

## **An Introduction to Power Quality Concerns**

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Power Quality and Reliability is the key to successful delivery of quality product and operation of an industry. It is now even more critical to the industry because of increasing application of electronic loads and electronic controllers which are sensitive to the quality of power supplied. These can have serious economic consequences and cost business millions of rupees each year in revenues loss, process improvements, and scrapped product. There is a dire need for all concerned to discuss the business of power quality and the latest technologies for improving power system efficiency and reliability.

Bad power quality can cause malfunctioning of equipment performance. Harmonics, voltage unbalance, sag and flicker problems, standing waves and resonance – are some of the issues that adversely affect production and its quality, leading to huge loss in terms of product, energy and damage to equipment. Thus, it becomes imperative to be aware of quality of power grid and the deviation of the quality parameters from the norms / standard to avoid breakdown or equipment damage.

Automation of the industrial processes has lead to effective increase in production and reduction in cost. Somehow, the controls in automation are so sensitive to power supply that even trivial variation can create huge negative impact on production and product quality. This can be sorted out from the source itself, like transformer, switchgear, relays, is necessary. Latest innovations for askance distribution system design; including – high reliability distribution systems using high-speed fault detection, rapid fault clearing, fault isolation and automatic restoration systems – is not a distant dream. The focus on the dynamic characteristics of the system equipments while facing the abnormal supply should not be lost.

Most of the electrical equipment in an industrial facility requires high – quality electricity, showing zero tolerance towards power outages, no matter how short-lived it may be. Research shows that 80 % of all power quality and reliability problems occurs inside end-user's facilities. A timely diagnosis of the current status of equipment can help prevent major breakdown, process interruption and reduce monetary loss. Thus, measuring critical parameters pertaining to the equipment with the right quality instruments is necessary.

Benefits of industrial automation in saving labor cost and enhancing overall efficiency and product and quality are well-known. Companies in a wide range of business are expected to increasingly implement automation equipment. However, the increasing level of automation increases the use of electronic or solid state device, further enhancing the need for the safeguarding the power quality issues. These, if denied, result in the system unreliability and loss in efficiency of the equipment. But this cannot be the reason for not implementing automation, what is required is a proper system while going for automation to take care of the pollutants in the power system. In today's advanced technology, automation and power conservation along with better power quality is not far from reality contributing to savings in energy, money and minimizing human intervention.

Acute power shortage of course has created an alarming situation in the country. This apart, power quality problems like voltage fluctuation, frequency variation, generation of spikes, impulses, surges and sags, harmonics, high earth leakage current, missing cycles, black-outs, brown-outs, etc. are playing havoc on our assets. Besides downtime and production losses they cause incalculable damage to our costly capital equipment.

Power line disturbances such as voltage sag/swell, outages, flicker, harmonics, and incur a heavy loss to electric utility customer due to the wide application of the non-linear and electronically switched devices in distribution systems. At the same time, modern industrial equipment are more sensitive to these power quality problems than before and need higher quality of electrical power. The basic reason is that the minor power disruptions which one would have noticed only as momentary flickering in the lights, may now interrupt the whole automated factory assemble lines with sensitive electronic controllers or make all computers in an office go blank at once.

The generally encountered power quality problems are voltage dips and fluctuation, momentary interruptions, harmonics, transients, etc. Except the power outages and transients, etc. Except the power outages and transients due to lightning, other power quality problems like sags, swells short term interruptions, harmonics, distortions, etc. occur either due to some faults in distribution feeders or interference from loads. During short circuits or fault clearing process in feeder, the neighboring feeders can get affected with sags or swells in the supply voltages.

How do power quality problems occur? How do we go scientifically auditing power quality problems? How do we manage power quality? What are the technologies, equipment and systems available for the ensuring continuity of quality power and conditioning it? These are some of the issues.

These are the areas where ICPCI has undertaken an initiative to provide a neutral platform for comprehensive knowledge resources and free sharing of such experiences amongst all stakeholders. The aim is to build up the capacity and information dissemination through shared learning.

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