GE Mark VI and Mark Gas Turbine Controls

Full Simulation
Experts Course Faculty All are GE Contractor and Lead Training Consultants

Course Duration: 5 days
Course Description

The 5-day operations and Maintenance course is designed for plant personnel involved in the daily operation and maintenance of either Mark V control systems, Mark VI or Mark Vie and HMI. The course will enable operators and technicians to configure HMI displays and confidently, manipulate HMI software tools as well as diagnose problems in Gas Turbine SPEEDTRONIC Control Systems. The course is designed to provide a solid background in turbine governing systems. Participants increase their skills in HMI features, configuration and troubleshooting. The use of a Gas Turbine simulator for the Mark V will allow students to view various operational problems and introduce the concepts of configuration, troubleshooting and fault finding. For the Mark VI and Mark Vie, the simulation is software based and runs with the use of a “key” Dongle and will allow each student to work individually.

This course provides participants with practical hands-on training in operation and Maintenance of gas turbine power plants under normal and abnormal conditions. Participants learn safe and efficient plant operation methods, plant start-up, normal operation, plant shutdown, and dealing with typical problems that occur in gas turbine power plants. The training is conducted using advanced real-time simulators that simulate typical plant problems in a realistic environment for the participants to understand, analyse, troubleshoot and respond to the problems. Participants are required to deal with associated alarms, analyse and discuss the cause and the effects of the problem scenario and to take corrective actions to restore the plant to normal conditions.

Simulation-based training is one of the most effective methods of training the operation and Maintenance personnel of industrial plants. Simulators allow plant personnel to observe the consequences of their actions without any direct impact on actual plant operations. Through simulation-based exercises, trainees can learn how to respond to emergencies and how individual actions and decisions affect entire processes in an environment that mirrors situations they would normally encounter in a plant or facility.

Each course is 5-Day duration using the respective simulation either Mark V, Mark VI or Mark Vie depending on the client Turbine Controller. A fully concise training manual will be provided will be provided for each delegate.

Your key learning outcomes from attending this 5 day training course:

- Get familiar with the types of GE Gas Turbines and their applications.
- Understand and read Gas Turbine schematics and identify instrumentation devices/uses.
- Acquire knowledge of the various GE Gas Turbine Systems and explain operating requirements for Lube Oil, Hydraulic Oil and Fuel Systems.
- Be able to explain start-up, synchronising and loading procedures
- Be able to troubleshoot, fault finding and configure sequencing
- Be able to configure operating displays and Trip Historical display.
- Be able to use the software tools that are used to troubleshoot alarms,
- Edit the sequencing, configure the inputs and outputs (both hardwired and networked)
- Be able to calibrate Servo-Actuated Valve ,LVDT’s and other device
- Appreciate the principles of emissions control and the various methods of achieving this.
Who Should Attend

This is an excellent course for plant operators/technicians responsible for the day-to-day operations of a Gas Turbine. The course will also benefit maintenance personnel who are involved in the troubleshooting of operational problems. Shift supervisors and Team Leaders will also find the course beneficial.

MARK VI Operation and Maintenance

DAY 1

Introduction Speedtronic Mark VI
• GE Gas Turbine Fundamentals and control basics.

Speedtronic Mark VI hardware
• Panel, modular concept discussion
• Mark VI cards
• Internal and external Mark VI wiring
• Hardware documentation
• The main protection system VPRO
• Supply voltage.

DAY 2

• Data structure of the operator interface <HMI>
• Brief discussion of the Windows 2000/XP based operator interface
• Most important files of the operator interface and their function
• Failure of the operator interface, what to do.
• Communications with the operator interface, Ethernet and DCS communications
• Operator interface facilities, TOOLBOX and Cimplicity
• Watch Windows
• The M6B file, functions, modules and tasks
• The Finder
• Trip log
• Alarm display
• Trouble shooting procedure
• Control constants
• Mark VI tools (TOOLBOX practice)
• Trend Recorder, Historical trip display, Alarms and SOE's.
DAY 3

Mark VI software structure
- M6B file, MKVI I/O and functions
- Programming languages of the Mark VI
  Macro’s and Modules

Practice: Making Mark VI software with TOOLBOX
- Digital input.
- Analog input with software by students
- Digital input with software example by Students

Gas turbine sequence
- Control modes
- Start up and permissive for start
- IGV sequence
- Normal stop
- Emergency stop

Discussion of the following controls and sequencing
- Fuel control
- Start up, Speed, Acceleration, Temperature, Shut-down control and
- Manual FSR control Special control loops Inlet Guide Vane, Anti icing,
- Water / steam injection and Start and stop.
- control loops The protection systems Flame detection, Overspeed, Vibration,
- Exhaust temperature, Lube oil pressure and temperature, Fire protection system.

Discussion of the following controls and sequencing
- Synchronization, auto and manual
  Power factor control MVAR control

Dry Low NOx
- Explanation of the system
- Discussion of the controls, implementation in Mark VI
- controls and logics.

DAY 4

Trouble shooting, alarm analysis and limited software changes in practice:
- Diagnostics of card failure-Card replacement procedure.
- Alarm display-Setup and configuration
- Alarm Management (flow chart explanation)
- Exercise of different simulated alarms trouble shooting
- Changing control constants, adding alarms
- Trip Log display and interpretation.

DAY 5

Trouble shooting using simulation
- Configuring Trip log display
- Adding Sequencing (CI, CO etc.), Build, Downloading, HMI device
- Configuring a new Cimplicity screen.
- Case study: Unit "not ready to start". Start Checks, Trip logs. First failure analyses
- for trips , (emergency stop)
- Class Discussion and Evaluation of the course.