireless in Oil & Gas
- Wireless Transmitters
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<table>
<thead>
<tr>
<th>3 Day Programme</th>
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<th>2 PARTICIPANTS OR MORE</th>
<th>IN-HOUSE TRAINING</th>
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COMPANY DETAILS

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