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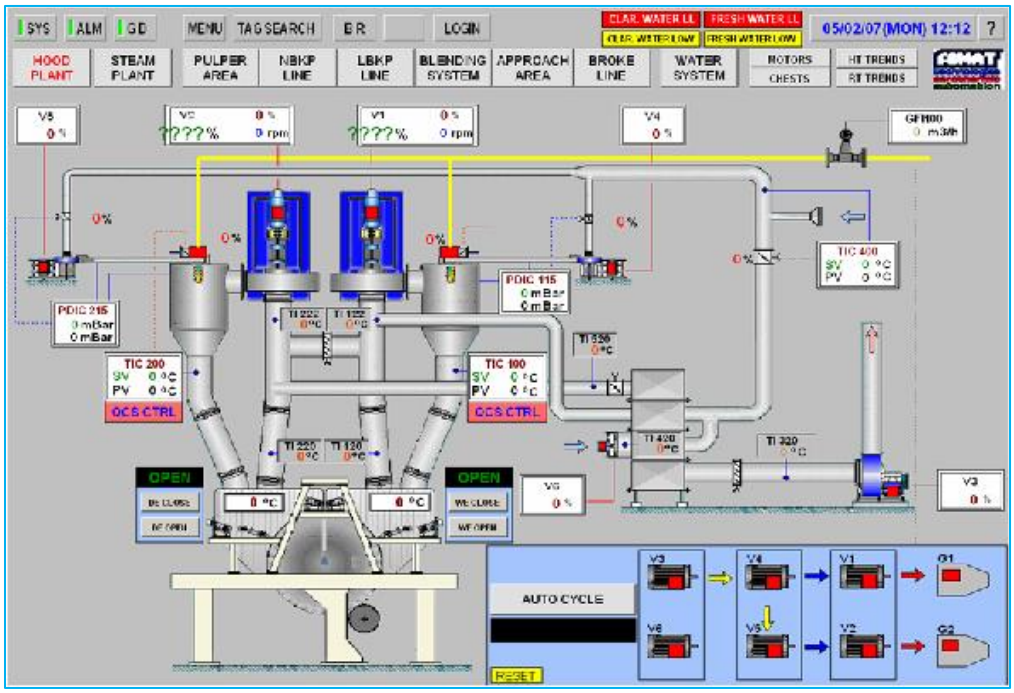

IE024:
Distributed Control System (DCS) Applications, Selection & Troubleshooting

Training Description:

This course presents the evolution of computer control systems and the architecture of contemporary DCS offerings are 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 the DCS. It covers troubleshooting techniques using DCS self-diagnostics and the various diagnostic displays available to the 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.

The course will provide hands-on training sessions in PLC and HMI (OIU and SCADA) programming techniques using one of our state-of-the art Allen Bradley SLC 500, Siemens S7, AB Micrologix 1000 (Digital or Analog), AB SLC5/03 and AB WS5610 PLC simulators.

Training Objective:

By the end of the training, participants will be able to:

- ✓ Apply an in-depth knowledge and skills in DCS systems and implement systematic applications, 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 the 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 system including its types, features, architecture and functions
- ✓ Discuss the concepts of humans in control and identify the factors that contribute in the following concept
- ✓ Recognize the safety considerations involved in DCS such as intrinsic safety, explosion, approval standards, oxygen, etc
- ✓ Identify types of redundancy and recognize how it works
- ✓ Appreciate the principles analogue and digital field communications and discuss its transmitter classifications, intrinsic safety, fieldbus communications & technologies, etc
- ✓ Discuss the concepts of safety instrumented systems and explain its 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, its functional description and diagrams

Training Designed for:

This course is intended for all Electrical Engineers, instrumentation staff and highly qualified technicians whom concerning with DCS Control and Protection Systems Operation, Selection and Maintenance.
Those who are working in electrical power and industrial processing control systems such as: Electrical Power Grids and Electrical Generation Plants, Environmental Control Systems, Traffic signals, Radio Signal s, Water Management Systems, Oil Refining Plants, Chemical plants, Sensor Networks

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ General Introduction to Electrical Plant
  - Power plants
  - Turbines
  - Generators
  - Transformers
  - Transmission lines
  - Distribution lines
  - Voltage level and standard
  - Frequency standard
  - Generator layout
  - Transmission layout
  - Distribution layout
- ❖ Evolution of Distributed Control Systems
  - Introduction
  - Historical Background

DAY TWO:

- ❖ Digital Processing Principles and Microcomputer Interfacing
  - Introduction
  - Microprocessor systems
  - Microcomputers
  - Microprocessors
  - Program memory
  - Input output
  - Software
  - Languages
  - Case study
- ❖ Local Control Unit Architecture
  - Introduction
  - Local control unit (LCU)

- Low-level human interface (LLHI)
- Data input/output unit (DI/OU)
- High-level human interface (HLHI)
- High-level computing device (HLCD
- Computer interface device (CID)
- Shared communication facilities
- Case study

❖ Local Control Unit Languages
- Introduction
- Language Requirements
- Function blocks
- Language Alternatives
- Example of Continuous Control
- Example of Logic Control
- Example of Batch Reactor
- Ladder Diagram
- Case study

DAY THREE:

❖ Communication Facilities
- Introduction
- Communication System Requirements
- Network Topologies
- Case study

❖ Operator Interface
- Introduction
- Operator Interface Requirements
- Low-Level Operator Interface
- HighLevel Operator Interface
- Case study

❖ Operator Displays
- Introduction
- Sample of Display Layout
- Elements in a Display
- Typical Display Hierarchy
- Design Considerations for Operator Input
- System Design Issues
- Case study

❖ Distributed Control Systems DCS Troubleshooting
- Objectives for Control Loop Troubleshooting
- Control Diagram of a Typical Control Loop
- Components and Signals of a Typical Control Loop
- What is Control Loop Troubleshooting?
- Overall Approach to Troubleshooting Control Loops

- Checking the Actuator System
- Check the Controller
- Check the Sensor System
- Troubleshooting Example

DAY FOUR:

❖ Protective Relaying and Control System
- What is relaying,
- Multilayered structure of power systems,
- Abnormalities,
- Basic Terms Used on Protection,
- Selectivity, Zones of protection
- Stability, Speed, Sensitivity,
- Primary and back up protection
- Methods of Discrimination
- Definitions,
- Indicators and Tripping circuits

❖ Distribution Automation and Protection
- Introduction
- Over current protection
- Time delay over current relays
- Instantaneous over current relays
- Settings
- Coordination
- Directional over current relays
- Distance Protection Schemes
- Stepped distance protection
- Zones setting
- Case study
- RX diagram
- Three phase distance relays

DAY FIVE:

❖ Post-Test and Evaluation
❖ Applications
- Application on electrical power systems
- Application on industrial processing systems

❖ Course Conclusion
❖ Post Test & Evaluation

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request".

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours: -

- 30% Lectures, Concepts, Role Play
- 30% Workshops & Work Presentations, Techniques
- 20% Based on Case Studies & Practical Exercises
- 20% Videos, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

As per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:
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Training & Career Development Department