



Content
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VFD Training

[View Course Details](#)

COURSE DATES AND TIMES

June 11-12 , 2026

10:00 am - 4:30 pm ET

October 19-20 , 2026

10:00 am - 4:30 pm ET

VFD Training for Industrial Motor Control Systems

Variable frequency drives are used in nearly every modern industrial motor system, but improper installation, incorrect programming, and poor power system design frequently lead to motor overheating, nuisance drive trips, harmonic distortion, and premature equipment failure.

Many facilities install VFDs to improve energy efficiency and motor speed control, yet problems often occur when drives are applied without a clear understanding of how they interact with the electrical distribution system, motors, and control circuits.

Our VFD training course provides engineers and technicians with the practical knowledge required to properly install, program, operate, and troubleshoot variable frequency drives used in industrial drive systems. Participants learn how adjustable speed drives regulate AC motor speed using rectifier, DC bus, and inverter stages and how modern PWM motor control techniques produce precise torque and speed control.

This variable frequency drive training program focuses on real-world industrial applications, including pumps, fans, compressors, conveyors, and process equipment. The course explains how to configure VFD parameters, apply proper drive installation practices, mitigate harmonic distortion, and diagnose common VFD faults.

By the end of this VFD course, students understand how to commission variable speed drive systems, optimize motor performance, and troubleshoot the electrical and mechanical issues that commonly occur in industrial motor control installations.

VFD Training Course Overview

This 12-hour instructor-led VFD training program explains the engineering principles and practical installation practices required for reliable operation of variable frequency drives in industrial facilities.

The course examines how adjustable speed drives interact with the entire electrical distribution system, beginning at the point of common coupling where utility power enters the facility and continuing downstream through transformers, switchgear, motor control centers, drive systems, and connected motors.

Participants learn how electrical system characteristics such as fault capacity, voltage quality, and harmonic distortion influence the performance and reliability of VFD motor control systems.

This variable frequency drive training course also examines the most common installation problems that cause drive failures, motor damage, and operational instability. Real-world examples of improper VFD installation and commissioning are discussed to highlight issues that frequently occur in industrial facilities.

Special attention is given to practical engineering solutions used to prevent these problems, including proper drive sizing, grounding practices, harmonic mitigation, cable selection, and motor protection techniques.

Throughout the course, students evaluate the electrical distribution system step-by-step and identify potential issues that may affect VFD performance or motor reliability.

Key Skills Developed in This VFD Training Course

Participants completing this variable frequency drive training program will be able to:

- Explain how the VFD rectifier, DC bus, and inverter stages regulate the AC motor speed
- Apply PWM motor control principles used in modern adjustable speed drives
- Configure common VFD programming parameters used in industrial drive systems
- Identify electrical distribution system issues that affect VFD performance
- Apply proper VFD installation practices for reliable motor operation
- Diagnose common VFD faults and drive alarm conditions
- Understand the causes of harmonics and power quality issues created by drives
- Prevent bearing currents, reflected wave voltage stress, and motor insulation damage
- Optimize variable speed drive systems for energy efficiency and process control

Why VFD Training Is Important

Variable frequency drives play a critical role in improving energy efficiency and process control in modern industrial facilities. However, improper drive selection, incorrect parameter configuration, and poor electrical system design can introduce significant operational problems.

Common issues associated with poorly applied VFD systems include:

- nuisance drive trips and system shutdowns
- excessive harmonic distortion on the power system
- motor overheating and insulation damage
- bearing current damage and premature bearing failure
- reflected wave voltage stress on long motor cables
- electromagnetic interference affecting instrumentation and communication systems

Proper VFD training helps engineers and technicians understand how these problems occur and how to apply practical engineering solutions that improve reliability, reduce downtime, and extend the service life of motors and drive equipment.

WHO SHOULD ATTEND

- Industrial, Commercial, Institutional Electrical Engineers, And Electrical Maintenance Personnel
- Consulting Electrical Engineers
- Project Engineers
- Design Engineers
- Field Technicians
- Electrical Technicians
- Plant Operators
- Plant Engineers
- Electrical Supervisors
- Managers In Charge Of Plant Communication Infrastructure

STUDENTS RECEIVE

- VFD Training Course Certificate
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- This Course Includes Our Latest Electric Motor and VFD Handbook Volume!! (Value \$20)
- \$100 Coupon Toward any Future Electricity Forum Event (Restrictions Apply)
- FREE Magazine Subscription (Value \$50.00)
- Course Materials in Paper Format

COURSE OUTLINE

VFD Training Course Outline

DAY ONE

Variable Frequency Drive Fundamentals and System Design

Section 1: Industrial Power Distribution Systems and VFD Applications

This session introduces the electrical distribution system that supplies power to industrial motor control systems and explains how variable frequency drives interact with upstream equipment.

Topics include:

- Point of common coupling (PCC)
- Available fault capacity
- Distribution transformers
- Power factor correction capacitors
- Switchgear and protection devices
- Low-voltage motor control centers (MCCs)
- Integration of VFD systems and motor loads

Participants learn how upstream electrical system characteristics influence VFD installation and performance.

Section 2: AC Motor Fundamentals for Variable Speed Drive Systems

This section explains the operating principles of AC motors used with variable frequency drive motor control systems.

Topics include:

- Magnetic field generation in AC motors
- Synchronous and rated motor speed
- Slip and torque development
- Motor power factor and efficiency
- Rated voltage, frequency, and current
- Starting torque and locked rotor conditions
- Breakdown torque and pull-up torque
- Motor service factors and insulation classes

Motor torque-speed characteristics are examined to understand how motor performance changes during variable speed drive operation.

Section 3: NEMA Motor Standards for VFD Applications

This section explains the differences between motors designed for fixed-speed operation and motors designed for inverter duty service.

Topics include:

- NEMA MG1 Part 30 vs Part 31 motors
- Motor nameplate data and ratings
- Motor cooling methods
- Stator winding insulation design
- Speed operating ranges
- dv/dt voltage stress and insulation protection

Participants learn how to properly select motors for variable frequency drive systems.

Section 4: Power Semiconductor Devices Used in VFD Systems

This session explains the evolution of power semiconductor switching devices used in modern adjustable speed drives.

Topics include:

- Rectifier diodes
- Silicon controlled rectifiers (SCRs)
- Bipolar power transistors
- Darlington transistors
- Insulated Gate Bipolar Transistors (IGBTs)

Participants gain an understanding of the electronic components that make modern PWM motor control possible.

Section 5: Mechanical Fundamentals of Motor Driven Systems

This section reviews mechanical concepts necessary for proper VFD motor control system design.

Topics include:

- Torque, force, and acceleration
- Rotational inertia and load dynamics
- Speed and horsepower relationships
- Variable torque vs constant torque loads

Examples include common industrial applications:

- pumps
- fans

- conveyors
- compressors

Section 6: Voltage and Frequency Control of AC Motors

This section explains how variable frequency drives control motor speed.

Topics include:

- Voltage-to-frequency (V/Hz) relationship
- Motor torque production
- Speed control characteristics
- Differences between fixed-speed and VFD operation

Participants learn how adjusting voltage and frequency affects motor torque and operating efficiency.

Section 7: Variable Frequency Drive Operation and Components

This session provides a detailed overview of how VFD systems operate.

Topics include:

- VFD rectifier stage operation
- Pre-charge circuits
- DC bus capacitors and energy storage
- Inverter switching circuits
- Pulse Width Modulation (PWM) motor control
- V/Hz control vs vector control

Participants also learn how to properly select drives based on:

- voltage rating
- current capacity
- overload capability
- reliability and MTBF considerations

Section 8: VFD System Design and Installation Requirements

This section explains how variable frequency drive systems are properly installed.

Topics include:

- enclosure types and environmental considerations
- disconnect switches and circuit breakers
- line reactors and harmonic filters
- surge protection devices
- control power supplies

- bypass control schemes
- enclosure cooling and ventilation

Participants learn how proper VFD installation improves reliability and safety.

DAY TWO

VFD Performance, Power Quality, and Troubleshooting

Section 9: Internal Layout and Components of a VFD

This section examines the internal structure of a three-phase variable frequency drive.

Topics include:

- input power terminals
- DC bus circuits
- pre-charge resistors and contactors
- inverter driver circuits
- IGBT power modules
- current sensing systems
- motor output terminals

A physical VFD unit is used to illustrate the major drive components.

Section 10: Benefits of Variable Frequency Drive Systems

This session explains why adjustable speed drives are widely used in industry.

Topics include:

- energy efficiency improvements
- process control advantages
- reduced mechanical stress on equipment
- improved system reliability

Applications discussed include:

- pump systems
- HVAC fan systems
- conveyor systems
- manufacturing machinery

Section 11: Harmonics and Power Quality Issues

This section explains how VFDs affect electrical power quality.

Topics include:

- harmonic current distortion
- voltage distortion
- IEEE harmonic limits
- power factor considerations
- harmonic mitigation techniques

Solutions discussed include:

- line reactors
- passive harmonic filters
- active harmonic filters

Section 12: Motor Cable and Load Side Electrical Issues

This section examines electrical issues that occur between the VFD and the motor.

Topics include:

- reflected wave voltage stress
- cable length limitations
- dv/dt voltage rise rates
- peak voltage stress on motor insulation

Solutions include:

- dv/dt filters
- sine wave filters
- motor reactors

Section 13: Bearing Currents and Motor Damage

Participants learn how bearing currents occur in VFD motor systems.

Topics include:

- shaft voltage buildup
- electrical discharge machining in bearings
- bearing fluting damage

Prevention methods include:

- insulated bearings
- shaft grounding rings
- proper grounding practices

Section 14: VFD Cable Selection and Grounding

This section explains why specialized VFD cables are required.

Topics include:

- cable shielding
- grounding conductors
- electromagnetic compatibility
- cable installation practices

Section 15: Electromagnetic Interference and Noise Control

Variable-frequency drives generate high-frequency switching signals that can cause EMI and RFI problems.

Topics include:

- sources of electrical noise
- coupling paths for interference
- mitigation techniques
- shielding and grounding practices

Section 16: VFD Programming, Testing, and Commissioning

This section explains how VFD systems are tested and commissioned.

Topics include:

- parameter configuration
- motor nameplate setup
- acceleration and deceleration tuning
- control logic verification
- routine testing procedures
- full load testing
- heat run testing in high ambient conditions

Section 17: Application Engineering and Drive Selection

Students analyze real-world industrial motor control applications.

Topics include:

- motor selection criteria
- drive sizing considerations
- torque and speed requirements

- cost comparisons of different system configurations

Participants evaluate various VFD and motor combinations to optimize system performance.

Section 18: VFD System Specifications and Best Practices

This final session reviews the structure of a complete VFD system specification.

Topics include:

- electrical design requirements
- drive performance specifications
- installation standards
- testing and commissioning procedures

Participants receive a reference specification template used for industrial VFD installations.

COURSE SCHEDULE

Both days:

Start: 10 a.m. Eastern Time

Finish: 4:30 p.m. Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company's location.

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