

POWER QUALITY ITINERARY

John Waggoner

This workshop series will be conducted by **John H. Waggoner**, Director of Technical Training for TEGG Corporation. Mr. Waggoner has a broad experience in electrical preventive maintenance and power quality assurance.



He is skilled in the use of both Energized and De-energized test equipment. He is certified in numerous testing disciplines as well as energized safe work practices. He has maintained and installed solid state and rotary UPS systems. He has instructed electricians/technicians in preventive maintenance techniques, thermography, voltage disturbance testing, power conditioning, power and grounding, and in the conduct/analysis of harmonics interaction surveys. Mr. Waggoner has written about and lectured widely in these fields.

✓ Grounding & Bonding for Electronic Equipment

- ◆ Safety vs. Performance Grounding
 - NEC vs. Power Quality
 - Introduction to Power Quality
 - Standards
- ◆ Defining Grounding Terms
 - Multi Point Grounding
 - Single Point Grounding
 - Signal Reference Systems
- ◆ Establishing NEC Approved Building Ground
 - Review of the NEC Methods
 - Review of Power Quality
 - Recommendations

✓ Surge Protection for Electronic Equipment

- ◆ Anatomy of Lightning
 - Expected Magnitudes on Electrical Systems
 - Reflection in an Electrical System
- ◆ Surges in the Building Electrical System
 - IEEE Defined Categories
 - Impulsive and Oscillatory
 - Waveforms
 - Zoned Protection
- ◆ Surge Protective Devices
 - Crowbar
 - Voltage Clamping
 - Hybrid
- ◆ Product Installation
 - Distance Application
 - Lead Length
 - Routing of Conductors

✓ Powering Electronic Equipment

- ◆ Dedicated Feeder Systems
 - Electrical Noise
 - Voltage Disturbances
 - Maintenance Concerns
- ◆ Isolation Transformer Applications
 - Improving Attenuation
 - Distance Concepts
- ◆ Dedicated Branch Circuits
- ◆ IG Receptacles
 - Insulated or Isolated?
 - Common Mode Noise Concerns

✓ Harmonics Interaction

- ◆ Introduction to Harmonics
 - Linear and Non-Linear Loads
 - How are Harmonics Produced
 - Where do Harmonics Go
- ◆ Harmonic Measurement
 - Root Mean Square
 - Total Harmonic Distortion
 - Fundamental
 - Total Harmonic Distortion RMS
- ◆ Effects of Harmonics
 - Heating of the Electrical System
 - Voltage Distortion Issues
 - Common Electrical Problems
- ◆ Harmonic Mitigation
 - Sizing of Electrical Components
 - Passive Filtering
 - Specialty Transformers
 - Other Applications

✓ Power Monitoring

- ◆ Definitions
 - High Speed vs. Low Speed Monitoring
 - Tolerance Formats
 - Objectives of Power Monitoring
- ◆ Voltage Disturbances
 - Sags
 - Swells
 - Interruptions
 - Transients
 - Voltage Imbalance
 - Flicker
- ◆ Power Monitor Setup
 - Threshold Monitoring
 - Continual Monitoring
 - Duration of Monitoring
- ◆ Monitor Placement
 - Utility Service
 - Building Main Service
 - Individual Circuit Monitoring
 - Review of Monitoring Objectives