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## Combined Power Quality Analysis And Power Factor Training

Course details: <https://www.electricityforum.com/electrical-training/455>

### COURSE DATES AND TIMES

**April 15-17 , 2024**

10:00 am - 4:30 pm ET

**June 24-26 , 2024**

10:00 am - 4:30 pm ET

This combined 18-hour course is the Power Quality Analysis Training AND our Power Factor Training course. You can register for these two courses (Power Quality Analysis \$499 and Power Factor Training \$199) separately or you can register for the 18-hour Power Quality Analysis and Power Factor combined course for \$599.

### **Power Quality Analysis Training (\$499)**

<https://www.electricityforum.com/electrical-training/power-quality-training>

### **Power Factor Training (\$199)**

<https://www.electricityforum.com/electrical-training/power-factor-training>

### **Power Quality Analysis Training**

This 12-hour live online instructor-led course is important because power quality and harmonics analysis, measurement, and mitigation of electrical disturbance is no longer an option in our modern electronic society, it is a necessity. The course is designed to help organizations to recognize power quality problems by their symptoms and waveforms and to understand the root causes of electrical power quality problems as well as typical remedies.

Microprocessor-based industrial controls - PLCs, industrial computers, HMI, drives, motion controllers and sensors - are the foundation of high productivity, quality and competitiveness. If there is one universal factor that can and will disrupt microprocessor-based controls and cause downtime, it is power quality. Since industrial electrical systems frequently experience voltage fluctuations, harmonic distortions, noise and short- or long-term power outages, it is essential to ensure maximum uptime. The ability to quickly identify and remedy power quality problems will help ensure metering accuracy, lengthen the life of electrical equipment and improve power system availability.

Power quality failures are expensive and can significantly impact the bottom line of an organization. Electrical engineering and maintenance personnel have long been aware that identifying, monitoring and correcting power quality problems is vital to keeping facilities and processes running smoothly. This forum offers electrical professionals the opportunity to keep abreast of the latest technologies and techniques available in this area. It also offers an excellent opportunity for delegates to ask specific questions and exchange ideas relating to their own applications. This is designed to be an interactive, problem-solving, learning

environment for delegates of all disciplines.

Upon completion of this Power Quality Analysis Training course, students should have a meaningful understanding of various types of power quality disturbances associated with typical motor control applications. They should understand the causes of these problems, symptoms and problems associated with each, as well as the typical means of solving or preventing these problems.

This course includes a Power Quality Analysis Training Course Materials and Training Course Certificate.

**Our 12-hour, Live Online Instructor-Led Power Quality Analysis Training Course offers:**

- Explanation Of Various Power Quality Disturbances.
- Explanation Of The Causes, Symptoms, Problems And Solutions For Each Disturbance.
- Suggested Best Practices To Prevent Future Problems.
- Recognizing Power Quality Problems Through Waveforms.

**THIS COURSE WILL TEACH YOU ABOUT:**

- Voltage Sags
- Power Factor
- Voltage Transients
- Harmonics
- Harmonic Resonance
- PWM Voltage And Its Effects On Motors
- Long Motor Lead Applications
- EMI In VFD Environments
- Identifying Power Quality Problems Through Waveforms

### **Harmonics Problems Cause:**

- Increased Losses, E.G. Machines Will Operate At Increased Temperature And Can Be Overheated
- Resonance Problems Between The Inductive And Capacitive Parts Of The Power Network
- Malfunctioning Of Control Systems Since Electronic Meters, Relays, Etc. Are Matched To The Fundamental Frequency
- Overloading Of Capacitors, Leading To Malfunctioning And Premature Aging
- Interference With Telecommunications And Computers
- Disturbances In Ripple Control Systems
- High Currents In Neutral Conductors.

### **LEARNING OBJECTIVES**

- Recognize Symptoms Of Power Quality Problems Including Sags, Swells, Under Or Overvoltage, Harmonics, Transients, Electrical Noise (EMI/RFI/EMF), Interruptions, Wiring And Grounding Issues
- Classify Power Quality Events According To IEEE, ITIC (CEBNA) And Public Utility Standards
- Collect The Required Data To Perform A Detailed Coordination Study
- Explain Proper Application And Interpret Results Of Power Quality Monitoring Equipment
- Recommend Viable Solutions Including UPS, Line Voltage Regulators, Transient (Surge) Suppressors, Harmonic Filters, Line Filters, Power Conditioners, K-Rated, Isolation And Zig-Zag Transformers, Proper Wiring And Grounding, Etc.

If you would like to register for this course separately, here is the link:

<https://www.electricityforum.com/electrical-training/power-quality-training>

### **Power Factor Training**

This is a 6-hour, live online training course designed for electrical engineers, electrical technologists, electrical designers, plant electricians, and electrical maintenance specialists working in industrial, commercial, and institutional power systems.

The course covers the basic principles of Power Factor, its significance in industrial applications, and the benefits of correcting low Power Factor. Participants will learn about the different types of Power Factor and the means to correct it, including reactive power, capacitors, and inductive loads.

The course focuses on implementing Power Factor Correction in industrial applications with variable inductive loads, such as induction motors. Participants will gain an understanding of the different types of Power Factor Correction methods available, including plant-wide and distributed methods, and their respective advantages and disadvantages.

The training program also covers Power Factor principles in single-phase and three-phase AC power circuits. In addition, participants will learn how to calculate the Power Factor and three-phase power and the correction techniques used in each type of circuit.

This course is ideal for electrical engineering, maintenance, and operations professionals who want to gain a deeper understanding of Power Factor Correction and its applications in industrial systems. The live online format allows participants to engage with the instructor and other participants in real time, and the course is designed to be interactive and engaging. Upon completion of the course, participants will have the skills and knowledge to implement effective Power Factor Correction solutions and reduce energy costs in industrial applications.

If you would like to register for this course separately, here is the link:

<https://www.electricityforum.com/electrical-training/power-factor-training>

## 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 Electrical Infrastructure

## STUDENTS RECEIVE

- This Course Includes Our Latest Power Quality And Grounding Handbook!! (Value \$20)
- **\$100 Coupon** Toward Any Future Electricity Forum Event (Restrictions Apply)
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- **FREE** Magazine Subscription (Value \$25.00)
- Course Materials In PDF Format

## COURSE OUTLINE

### Power Quality Analysis Training Course Outline

### Instructor

## **DAY ONE**

### **POWER QUALITY DISTURBANCES**

- Typical Disturbances
- Disturbances associated with motor control applications
- Voltage quality

### **VOLTAGE SAGS**

- Across the line motor starting
- What are effects of voltage sags
- Motor inrush current
- Flat – topped voltage
- Preventing Voltage sags
- Soft starting with VFDs, RVSS

### **POWER FACTOR**

- Fundamental Frequency Power Factor
- Causes of low power factor
- What are effects of low power factor
- Motor currents
- Power factor vs energy savings
- Improving Power Factor
- Selection methods for power factor capacitors
- Cost of low power factor
- Locating PF capacitors
- Capacitor applications issues
- Best practices

## **VOLTAGE TRANSIENTS**

- Sources of transients
- What are effects of transients
- Capacitor switching transients
- Effects of Transients on drives
- Voltage notching
- Best practices

## **DAY TWO**

### **HARMONICS**

- What is harmonic distortion and what does it look like?
- What are effects of harmonics
- Causes of harmonic distortion
- Power system reactance – effect on harmonics
- AC-DC Rectifier types
- Problems caused by harmonics
- Harmonics vs energy loss
- Harmonic Voltage distortion & effect on circuit elements
- Capacitors vs harmonics
- Harmonic resonance
- IEEE-519-2014 harmonic distortion limits
- Analyzing harmonic distortion
- Remedies for harmonic distortion
- Line reactors
- Tuned harmonic filters
- Wide band harmonic filters
- Multi-pulse drives
- Active filters



- Filter for grid connected inverters
- Symptoms of harmonics
- Best practices

### **PWM Voltage effects on motors**

- PWM effects on motor temperature
- What are effects of PWM Voltage
- PWM voltage when motors have long cables
- Motor bearing currents
- Remedies for PWM motor issues

### **EMI / RFI**

- Definition of EMI and RFI
- What are effects of EMI/RFI
- Equipment vulnerable to EMI
- Causes of EMI
- EMI propagation methods
- Measuring common mode current
- Remedies for EMI
- Best practices

### **Cautions for Retrofits**

- Starter to VFD upgrades
- LED lighting upgrades
- Best practices

### **Waveforms & Measurements**

### **Questions and Answers**

## **COURSE SCHEDULE**

Start: 10 a.m. Eastern Time

Finish: 4:30 p.m. Eastern Time

## **DAY THREE**

### **Power Factor Correction Training - Course Outline**

#### **Instructor**

*John Houdek, Power Quality Consultant, The Electricity Forum*

#### **Session 1: Introduction & Definitions**

- Energy, Power & Power Factor
- Apparent, Real & Reactive Power
- Total Power Factor

#### **Session 2: Problems caused by Low Power Factor**

- Electricity Costs
- High Current And KVA
- Voltage Sags
- Infrastructure Costs

#### **Session 3: What is your Power Factor?**

## **What is it?**

- Utility Bills
- Measurement
- Waveforms
- Estimation

## **What causes it to be low?**

- Electrical Equipment & Typical PF
- Typical PF For Facilities

## **Session 4: Improve your Power Factor**

### **Add capacitance**

- 1) Minimum capacitance to add
- 2) Maximum capacitance to add

### **Thumb Rules**

- Calculate Savings/ROI

## **Session 5: Locating PF Correction**

- Benefits Of Capacitors
- Options For Locating Capacitors
- Harmonics And Harmonic Resonance

## **Session 6: Application Issues**

- Capacitor Switching
- Voltage Rise
- Harmonics
- Detuned Capacitors

## **Wrap-up**

### **COURSE SCHEDULE:**

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.

<https://www.electricityforum.com/onsite-training-rfq>