POWER QUALITY

Educational Series: Why Test?

Why Measure Power Quality?

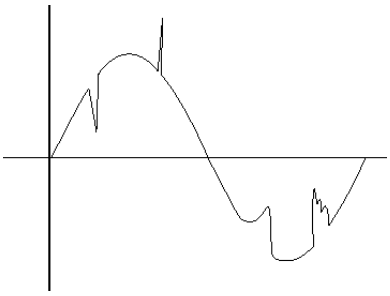
Power Quality (PQ) refers to the reliable delivery of electrical energy in a form that enables electrical equipment to operate properly. When dips and swells, spikes, surges, momentary outages, sags or other disturbances occur, computers and other electrically powered equipment may malfunction, fail prematurely or shut down unexpectedly. Many facilities simply cannot accept these consequences. Consider hospitals, banks, data communications centers, manufacturing and other facilities that rely on smooth, reliable power for operations. The consequences of an unplanned outage can cost thousands of dollars each minute or result in unsafe conditions or other serious problems.

What is Power Quality?

Power quality is a multi-dimensional and complex measure, especially as it applies to AC power circuits. PQ encompasses voltage, current, power factor and frequency spectrum magnitudes. It can involve electromagnetic field measures. Sudden or gradual changes in any of these measures have a big impact on power quality. PQ is really a comparison of the actual to the ideal or desired values of each of the characteristics of electrical power. Unlike current or power, which are measured in amperes and watts there is no scoring or measurement unit for PQ. Consequently, terms associated with power quality refer to the gaps or anomalies between the actual and desired values. Desired attributes of PQ are therefore negative terms; no dips, no spikes, no sags, no surges, no outages, etc.

Some of the attributes of PQ as they apply to AC power are shown below.

Power Quality Problems



Standards that are helpful in measuring and resolving PQ include IEEE 519, 1100, 1159, 1346, 493 and 446 (CBEMA Curve).

Solving Power Quality Problems

The first step is to identify the source and nature of the disturbance or condition that is causing the problem. This usually involves interviews with facility personnel and making a variety of measurements using power monitoring equipment. Based on the source and nature of the problem, alternative solutions are developed.

Typical solutions may involve installation of an uninterruptible power supply (UPS), design and installation of filters, removing the external source of interference or the answer might be as simple as transferring the load to another circuit or reconnecting an improperly connected ground or neutral conductor. Here are some examples of PQ problems and solutions.

FACILITY	PROBLEM	SOLUTION
Telecommunication Center	Emergency generators produced sags and surges	Installed filters on generator control circuits
School	Mild shocks and flickering lights	Revised grounding connection
Hospital	Repeated failure of critical care monitors	Installed transient voltage suppressors
Military	Transfer switch mis-operation	Installed power factor correction equipment
Semiconductor Manufacturer	Sporadic tripping of large circuit breaker	Replaced breaker trip unit with one less sensitive to harmonic current
Electronics Manufacturer	Computer monitor "jitters"	Installed magnetic field shielding to block EMF's
Distribution Center	Servers Failing	Overload neutral provided high neutral to ground voltage, possible cause for server power supply failure. Installed dedicated circuit for servers.