

The Crystal Ball of Power Quality

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One of my favorite scenes from the Wizard of Oz is when Dorothy stops at the trailer of the traveling magician (and soon to be Wizard). He tells her about her future by looking into the crystal ball while rummaging through her belongings for information about her when she closes her eyes. The following article has a similar origin. As we enter what some say is the real start of the new millennium (not with all of that Y2K-hype of last year), the future of power quality monitoring is based on what can be seen at trade shows, conferences, and web sites of the many producers of power quality instruments and mitigation equipment. A search on the web using the keyword "power quality" will give you more links than you will have time to read.

The article is also inspired by the many power quality articles recently in business journals and newspapers, including Business Week and the New York Times. Power quality has been brought into a new light as a number of economic forces have come together. Foremost is the significant increase in information technology equipment that is given credit by numerous sources (including the Federal Reserve chairperson) as having contributed to the unprecedented increase in productivity in the United States. The flip side of this is that businesses are relying more on equipment that is both a contributor and victim of power quality phenomena, as mentioned in IEEE Std 1100 (also called the Emerald Book.) Businesses are now competing in a global economy, with more and more of them operating 24/7, or 24 hours a day, 7 days a week. The cost of downtime has skyrocketed, and it is not uncommon to see figures quoted in the millions of dollars per minute for downtime. Uptime of six 9's 99.9999% is the new buzzword.

What has been traditionally called "reliability" and "power quality" is now blurring together. "Reliability" were typically longer term events and the metric used by Public Utility Commissions (PUCs) to evaluate electric utility companies performance. As demand begins to exceed capacity (more electricity consumed than generated), concerns over rolling-blackouts and system stability are now entering into the power quality arena. This further complicated with deregulation, where the consumer now has the option of where to buy the electricity from (though you still get the same electrons which flow according to the laws of physics not the laws of a contract). Distributed generation has received significant press lately as a means to utilize standby generating capacity during peak loading times. However, the utilities have raised concerns of system stability and protection, and the effects on power quality.

The net result is that more people are monitoring electricity for more reasons. The portable power quality monitors went through a change about ten years ago when energy and demand information was combined into the PQ monitor, rather than having a separate portable instrument monitoring those parameters. This same change has recently happened in the watthour meter market, where some power quality information is now be computed in the digital watthour/demand meters. Instead of just having one meter at the service entrance, submetering is being deployed throughout office complexes and factories to more accurately account for where the electricity is being consumed. The development of lower cost, permanently installed power quality

monitors has allowed these devices to be economically used throughout facilities also, rather than just at critical loads and the service entrance.

So, more data is good, yes?? Maybe. It also can lead to analysis-paralysis or information overload. The more parameters being monitored on more circuits throughout a facility with faster data sampling rates results in gigabytes of data where there was previously a single utility bill once a month. Data can be retrieved from monitors that are connected via local area networks or anywhere in the world via the Internet. The effects of a large motor start in one part of the building can be seen on the paint spray booth in another part of the building. There is more data from more places needing to be correlated and analyzed.

This has led to another development in the power quality monitoring market -- the evolution of data to information to answers. You don't have to weed through countless waveforms to try to find the cause of a mis-operation. You can just get the answer you want, when you want it, where you want it. Monitoring systems can send you an e-mail or page you with what caused the problem, where the source of the problem is located, and most importantly, is it a problem for your equipment or not. A maintenance person in one part of the world can review the performance of the system from thousand of miles away at the same time as the local electrician and the electric utility representative back at their office look at the info. Comparisons against baseline studies, susceptibility charts, PQ indices, and many other tools available in the monitors and/or software programs from the leading PQ instrument vendors help you quickly get production efficiently running again. To continue to increase productivity (and profitability), more 9's need to be added to the reliability figures by preventing problems from re-occurring in the future. And the power quality tools are available now for just that; you just need to look in the crystal ball.