

Oil & Gas DCS

COURSE CONTENT

GET IN TOUCH



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About Multisoft

Train yourself with the best and develop valuable in-demand skills with Multisoft Systems. A leading certification training provider, Multisoft collaborates with leading technologies to bring world-class one-on-one and certification training. Intending to empower professionals and businesses across the globe, we offer more than 1500 training courses, which are delivered by Multisoft's global subject matter experts. We offer tailored corporate training, a comprehensive learning solution with lifetime e-learning access, after-training support and globally recognized training certificates.

About Course

Oil & Gas DCS Training by Multisoft Systems focuses on the engineering and practical application of Distributed Control Systems within oil and gas processing environments. Participants explore DCS architecture, field instrumentation, regulatory and advanced control strategies, operator interfaces, alarms, interlocks, sequences, system integration, testing, commissioning, and troubleshooting. Industry-oriented examples involving separators, pumps, compressors, storage systems, and associated process equipment provide practical context for understanding how DCS engineering principles are applied throughout the lifecycle of an oil and gas automation project.

Module 1: Introduction to Oil & Gas Process Automation

- ✓ Overview of the oil and gas industry
- ✓ Upstream, midstream, and downstream operations
- ✓ Role of automation in oil and gas facilities
- ✓ Process control requirements
- ✓ Automation hierarchy in process plants
- ✓ PLC, DCS, SCADA, and SIS overview
- ✓ Role of DCS in continuous process operations
- ✓ Typical DCS applications in oil and gas facilities

Module 2: Oil & Gas Process Fundamentals

- ✓ Oil and gas production process overview
- ✓ Wellhead and gathering systems
- ✓ Oil, gas, and water separation
- ✓ Three-phase separator operation
- ✓ Gas compression processes
- ✓ Oil stabilization
- ✓ Gas dehydration concepts
- ✓ Pumping and transfer systems
- ✓ Storage and tank farm operations
- ✓ Refinery process overview
- ✓ Utilities and offsite systems

Module 3: DCS Fundamentals and System Architecture

- ✓ Distributed Control System concepts
- ✓ DCS functional architecture
- ✓ Controllers and processing units
- ✓ I/O subsystems
- ✓ Operator workstations
- ✓ Engineering workstations
- ✓ Application and historian servers
- ✓ Communication networks
- ✓ System redundancy concepts
- ✓ Controller and server redundancy
- ✓ Network redundancy
- ✓ Distributed system topology

Module 4: Process Instrumentation for Oil & Gas

- ✓ Measurement principles
- ✓ Pressure measurement
- ✓ Differential pressure measurement
- ✓ Temperature measurement
- ✓ Flow measurement technologies
- ✓ Level measurement
- ✓ Control valves and actuators
- ✓ Transmitters and smart instruments
- ✓ Analog and digital signals
- ✓ 4–20 mA signals

- ✓ HART communication overview
- ✓ Instrument calibration concepts
- ✓ Instrument ranges and engineering units
- ✓ Fail-safe considerations

Module 5: DCS I/O and Signal Processing

- ✓ Analog inputs and outputs
- ✓ Digital inputs and outputs
- ✓ Pulse and frequency signals
- ✓ I/O card configuration
- ✓ Channel assignment
- ✓ Signal conditioning
- ✓ Raw signal scaling
- ✓ Engineering unit conversion
- ✓ Signal filtering
- ✓ Input validation
- ✓ Bad signal handling
- ✓ I/O diagnostics
- ✓ Remote I/O concepts

Module 6: Control Loop Fundamentals

- ✓ Open-loop and closed-loop control
- ✓ Process variable, setpoint, and manipulated variable
- ✓ Feedback control
- ✓ Feedforward control

- ✓ On/off control
- ✓ Proportional control
- ✓ Integral action
- ✓ Derivative action
- ✓ PID control fundamentals
- ✓ Direct and reverse control action
- ✓ Manual and automatic modes
- ✓ Controller output tracking
- ✓ Bumpless transfer

Module 7: PID Configuration and Process Control Strategies

- ✓ PID function block configuration
- ✓ Controller tuning fundamentals
- ✓ Process response characteristics
- ✓ Flow control loops
- ✓ Pressure control loops
- ✓ Temperature control loops
- ✓ Level control loops
- ✓ Cascade control
- ✓ Ratio control
- ✓ Split-range control
- ✓ Override/selective control
- ✓ Feedforward-plus-feedback control
- ✓ Master and slave controllers
- ✓ Control strategy selection for oil and gas processes

Module 8: Oil & Gas Equipment Control Strategies

- ✓ Separator pressure control
- ✓ Separator level and interface control
- ✓ Compressor control overview
- ✓ Compressor suction and discharge monitoring
- ✓ Anti-surge control concepts
- ✓ Pump control logic
- ✓ Pump start/stop sequences
- ✓ Duty/standby pump configuration
- ✓ Tank level control
- ✓ Heater temperature control
- ✓ Control valve operation
- ✓ Equipment permissives
- ✓ Equipment status monitoring

Module 9: Logic, Interlocks, Permissives, and Sequences

- ✓ Boolean logic fundamentals
- ✓ AND, OR, NOT, and voting logic
- ✓ Equipment permissives
- ✓ Process interlocks
- ✓ Start and stop logic
- ✓ Motor control logic
- ✓ Valve control logic
- ✓ Sequential control
- ✓ State-based control concepts

- ✓ Trip conditions
- ✓ Reset logic
- ✓ First-out indication concepts
- ✓ DCS interlock versus SIS trip

Module 10: HMI and Operator Graphics

- ✓ Human Machine Interface fundamentals
- ✓ Operator station functionality
- ✓ Process graphic philosophy
- ✓ Equipment symbols
- ✓ Dynamic process values
- ✓ Status indications
- ✓ Faceplates
- ✓ Controller faceplates
- ✓ Trend displays
- ✓ Navigation hierarchy
- ✓ Overview and detail displays
- ✓ Operator commands
- ✓ Graphic consistency
- ✓ Situational awareness principles
- ✓ HMI considerations for oil and gas facilities

Module 11: Alarm Management

- ✓ Purpose of process alarms
- ✓ Alarm configuration

- ✓ High and low alarms
- ✓ High-high and low-low alarms
- ✓ Deviation alarms
- ✓ Rate-of-change alarms
- ✓ Alarm priorities
- ✓ Alarm acknowledgement
- ✓ Alarm shelving and suppression concepts
- ✓ Alarm deadband
- ✓ Alarm delays
- ✓ Alarm flooding
- ✓ Nuisance alarm reduction
- ✓ Alarm rationalization overview
- ✓ Alarm history and analysis

Module 12: DCS Integration with SIS, PLC, SCADA, and Package Units

- ✓ DCS and Safety Instrumented System integration
- ✓ DCS versus SIS responsibilities
- ✓ Emergency Shutdown System overview
- ✓ Fire and Gas System interface
- ✓ PLC integration
- ✓ SCADA integration
- ✓ Package equipment integration
- ✓ Compressor control panel interfaces
- ✓ Analyzer interfaces

- ✓ Third-party system communication
- ✓ Data exchange principles
- ✓ Interface signal monitoring

Module 13: Industrial Communication and Networking

- ✓ Industrial network fundamentals
- ✓ DCS network architecture
- ✓ Ethernet-based communication
- ✓ Modbus RTU
- ✓ Modbus TCP/IP
- ✓ OPC concepts
- ✓ OPC UA overview
- ✓ HART integration
- ✓ Foundation Fieldbus overview
- ✓ Network switches
- ✓ Communication redundancy
- ✓ Network segmentation
- ✓ Time synchronization
- ✓ Communication diagnostics

Module 14: DCS Engineering and Project Execution

- ✓ DCS project lifecycle
- ✓ Control philosophy
- ✓ P&ID interpretation
- ✓ Instrument index

- ✓ I/O list
- ✓ Cause-and-effect matrix
- ✓ Control narratives
- ✓ Functional Design Specification
- ✓ Tag database preparation
- ✓ Controller assignment
- ✓ I/O allocation
- ✓ Control logic configuration
- ✓ HMI database preparation
- ✓ Alarm database preparation
- ✓ Engineering change management
- ✓ Configuration documentation

Module 15: Testing, Commissioning, and Troubleshooting

- ✓ Factory Acceptance Test (FAT)
- ✓ Site Acceptance Test (SAT)
- ✓ DCS hardware inspection
- ✓ I/O testing
- ✓ Loop checking
- ✓ Logic testing
- ✓ Interlock testing
- ✓ Sequence testing
- ✓ HMI verification
- ✓ Alarm verification
- ✓ Communication testing
- ✓ Controller redundancy testing

- ✓ Startup and commissioning support
- ✓ Fault diagnosis methodology
- ✓ Instrument signal troubleshooting
- ✓ I/O troubleshooting
- ✓ Communication fault troubleshooting
- ✓ Controller and workstation diagnostics

Module 16: DCS Operations, Maintenance, Cybersecurity, and Practical Scenarios

- ✓ DCS system health monitoring
- ✓ Preventive maintenance concepts
- ✓ Controller diagnostics
- ✓ Server and workstation monitoring
- ✓ Network diagnostics
- ✓ Configuration backup
- ✓ Restore and recovery considerations
- ✓ Change and revision management
- ✓ User accounts and access control
- ✓ Industrial cybersecurity fundamentals
- ✓ Network segmentation and secure access concepts
- ✓ Backup and disaster recovery practices
- ✓ Separator control scenario
- ✓ Pump control scenario
- ✓ Tank level control scenario
- ✓ Compressor monitoring scenario

- ✓ Alarm and interlock troubleshooting scenario
- ✓ Review of an integrated oil and gas DCS control application