



Arabian Institute For Training

Electrical Motor Installation and Protection

INTRODUCTION

- This highly participative training course is designed to provide participants with the skills to understand how Electric Motors and their associated Motor Protection and Control Systems are applied in industrial process plants in both Non-Hazardous and Hazardous Environments (Oil & Gas, Mining and Minerals Processing and Heavy Industries).

In this Electrical Motor Installation and Protection training course, participants will learn:

- The types of Electric Motors used in these Industries
- How Motors are Started and Controlled, including Variable Speed Drives
- The Various Classifications Types of Motors used in Hazardous Areas
- The importance of Selecting and Installing the correct Motor Bearings
- Lubrication Programs to ensure the Maximum Motor Life
- The importance utilizing the correct Motor Protection
- The use of Intelligent Motor Control and Motor Managers
- Effective Motor Maintenance, On Line and Off Line Diagnostics
- A Repair Program for Faulty Electric Motors

PROGRAMME OBJECTIVES

- Undertake a detailed review the different types of electric motors available
- Define motor if class or not as per name plate codes
- Reading Motors Name plates and understand all items
- Explosion proof motors
- Area classification as per ATEX standard
- Learn the different starting and control methods used
- Understand the requirements for electric motors in hazardous areas
- Understand the types of motor protection required for different motor types
- Understand the terms “Intelligent Motor Control” and ‘Motor Manager”
- How they are used to control and automate many motor control functions
- Learn about comprehensive electric motor maintenance programmers

PRE-REQUISITE

- The Electrical Motor Installation and Protection training course has strong electrical engineering content. Therefore, participants attending this training course should have a basic understanding of electric principals.
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WHO SHOULD ATTEND?

- This training course is designed to provide a practical and detailed insight for personnel who are directly involved in the design, selection, installation, operation and maintenance of electric motors; professionals and semi-professionals who have an electrical background such as project engineers and electrical engineers and technicians.

It is specifically tailored to suit the following personnel who specify, operate and maintain the driven machinery (e.g. pumps, compressors, coolers, mills, etc.)

- Project Engineers
- Lead and Senior Design and Support Engineers
- Electrical Engineers and Designers – Design and Maintenance Operations
- Electrical Superintendents – Maintenance Operations
- Facilities Engineers
- Process and Chemical Engineers
- Mechanical Engineers
- Maintenance Technicians
- The Electrical Motor Installation and Protection training course may also be of significant relevance to persons who require a detailed understanding of electrical motors, drives and control in their application in industry such as process and mechanical engineers, assuming they have a basic understanding of electrical principals.

TRAINING METHODOLOGY

- This training course will combine presentations with interactive practical exercises, supported by video materials, activities and case studies. Delegates will be encouraged to participate actively in relating their particular protection requirements at their workplace.
- There will be adequate time given for group discussion during and at the end of each session, including detailed case studies and anecdotes on based on the subject matter and the facilitator's own experience in the field.

PROGRAMME SUMMARY

- This training course covers a comprehensive range of topics relating to Electric Motors and their protection as used in industry, ranging from small (part kW) to large (many thousands of kW or MW). It includes a detailed section on the type motors and protection suitable for use in Hazardous Environs such as Oil & Gas processing facilities.
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PROGRAM OUTLINE

Fundamentals of Electric Motors

- Introduction to Electrical Motors, Basic Theory and Operation
- Types of Electric Motors
- DC
- AC Synchronous
- AC Asynchronous
- Other
- Commonly used Electric Motors in Industry
- Cast or Rotor
- Wound Rotor and Slipring
- Speed torque curves and motor starting considerations
- High Voltage Electric Motors
- Motor losses
- Motor selections based on load
- Special Motors (Mill Drives, Gas Turbine Helper Motors etc.)

Electric Motor Control and Hazardous Area Requirements

- Motor Control Methods and Techniques
- DOL
- Reduced Voltage Start by different techniques
- Variable Speed Drives
- PLC controlled
- Area classification as per ATEX standard
- EXd and EX ed Motors
- Motors Classified for use in Hazardous Areas
- Gland installation and cabling for EX motors

Electric Motor Bearings, Efficiency and Harmonics

- Motor Bearings – Design and Types, Plain, Roller and Sleeve, Lubrication.
- THD (total harmonic distortion measurements)
- Explain K factor
- Power quality improvement to increase efficiency
- Power factor correction different methods

Electric Motor Protection

- Motor Protection Requirements – General
 - ANSI code for motor protection
 - Using multifunction protection relay (practical session using simulator)
 - Motor Stall, Acceleration and Running Thermal Limit Curves
 - Motor Thermal Capacity and How it is Evaluated in Motor Protection Devices
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Electric Motor Maintenance and Repair

- Preventative Maintenance, Corrective Maintenance and Maintenance Planning
- On-Line Testing of Motors Using Current Signature Analysis can detect:
 - Rotor defects
 - Stator Problems
 - Bearing Problems
 - Air Gap Problems
- Off-line Static testing to evaluate:
 - Stator Condition
 - Rotor Health
 - Air Gap Anomalies
 - Power Circuit Faults
 - Motor Insulation Health
- Predictive Maintenance using PD , infrared Camera
- Cable selection and voltage drop calculation
- FMEA and RBI
- Repair or Replacement Decisions, Motor Repair



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