

# ELECTRICAL MOTOR STARTER (REF:OTSEMS001)

## Course Introduction

Process control is an engineering discipline that deals with architectures, mechanisms and algorithms for maintaining the output of a specific process within a desired range.

Process control is extensively used in industry and enables mass production of continuous processes such as oil refining, chemicals, power plants and many other industries.

To complete any process, the sequence of events is regulated and controlled with the help of valves, pumps, compressors and similar equipment and devices operated with motors.

Understanding the characteristics and the startup of such motors is of great help to understand and implement the correct process sequence.

This course explains methods of start-up of different types of motors, using Using Motor, Electric Traction & Electrical Control Trainer simulator.

## Course Objectives:

- Understanding the main process control methods
- Understanding classification of Electric motors.
- Understanding the different methods of motor start-up.
- Understanding the speed torque relation.
- Methods for controlling the speed of motors.
- Methods of reversing the direction of rotation.
- Speed current curve and protection coordination.
- Types of faults and abnormal operating conditions
- Effect of under voltage and negative sequence on the performance of motors.
- Locating motor faults and repairing technique.
- Requirement for safe operation related to hazard areas and standards

## DAY 1

- Introduction to process control.
- Process control methods.
- Discrete, Batch and continuous.
- Motors as a core of the process control.
- Types of electric motors
- Rotating Magnetic Field
- DC motors and applications
- Single Phase and Three Phase AC Motors
- Induction and Synchronous Motors
- Squirrel Cage Motors
- Wound Rotor Motors
- Single speed and variable speed motors
- Single voltage and dual voltage motors
- Unidirectional and reversible motors
- Efficiency & Power factor

## DAY 2

- Standardization & Classification of motors
- Synchronous speed and slip
- Constant speed applications of synchronous motors
- Three-phase induction motors types and applications
- Torque speed characteristic for motors
- Starting methods for single phase motors
- Split phase and capacitor start
- Refrigeration and A/C compressors starting
- Motor control centers and components
- Reading schematic for motor control
- Stator winding
- Rotor and field winding
- Squirrel cage and wound rotors
- Centrifugal switch and starting relays
- Slip wrings and brushes



### DAY 3

- Cooling system.
- Explaining the phenomena of high starting current.
- Starting methods.
- Direct on line start.
- Reduced voltage method
- Starting using starting resistance.
- Starting using auto transformer
- Starting using star delta switch.
- Soft start method.
- Inserted resistance method
- Speed control of different types of motor
- DC motor speed control.
- Variable speed drives
- Harmonics and their effect.
- Protection types and relays
- Effect of under voltage
- Negative sequence protection for big motors

### DAY 4

- Pressure relays
- Temperature relays
- Schematic including process parameters.
- Torque control
- Inspection Techniques
- Troubleshooting Techniques
- Power circuit troubleshooting
- Control circuit troubleshooting
- Ground Fault and Short Circuits
- Routine and Preventive Maintenance
- Vibration causes and correction
- Mantling and Dismantling.
- Emergency repairs
- Motor Storage for Long Periods

### DAY 5

- Test equipment and tools
- Pre-operational Testing
- Operational Electric Tests
- Testing for Insulation
- Measuring winding resistance
- Terminal determination and marking
- Properties of Motors and Applications
- Machine Tools
- Air & air conditioning Compressors
- Servomotors and step motors
- Using Motor, Electric Traction & Electrical Control Trainer simulator

