Training Title

DISTRIBUTED CONTROL SYSTEMS (DCS)

Training Duration

5 days

Training Venue and Dates

Distributed Control Systems (DCS)	5	12 - 16 May	$3,750	Abu Dhabi, UAE

In any of the 5 star hotel. The exact venue will be informed soon.

Training Fees

- **3,750 US$ per participant including Materials/Handouts, Tea/Coffee Refreshments & International Buffet Lunch.**

Training Certificate

Define Management Consultants Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION

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.

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Abnormal Situation Management and Intelligent Alarm Management is a very important DCS issue that provides significant advantages over PLC and SCADA systems.

Few DCS's 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.

Not only is the process control functionality normally underdeveloped but on-line process and control system performance evaluation is rarely seen and alarm management is often badly done. Operators consequently have little feedback on their own performance and exceptional adverse conditions are often not handled as well as they should be. This workshop gives suggestions on dealing with these issues.

The losses in process performance due to the inadequately developed control functionality and the operator's utilisation of the system are invisible in the conventional plant and process performance evaluation and reporting system; that is why it is so hard to make the case for eliminating these losses. Accounting for the invisible losses due to inferior control is not a simple matter, technically and managerially; so it is rarely attempted. A few suggestions are given in dealing with this.

Why are DCS's generally so underutilized ? Often because the vendor minimizes 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. Often the client does not have the technical skills in-house to realize the desired functionality is missing or to adequately specify the desired functionality.

Most of the process control functionality that should be in a DCS can be configured in terms of well tried and virtually standard combinations of function blocks. All DCS's have a comprehensive library of these but few operations outside the oil refining and petrochemicals industries have sufficient staff with the experience to design the control schemes required for reasonably comprehensive process stabilization ("straight lines on screens") and constraint compliance ("operating hard up against the limits"). Optimum alarm design philosophies also need to be vigorously applied in many DCS applications.

There is a lot of misinformation about configuring continuous control schemes using the DCS function block library and the use of the IEC 61131-3 "open" programming languages and these will be examined. If the operators work load is reduced by enhanced automatic control, they should be re-trained from "knob twiddlers" to "process optimizers" so that they do not become idle "exception monitors".

The control room operator (and process control technician) is the main user of the modern system and his requirements and wishes should influence the functional design especially as far as the operator displays, alarming and trending.

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.

There will be practical sessions during the course which cover Modern Distributed Control Systems (DCS).

OBJECTIVES:

What you will gain from attending this workshop:

- **A solid understanding of the architecture & operation of Distributed Control systems**
- **A solid understanding of the design of a simple DCS system**
- **Ability to design the overall DCS and process control system**
- **Better specification of planned DCS's**
- **Improved process performance for your plant**
- **Ability to specify, select and install DCS systems**
- **Understanding of the key ergonomic issues in design of operator displays**
- **Ability to detail the key trends underpinning modern Distributed Control Systems**
- **Apply advanced control strategies to your plant control system**
- **More effective use of your existing DCS process control capabilities**
- **Design and create a consistent and effective alarm philosophy for your installation**
- **Recognize and deal with human problems in interfacing to alarm systems**
- **Benchmark your alarm system performance**

WHO SHOULD ATTEND?

- **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**
- **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)**

TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. In addition to formal lectures and discussions, the delegates will learn by active participation through the use of group discussions, analysis of real-life case studies in Oil & Gas Sector etc. with Practical Applications.

TRAINING OUTLINE:

Following topics will be covered in 5 days.

Day 1:

Introduction
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

Evolution to DCS (continued)

Basic DCS Architecture

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

* Error checking and reporting

Evolution to DCS (continued)

Network technologies

- Polling, Token Ring
- Exception Reporting
- Others

Day 2:

Controllers

Basic Control

- Basic Control Theory
- Types of DCS controller

Single / Dual loop

Multi loop

* Redundancy Schemes

One for n

One for one

Controllers (continued)

* CPU, Memory, Function Code libraries
* Multi Tasking , scanning priorities, rates
* I/Q Data bus control
* peer to peer communication

Controllers (continued)

- Communication with HMI
- Control Algorithms, function codes

• Tag Driven vs . Address Driven systems • Configuration Tools
Controllers (continued) • Controllers Maintenance • Controllers Troubleshooting & Repair
End of Day Two

Day 3:

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)
Operator Interface Architecture (continued) • Scanning , polling, exception reports

• Open system (Upper network connection)
End Of Day three

Day 4:

Operator Interface Architecture (continued) • **Intranet** • **Internet** • **Ergonomics** **Screen glare** **Operator fatigue** **Alarm management**
Interfacing to the DCS • **Computer Interface** **Data throughput rates** **Communication standards** **Drivers** • **PLC Interfaces** **Drivers**
Interfacing to the DCS (continued) • **Batch controller interfacing** **Recipes** **Batch languages** **Partitioning between computer and controller (recipe storage)**
Interfacing to the DCS (continued) • **Power system integrity** **Configuration retention (Nvram, eaprom, eprom , lithium cells)** **Initialization, synchronization of system** **After lose of the power**
End Of Day four

Day 5:

System diagnostics **Error message** **Problem isolation**
System diagnostics (continued) **Error message** **Problem isolation**
Open Discussion **Future DCS evolution and Information Technology convergence** **Field controllers, Wireless communication**
Presentation Of Certificates
End Of Course

- **Course Summary and Evaluation**

Case Studies, Discussions & Last review, Pre & Post Assessments will be carried out

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