# Power Quality Issues

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***Abstract* –An electric power system is a network of electrical components used to supply, transmit and use electric power. An example of an electric power system is the network that supplies a region's homes and industry with power - for sizable regions, this power system is known as the grid and can be broadly divided into the generators that supply the power, the transmission system that carries the power from the generating centres to the load centres and the distribution system that feeds the power to nearby homes and industries. Smaller power systems are also found in industry, hospitals, commercial buildings and homes. The majority of these systems rely upon three-phase AC power - the standard for large-scale power transmission and distribution across the modern world. Specialised power systems that do not always rely upon three-phase AC power are found in aircraft, electric rail systems, ocean liners and automobiles.**

***Keywords – Three-Phase Ac, Power Quality.***

## I. INTRODUCTION

Electric power is the product of two quantities: current and voltage. These two quantities can vary with respect to time (AC power) or can be kept at constant levels (DC power).

Most refrigerators, air conditioners, pumps and industrial machinery use AC power whereas most computers and digital equipment use DC power (the digital devices you plug into the mains typically have an internal or external power adapter to convert from AC to DC power). AC power has the advantage of being easy to transform between voltages and is able to be generated and utilised by brushless machinery. DC power remains the only practical choice in digital systems and can be more economical to transmit over long distances at very high voltages

As we connect more electronic devices to our power systems, the "quality" of the power becomes more important. "Quality" can be defined many ways. Stable voltages and undistorted waveforms are two characteristics which are very desirable in power systems. Grounding affects voltage stability, and more importantly, is critical to personal safety. Harmonics are a mathematical model we use to analyze distorted waveforms.
You have probably heard the term "harmonics." Numerous technical articles have been written on this subject; however, these articles do not always address our basic problems in an understandable way:

- What are harmonics?
- How do they affect my building or my product?
- What are the symptoms of harmonics?
- How do I address these systems?
- How do I solve the problem?

Harmonics are a mathematical model of the real world. Harmonics are simply a technique to analyze the current drawn by computers, electronic ballasts, variable frequency drives and other equipment which have modem "transformer-less" power supplies. Let's examine how these power supplies operate.

## II. POWER QUALITY PROBLEMS & SOLUTIONS

Rolling brownouts, voltage sags, spikes, electrical noise and harmonic distortion. If you haven't experienced any of these power problems yet, you will. In today's market, you can't take the power from you local utility for granted. The growing use of microprocessors in appliances, office equipment and process controls has made us all aware of the power quality demands from equipment and the unpredictability of its supply.

Equipment and machinery can be damaged or even fail when subjected to power anomalies. One or two seconds of outage or a surge can bring your business down for hours or days. No matter where you are, spikes, surges, brownouts and other power issues are potential problems.

With the U.S. utility deregulation many people now realize that power is not an unlimited resource. Part of the problem utilities face is that they cannot produce enough power to supply growing needs, and it can take years to build additional power plants.

While utility power can be unpredictable, what happens inside your building can be worse. About 80% of power quality problems are caused inside a facility, from inadequate building wiring or incorrect grounding, to large loads sharing the same circuits. These problems can be compounded by starting, running and stopping large machinery and other business-critical systems. If your building is more than 15 years old, it probably wasn't designed to meet the demands of today's high power equipment. The systems supporting your organization's key functions may be overloading the wiring and causing power problems and failures that can harm valuable data and equipment.

## III. MAJOR POWER QUALITY ISSUES

There are two major power quality issues:

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| Voltage Dips | When the power system is subject to disturbance, the voltage level dips. Some sensitive equipment such as electronic controlled motors, cooling equipment and high pressure lighting would be affected. |
| Harmonic Interference | Widely used electronic equipment and switching applications (for example, computers, fluorescent lamps, variable speed drives and switch-type power sources), can often create harmonics to the power system. This results in distortion of electric current and voltage waveforms, and may result in:<br>Overheating of cables, transformers, and motors<br>Unstable circuit breakers and relays |

## IV. POWER QUALITY RELATED PRODUCTS

*How to resolve power quality issues?*

Various solutions can be applied to different PQ issues. For example, installation of protection devices (Uninterruptible Power Supplies or isolating transformers, etc) and reinstallation or modification of equipment etc. Frequently used equipment to resolve the power quality issues include:

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| Un-interruptible Power Supply (UPS) | UPS provides an alternative power source supplying continuous and conditioned power to connected equipment to mitigate a power interruption or fluctuation. On-line mode UPS offers more effective protection against the most common power problems. |
| Harmonic Filter | Harmonic filters not only suppress harmonics, they also help to reduce the electricity demand byincreasing the power factor.There are two types of filters, passive and active filters. Passive filters do not require an auxiliary power supply, and suit power equipment which generates constant harmonics. Active filters require an auxiliary power supply. Through an active sensor and controller, they produce anti-harmonic currents to neutralise the original harmonic currents. And are suitable for equipment with dynamic harmonic distortions. |

## V. POWER QUALITY PROBLEMS IN EQUIPMENTS & METHODS FOR ITS CORRECTION

Proper designing of the power supply system

- Application of voltage compensators.
- Use of uninterruptible power supplies (UPSs)
- Reliability on standby power

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