Training Program:

Operation & Maintenance Of Variable Speed Drives

Introduction:

It is estimated that electrical drives and other rotating equipment consume about 50% of the total electrical energy consumed in the world today. The cost of maintaining electrical motors can be a significant amount in the budget item of manufacturing, oil, gas, petrochemical and power industries. This course gives you a thorough understanding of electrical motorâ€™s working, maintenance and failure modes and gives you the tools to maintain and troubleshoot electrical motors and variable speed drives.

Maximum efficiency, reliability, and longevity of the various types of motors and variable-speed drives are of great concern to many industries. These objectives can only be achieved by understanding the characteristics, selection criteria, common problems and repair techniques, preventive and predictive maintenance. This course is a MUST for anyone who is involved in the selection, applications, or maintenance of motors, and variable-speed drives. It provides the latest in technology.

The course covers how this equipment operates and provides guidelines and rules that must be followed for a successful operation. Their basic design, operating characteristics, specification, selection criteria, advanced fault detection techniques, critical components as well as all maintenance issues are covered in detail.

You will gain a fundamental understanding of the installation, operation and troubleshooting of electric motors & variable speed drives. Typical applications of electric motors in oil, gas, petrochemical, power, manufacturing, materials handling, process control are covered in detail. You will learn the basic steps in specifying, installing, wiring and commissioning motors. The concluding section of the course gives you the fundamental tools in troubleshooting motors confidently and effectively.

This course is designed to provide participants with a comprehensive understanding of the various types of motors and variable-speed drives. Participants will be able to specify select, commission and maintain this equipment for their applications. The excellent knowledge and skills that participants gained in this course will help their companies in achieving reduced capital, operating and maintenance costs along with increase in efficiency.

This program is designed to familiarize trainees with the operation and use of variable speed drives. After completing this course, the trainees should be able to identify different types of DC and AC drives and explain how they control motor operation.

Who Should Attend?

This course is intended for engineers and other technical personnel who are in charge of selection, application, operation, diagnostic testing, protection, control, troubleshooting or maintenance of motors and variable speed drives.

This seminar is directed towards Supervisors, Team Leaders and Managers in Maintenance, Engineering and Production. It is suitable for who expects to become involved at any stage in project applications and applicable maintenance technologies

Course Objectives:

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

- Identify different types of variable speed DC drives

- Apply the latest techniques on selection, application, operation, diagnostic testing, protection, control, troubleshooting and maintenance of motors and variable speed drives
- Gain an in-depth knowledge on electrical machines and discuss their devices, symbols and circuits
- Enumerate the electric motor types and demonstrate how to operate and perform their functions
- Discuss the construction, operation and performance of 3-Phase AC induction motors
- Emphasize the importance of motor speed control and become familiar with power electronic converters
- Protect and select AC converters, motors & control system and conduct installation & commissioning of AC variable speed drives
- Identify the sources of electromagnetic compatibility (EMC)
- Analyze & test the different types of motor failure
- Carry-out predictive maintenance techniques such as the vibration analysis
- Conduct machinery faults diagnosis & correction using vibration analysis and corrective measures
- Apply bearing failure analysis and discuss the importance of lubrication & oil analysis program
- Explain the operation of a DC motor controlled by a variable speed controller
- Identify the major components of a variable speed controller operating a DC motor
- Explain the operation of a variable speed controller operating a DC motor
- Identify different types of inverter drives
- Explain the operation of an AC motor controlled by an inverter
- Identify the major components of a PWM inverter operating an AC motor

- Explain the operation of a PWM inverter operating an AC motor
- Identify the major components of a flux vector drive
- Explain the operation of an AC motor controlled by a flux vector drive
- Identify different types of flux vector drives
- Explain the operation of a flux vector drive
- Have an understanding of the different types of pumps and compressors
- Enable the delegate to develop a proactive maintenance regime within the organization

Course Outline

- Introduction to AC induction motors and their construction, rotor slip and principles of operation, equivalent circuit, torque-speed characteristics, motoring and regenerative region of operation
- Starting of induction motors and associated techniques
- Speed control methods of induction motors
- Characteristics of motors, enclosures and cooling methods, application data, design characteristics, insulation of AC motors
- Failures in three-phase stator windings, predictive maintenance, motor troubleshooting, diagnostic testing for motors
- Variable Speed Drives
- Basic principles of AC Variable-Speed Drives (VSD's), constant torque region, constant power (extended speed) region, four quadrant operation
- Functionalities and applications of VSD
- Electrical environment of VSD
- Cognitive Skills:

- Ability to select the right components for control and protection of electrical loads
- Ability to set coordination in protection schemes
- Ability to use the VSD with different applications
- Subject-specific Skills
- Ability to define the lifetime of contactors
- Ability to program VSD
- Ability to design a complete control system using motor control components and VSD's
- Power semiconductors, diode, thyristor (SCR), IGBT, MOSFET, GTO and others
- Inverters, Voltage-source and Current-source, Pulse Width Modulated (PWM) inverters
- Two-level pulse width modulated inverter, DC link energy and capacitor sizing, regeneration or dynamic slowdown, dynamic breaking, regeneration
- PWM waveforms and analysis, effects of PWM on motor bearings and insulation and life expectancy, Volts/Hertz control, start up and operation, dynamics, PWM rectifier inverter systems
- Switching transients, harmonics and power factor, failures, common failure modes, fault current limit, device explosion rating, device application, thyristor failures and testing, identification of failed Thyristor and Diode, testing of Thyristor and Diode
- AC drive applications issues, Line power factor, Effect of AC input on drive operation, IGBT switching transients, insulation voltage stress, motor winding voltage distribution, Radiated and Conducted Electromagnetic Interferences (EMI), cable terminating (matching) impedance, inverter output filter, EMI filtering

Accreditation:

BTS attendance certificate will be issued to all attendees completing a minimum of 80% of the total course duration.