

The Cost of Poor Power Quality

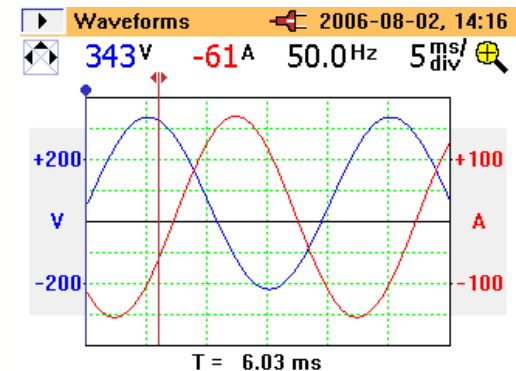
John Skow, Sales Representative, Volco representing Fluke Corporation



John was part of the US Army as an Electronic Communications Officer from 1982 – 1996. In 1985 he obtained his A.A. in Business Administration and also went to University of Iowa for Military Science, ROTC Commission. In 2010, he became an ISO Category I, ANST Level I Vibration Analyst. Also in 2010, John became a Certified Iowa Electrical Instructor for CE Credits. He has been a Fluke Factory Representative for Iowa and Nebraska since 2006 with a focus on power quality, thermography, vibration and test equipment.

The Cost of Poor Power Quality

- Power Quality Problems Originate
- How to Measure Power Quality Cost
- Equipment Problems
- Energy Cost
- Saving Power Quality Dollars
- Power Quality Standards



What is Power Quality

Power Quality is a measure of how well a system supports reliable operation of its loads. A power disturbance or event can involve voltage, current, or frequency. Power disturbances can originate in consumer power systems, consumer loads, or the utility.

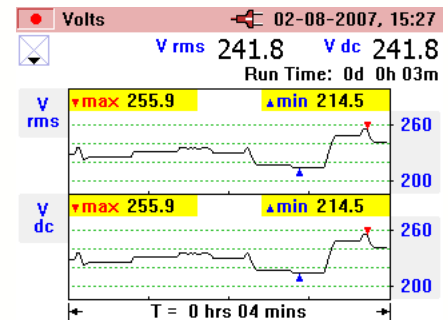
Why is Power Quality Critical?

Productivity = Key to Survival

Productivity requires Automation

Automation requires Clean Power

- Microelectronics
- Lower Voltages
- Faster Speeds



What is a Power Disturbance?

Power disturbances are defined in terms of magnitude and duration. Disturbances range from transients that last for microseconds to outages that continue for hours. When a power disturbance falls outside operating limits, equipment may be disrupted or damaged.

Origination of Power Problems

Inside the Facility

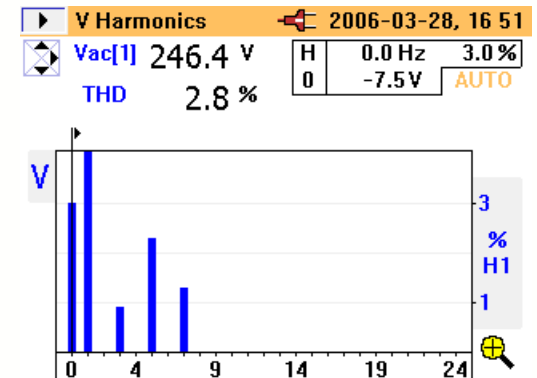
- Installation – Improper Grounding, Undersized Distribution
- Operation – Equipment operated Outside of Design Parameters
- Mitigation – Improper Shielding or Lack of Power Factor Correction
- Maintenance – Deteriorated Cable Insulation or Grounding
- Aged Equipment – Perfectly Installed and Maintained Equipment

Outside the Facility

- Power Outages
- Voltage Sags, Surges

Power Quality Problems Cause Issues

- Processes and Equipment to Malfunction or Shut Down
- Excessive Energy Cost
- Complete Work Stoppage



Power Quality Culprits

- Lightning
- Utility Automatic Breaker Reclosure
- Utility Capacitor Switching
- Commercial High Rises w/o enough Distribution Transformers
- Gen-sets not sized for Harmonic Loads
- Applying PF Correction Capacitors w/o considering the effects of Harmonics
- Inrush Currents from High Torque Motor Loads Started Across-the-Line
- Undersized Neutrals at the Panelboard
- Running Power and Signal Cables Together.
- Loose Conduit Connections and lack of Green Wire Grounding Conductors
- Shared Neutrals on Branch Circuits
- Laser Printers and Copiers Sharing Branch Circuits with Sensitive Loads
- Miswired Receptacles
- Data Cables Connected to Different Ground References at Each End

Measuring Power Quality Cost **Downtime / Equipment Problems / Energy Cost**

Downtime: Revenue /hour, Costs of Production

- Added Cost: Scrap, Restart, Additional Labor

Equipment Problems: Troubleshoot Cause, Determine Actual Costs

Energy Costs: Record Consumption Patterns

- * Reduce: Actual Power Usage, Power Factor Penalties, Peak Demand Charges

Saving Power Quality Dollars \$\$- Eliminate the Cost -\$\$

- Examine Design
- Comply with Standards
- Examine Power Protection
- Get Baseline test Data on All Loads
- Question Mitigation
- Review Maintenance Practices
- Use Monitoring

Power Quality Standards

IEC 61000-4-30 Class A

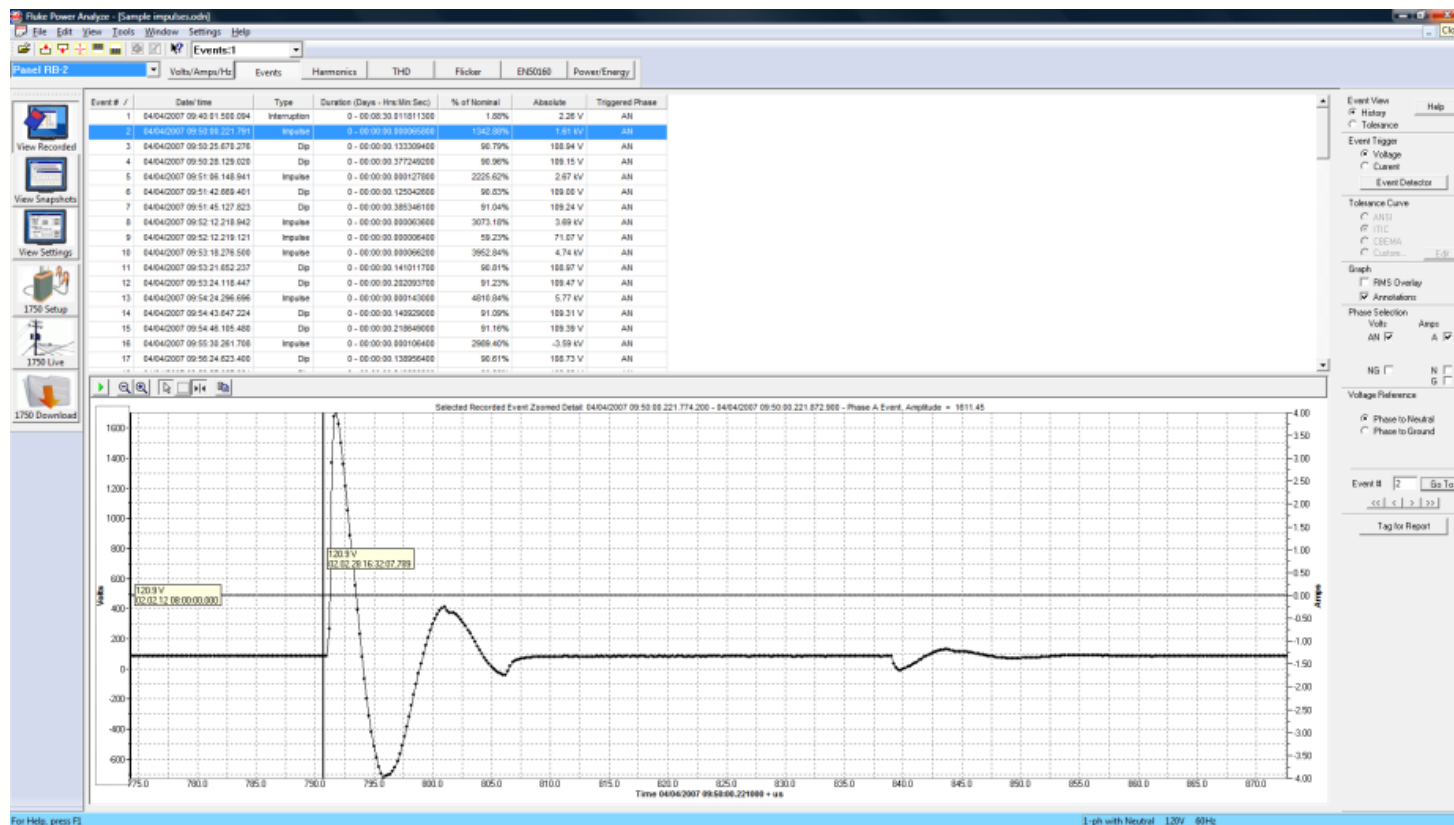
- Power Frequency
- Supply Voltage Magnitude
- Flicker, Harmonics, Interharmonics
- Dips, Sags, Swells
- Interruptions
- Supply Voltage Unbalance
- Mains Signaling
- Rapid Voltage Change

Power Quality Tools

Analyzers – Loggers - Recorders



Power Quality Software



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More electronics going in
means more power quality
problems coming out.
Step up to a power quality tool.



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Analyzer Solution Center**

Power Quality

Questions