



Training Program:

Variable Speed Drives (VSD)

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Introduction:

The continuous advancement of power electronics technology provides significant opportunities for the industry to operate all process control equipment and associated motors with better efficiency and higher reliability than ever before. Variable speed motor drives are widely used in the industry to continually adjust the speed and torque of motors to achieve the required control for automation with the most efficient approach possible.

This seminar has been acknowledged by delegates for it:

- Offers a strong practical background to the understanding of all the concepts associated with variable speed drives technology.
- Covers many applications, including the selection, handling, commissioning and operation of the said technology.
- Ensures that delegates fully understand the difference between soft-starting and VSD technology which are commonly mistaken and clears all misconceptions attached to the technology.
- Discusses case studies and showcases software technology for easy configuration of drives and their integration with the industrial plant.

Who Should Attend?

The seminar is designed for electrical/electronic engineers and technicians, maintenance personnel, plant technical staff, and supervisors who have some basic knowledge of electrical engineering and wish to expand their knowledge and learn the state-of-the-art in variable speed motor drive technology and the issues associated with it. Mechanical and chemical engineers will also benefit as most

industrial processes, if not all, are controlled and adjusted using this technology. From the management point of view, significant savings in a very short payback period can be justified with the technology presented in this seminar.

The emphasis is placed on practical concepts used widely in industrial environments so that the presented material is more relevant for practical use by the attendees.

Training Methodology

The latest educational methods and strategies are employed. The course is designed to not only give the required fundamental knowledge but also to provide a strong background for all attendees towards practical industrial applications.

Objective:

The main objectives of the seminar can be summarized as follows:

- To ensure attendees understand the basic components of an electric drive and the associated solid-state converter circuits.
- To learn the various types of motors and the related applications in an industrial process.
- To familiarize with various speed control methods and the important braking of motors, a capability of advanced hardware that can make huge potential savings in a large plant.
- To discuss the future of this technology and the market trends.

Course Outline

- Introduction
- Goals - Discussion
- Review of basic electric circuits, phasor representation of sinusoidal waveforms, three phase circuits, magnetic circuits, magnetic flux, inductance, permanent magnets, production of magnetic field, power losses and energy efficiency, machine ratings.
- Systems with linear motion, rotating systems. Introduction to motors and generators. Magnetic circuits.
- DC motors, overview of different types of DC motors, equivalent circuits, operating principles, flux weakening in wound field motors.
- AC induction motors, examination of typical nameplates and standards, locked rotor test, full load test, magnetic poles and frequency as related to motor speed, torque characteristics, cooling protection and starting methods, namely, DOL or soft-starters.
- Different methods of motor starting including sizing issue.
- Contactor utilization categories.
- Industrial processes, block diagrams of systems, types of motor drives, electric motor drives, why variable speed, types of variable speed motor drives, mechanical, hydraulic, electrical, market trends. Overview of horsepower and torque relationship, common types of loads, torque calculations, calculations of savings due to replacement of old drives with variable speed drives in retrofit applications.

- Power semiconductors, diode, thyristor (SCR), IGBT, MOSFET, GTO and others.
- Power electronic converters, rectifiers, phase controlled rectifiers for DC motor control.
- Harmonics, power factor in AC systems with harmonics, power factor and adjustable speed motor drives.
- Pulse Width Modulated (PWM) inverters, 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, latest developments.
- Electromagnetic Compatibility (EMC).
- Protection of power electronic converters and associated hardware, protection of motors.
- Selection of VSD .
- Control systems, low performance and open loop operation, medium performance and closed loop operation, high performance and closed loop operation, current feedback control, speed control.
- Maintenance of VFD
- System level selection, load requirements, motor selection, converter selection.
- Communication systems for VSDs,
- Ancillary issues in electric motor drives, hardware and software, sensors, application specific controllers.
- Market trends and the future.

- Case studie

Accreditation:

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