



Arabian Institute For Training

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# Variable Frequency Drives (VFDs)

## INTRODUCTION

- This training course highlights the relevance of Variable Frequency Drives (VFDs), also known as adjustable speed drives in the electrical installation. A VFD allows motor-based systems to adjust the speed at which the motor runs. That speed is based on how much power the mechanical systems need to meet the demand of the building. The demand of the system is also referred to as the “load” of the system. By varying the speed, the motor is able to meet the needs of the load without using more energy than necessary.
- Nearly all Variable Frequency Drives work on the basis of taking the existing AC supply, converting it to DC using a rectifier, and then converting it back to a variable frequency supply using an inverter. Modern VFDs utilizes the new matrix design with innovative trends to optimize the performance of the VFD.
- Currently, VFDs are being built into many new systems; however, they can also be added to some current systems through a retrofit. When looking to retrofit a system with a drive, consult a professional to match the drive with the existing system and motor. Making sure they are properly matched is very important in making sure you gain the highest efficiency possible.

## PROGRAMME OBJECTIVES

- Understand the factors controlling speed of an induction motor
  - Explain the construction and operation principles of VFD
  - Determine the benefits of the VFD
  - Understand the VFD technologies
  - Explain the importance VFD maintenance
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## WHO SHOULD ATTEND?

The technicians and maintenance staff will be able to perform correct maintenance procedures and troubleshooting of AC motors and VFDs. This Variable Frequency Drive training course is suitable to a wide range of professionals but will greatly benefit:

- Electrical Engineers
- Maintenance Technicians
- Maintenance Management Professionals
- Project Engineers

## TRAINING METHODOLOGY

- The goals of each participant are discussed to ensure their needs are fulfilled, as far as possible. Questions are encouraged throughout, particularly at the daily wrap up sessions. This provides opportunities for participants to discuss specific issues and, if possible, find appropriate solutions. Case studies are employed to highlight particular points and appropriate video materials used to illustrate particular conditions.

## PROGRAMME SUMMARY

- This training course covers a comprehensive range of topics related to variable frequency drives. These drives are increasingly popular and installed in most oil and gas industries pumps and HVAC systems. Attending this VFD training course will ensure total understanding with regards to the characteristics, construction and operations of the variable frequency drives.

## PROGRAM OUTLINE

### Fundamentals of Three Phase AC Motors, Starters and Factors Controlling Speed

- Three-phase AC motors, types, construction, characteristics and applications
  - Starting of induction motors and associated techniques and acceleration
  - Speed control requirements of AC motors and load matching
  - Soft starters characteristics
  - Selection of AC motors for industrial applications and service factor
  - Fundamentals of a variable speed drive
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## Components and Characteristics of Variable Frequency Drives

- Power semiconductors, diode, thyristor (SCR), IGBT, MOSFET, GTO and others.
- Voltage-source inverters characteristics
- Current source inverters characteristics
- Benefits and applications of VFD
- Two-level PWM, regeneration and dynamic braking
- Medium voltage VFD

## Characteristics and Functionalities of Pulse Width Modulation

- The rectification process
- The DC bus process and functionalities
- The inverter types, process and functionalities
- Volts per hertz operation
- The Megadrive -Load commutated inverters
- PWM technology in Megadrive-LCI

## Troubleshooting, Test Instruments and Maintenance of Drives

- Soft starters and selecting the correct VFD
- Troubleshooting techniques and maintenance for VFD
- Testing instruments and scopemeters for VFD
- Shaft ground rings
- VFD parameter settings and settings
- VSD bearing failures and remedies

## Modern VFD Matrix and Trends

- VFD matrix design
  - VFD management
  - Preventive VFD faults and failures
  - Innovative trends in VFDs
  - Case studies, selection and design
  - Q&A and wrap up session
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