



Training Program:

Electrical Motors & Variable Speed Drives Masterclass

www.btsconsultant.com

Introduction:

The various drive features such as operating modes, braking types, automatic restart and many others will be discussed in detail. You will learn the four basic requirements for a VSD to function properly with emphasis on typical controller faults, their causes and how they can be repaired. The concluding section of the course gives you the fundamental tools in troubleshooting VSDs confidently and effectively.

The course covers all topics relating to both AC motors and their drives. AC motors represent industry's workhorse in all applications. It is no exaggeration to suggest that more than half of the energy consumed worldwide is converted by AC motors into work and these are controlled by drives.

Understanding maintenance and troubleshooting procedures of such vital industrial equipment means that reduced downtime and increased productivity for the company.

The protection a requirement along with their function and integration with the overall system ensures that such expensive apparatus is well guarded against failures which further offer safety for operations personnel as well. This course will feature:

- Understanding types of AC motors and their starting methods
- Principle of operation of variable speed drives
- Identification of the various types of variable speed drive
- Trouble shooting and maintenance of variable speed drives
- Protection of motors and drives

Who Should Attend?

Electrical Engineers, Electrical Technicians, Electrical Inspectors, Electrical Professionals & Supervisors, Instrumentation and Design Engineers, Maintenance Engineers, Supervisors & Technicians, Energy Management Consultants, Control Engineers & Technicians, Automation & Process Engineers, Chemical & Mechanical Engineers, Consulting Engineers, Field Technicians, Graduate Engineers, Project and Production Managers, Project Engineers, Electronic Technicians, Plant Managers, Process Control Engineers, System Engineers, System Integrators, Testing Engineers & Technicians, Power System Engineers, Power System Technicians, Utility Engineers, Managers & Team Leaders of Engineering Departments, Safety Professionals, Plant Electricians, Facilities Engineers, Operations & Maintenance Engineers, Supervisors & Technicians, Project Engineers, Commissioning & Testing Engineers, Consulting Engineers, Electrical Technologists, Facility & Plant Managers.

Course Objectives:

By the end of this course delegates will be able to:

- Understand the various types of AC motors and starters
- Determine the components and operations of variable speed drives
- Explain the different types of variable speed drives
- Analyze the common faults in a variable speed drive
- Design the protection requirements for motors and drives
- Demonstrate a sound understanding of how AC Variable Speed Drives (VSD's) work
- Install VSDs properly
- Select the right VSD for a given application

- Troubleshoot VSDs competently
- Competently explain how flux-vector control works for drive applications
- Understand squirrel cage induction motors
- Identify the protection and control system requirements for VSD's
- Interface VSD's with PLCs
- Understand the causes of motor burnout
- Deal effectively with VSD harmonics and EMC/EMI problems

Course Outline

Control System for AC Variable Speed Drives

- The Overall Control System
- Power Supply to the Control System
- DC Bus Charging System
- VSD Control Loops (Open-Loop, Closed-Loop)
- Vector control and its applications
- Current Feedback in AC Variable Speed Drives
- Speed Feedback from the Motor

Introduction to Variable Speed Drives

- The Need for Variable Speed Drives
- Fundamental Principles of Speed Control
- Efficiency, Torque, Inertia, Horsepower/Power Factor
- Torque-Speed Curves

- How the motor produces Torque
- Types of Variable Speed Drives

The Selection of AC Converters for Variable Speed Drive Applications

- The Basic Selection Procedure
- Load ability of Converter Fed induction Motors
- Operation in the Constant Power Region
- The Nature of the Machine Load
- Starting and Stopping VSDs (Motor Braking)
- How to Calculate Acceleration Torques and Times
- How to select the correct Motor and Converter for Pump and Fan Loads
- How to select the correct Motor and Converter for Constant Torque Loads, such as conveyors

Installation and Fault Finding Techniques

- General Installation and Environmental Requirements
- Power Supply Connections and Earthing
- Where to install the Contactors in the Power Circuit
- Installing AC Converters into Metal Enclosures

Phase AC Induction Motors

- Basic Construction and Physical Configuration
- Principles of Operation and Performance

- Equivalent Circuit and Fundamental Equations
- Starting, Acceleration, Running and Stopping
- Power, Torque and Thermal Rating

Power Electronic Converters

- Definitions and Basic Principles
- Power Diodes and Thyristors
- Principles of Commutation
- Power Electronic Rectifiers
- Power Electronic Inverters
- Gate Commutated Converters
- Gate Controlled Devices - GTO, FCT, GTR, FET, IGBT

Electromagnetic Compatibility (EMC)

- Sources of Electromagnetic Interference
- Harmonics on the Power Supply side of AC Converters
- The Effect of Harmonic Distortion on other connected Equipment
- Methods of reducing the effect of Supply Side Harmonics
- Electric Motor Protection
- Thermal Overload Protection

Protection of Motors and Converters

- AC Frequency Converter Protection
- Fault Diagnostics

- Electric Motor Protection
- Thermal Overload Protection