



Content  
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## 4-Day Power Quality Training

Course details: <https://www.electricityforum.com/electrical-training/4-day-power-quality-training>

Power Quality Training - Our 4 day (24 hours) live online instructor-led course is actually a series of three courses:

1. [Power Quality Analysis Training](#) - May 31 – June 1, 2022 - \$499
2. [Power Factor Correction Training](#) - June 2, 2022 - \$199
3. [Power Quality Troubleshooting Training](#) - June 3, 2022 - \$199

**1. 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.

Course Details Here:

**[Power Quality Analysis Training](#) - May 31 – June 1, 2022 - \$499**

**2. Power Factor Correction Training** - Our 6-hour live online instructor-led course explains the three types of power factor, from a cause and effect basis and then teaches the intricacies of each type along with the methods to improve each power factor. The course demonstrates how to size power factor capacitors for various types of situations and the pitfalls to be avoided. Several real life examples are worked as a group to demonstrate the techniques used to perform analysis of power factor, size power factor equipment and to quantify the expected results and ROI.

Course Details Here:

**[Power Factor Correction Training](#) - June 2, 2022 - \$199**

**3. Power Quality Troubleshooting and Problem Solving Training** - This 6-hour instructor-led course identifies many different power quality problems and explains a six-step process to understand the root cause and solve the problems. It also shows many waveform signatures and reveals the power quality problem associated with each of these.

Course Details Here:

**[Power Quality Troubleshooting 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)
- 2.4 Continuing Education Unit (CEU) Credits (24 Professional Development Hours)
- **FREE** Magazine Subscription (Value \$25.00)
- Course Materials In PDF Format

### COURSE OUTLINE

#### **Day One and Two - Power Quality Analysis Training Course**

#### **Instructor**

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

#### **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**

## **Day Three - Power Factor Correction Training**

### **Instructor**

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

## **Introduction to Power Factor**

- Definition Of Power Factor
- Benefits Of High Power Factor
- Problems With Low Power Factor
- Types Of Power Factor

## **Fundamental Frequency (Displacement) Power Factor**

- Motor Currents And PF
- Typical PF By Industry
- Lagging (Inductive) Current
- Leading (Capacitive) Current
- How Much Capacitance To Add
- Harmonic Resonance
- Detuning Capacitors To Avoid Resonance
- Capacitor Boosting (Voltage, KVAR, Current)
- Local Vs. Centralized Capacitors
- Fixed Vs. Automatic PF Capacitor Systems
- Capacitor Switching Device Ratings
- Cost Of Low Power Factor

## **Distortion Power Factor**

- Estimating Distortion PF Based On Harmonic Current Distortion
- Causes Of Low Distortion Power Factor (Harmonic Distortion)
- Typical Current Distortion By Equipment
- What Does Harmonic Current Distortion Look Like?
- Improving Distortion PF

## **Total (true rms) Power Factor**

- Function Of Both Displacement And Distortion PF
- Best Practices
- Decisions To Be Made About Total PF

## **Day Four - Troubleshooting Power Quality Problems**

### **Instructor**

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

### **Unit 1**

#### **Introduction & PQ Examples**

- a. Definitions
- b. Electrical vs Electrical PQ problems
- c. Examples
- d. Internal vs external sources
- e. 5-Step PQ Problem Diagnosis



## **Unit 2**

### **Preliminary (Steps 1-2)**

- a. Problems & symptoms
- b. Single line electrical diagram review
- c. Linear & Non-Linear loads

## **Unit 3**

### **Collect Data (Step 3)**

- a. Measurements
- b. Monitoring
- c. Monitoring equipment settings
- d. Measurement/Monitoring locations

## **Unit 4**

### **Analyze the Data (Step 4)**

- a. Upstream vs downstream
- b. Is there a power quality problem?
- c. Data Relationships
- d. Recognize waveform signatures

- e. Harmonic distortion vs IEEE-519 limits
- f. Make some calculations

## **Unit 5**

### **Probable Root Cause Analysis (Step 5)**

- a. Logical explanations according to electrical laws
- b. What to look for in harmonic spectrums
- c. What to recognize in waveforms
- d. Recognizing motor problems
- e. Other

## **Unit 6**

### **Mitigate the Problem**

- a. Problem / cause / solution
- b. Waveform recognition
- c. Symptoms vs. solutions

## **Questions and Answers**

**COURSE SCHEDULE:**

**All Days 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.

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