How might poor power quality harm your business?

Poor power quality harms the consumers both technically and financially. One might suppose the major cost is a result of power losses, but damaged equipment and assets could cost even more! The most important one, in the mind of the consumer, might be downtime of a manufacturing line, but the life expectancy of equipment can also be compromised and cannot be overlooked. Assets affected by poor power quality suffer from increased heat during operation which consequently shortens the equipment life expectancy. Recognizing, measuring, and verifying the power quality symptoms and how to tackle them is the initial step in eliminating power quality issues.
To understand the effects on the system, one first needs to recognize the possible symptoms of an electrical supply with a poor power quality. In this document, you will find some of the main symptoms and their impact:

- voltage anomalies

Voltage swells and sags contribute to up to 80 percent of power quality issues. Literally voltages less than 0.9 p.u. of the rated voltage lasting more than 8ms (half a cycle) and less than 1 minute, are called sags or dips. Voltage dip is the reason behind incandescent lights dimming (usually if the dip lasts more than three cycles), unexpected shutdown of sensitive electronic devices, data (memory) loss on PLCs, and relay settings troubles (nuisance tripping).
Voltage anomaly detection can be tough because it's hard to forecast when they will happen. Secondly, occurrences listed above might have different roots. For instance, a nuisance tripping might not necessarily be caused by voltage dips.
To troubleshoot them, start by monitoring load where the dip happens. Generally, a voltage dip can be recognized by sudden increase in current amplitudes or a significant drop in voltage. Our staff at Circuit Energy can help you recognize these occurrences within your facility and provide a comprehensive report and possible solutions.
On the other hand, voltage swells or surges are much less common in comparison with dips. However, they can also cause some problems in the facility. Indicators of voltage swells often include sudden device failures or shutdown, typically the power supply section.

Below diagram depicts voltage sag and swell.

Figure 1: voltage sag and swell

- Voltage unbalance

Voltage unbalance between the different phases can result in severe heating losses and over-temperatures of devices in the system and it is usually neglected. There are several designing solutions to prevent voltage unbalance while some parts of it might be inevitable. Unusual noises, temperature rises, or excessive vibrations might all be due to voltage unbalance. By installing power quality improvement devices, you can enhance the system status in terms of voltage unbalance. Figure 2 represents a balanced proper waveform of a 3-phase system, while the waveform in figure 3 has severe voltage unbalance factors.

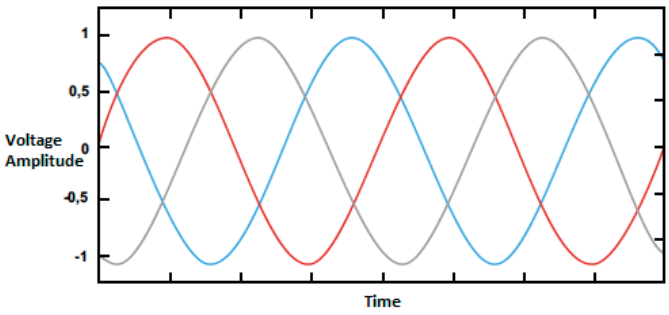

Figure 2: balanced voltage

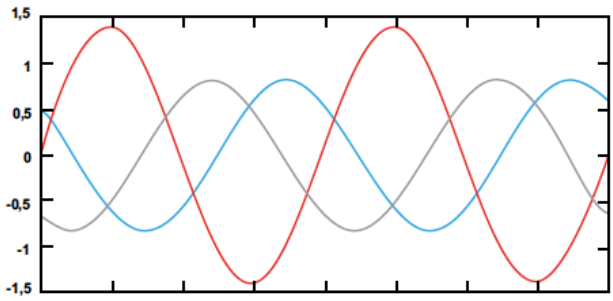

Figure 3: Unbalanced Voltage

- Harmonics

Fundamental frequency of the system depending on the standard applied in that country is 50 or 60Hz. Any voltage or current in the system whose frequency is a multiple of the fundamental frequency is called a harmonic. For example, the 7th harmonic of a 60Hz system includes waveforms of 420 Hertz (Hz). The amplitude of these harmonic voltages is smaller than the fundamental voltage, but they will be added to the total voltage amplitude seen by the load. That is why they can also cause voltage anomalies as well.
The main application of power quality improvement equipment is to eliminate these harmonics. In some provinces, consumers are penalized for harmonics, so they utilize components to mitigate these harmonics. Even if there is no penalty on your bills, elimination of these harmonics is beneficial for the electrical loads operation as they are the main reason of devices overheating (mainly motors and transformers due to Hysteresis and eddy current losses). Power conditioning methods are being widely used globally to tackle these issues.

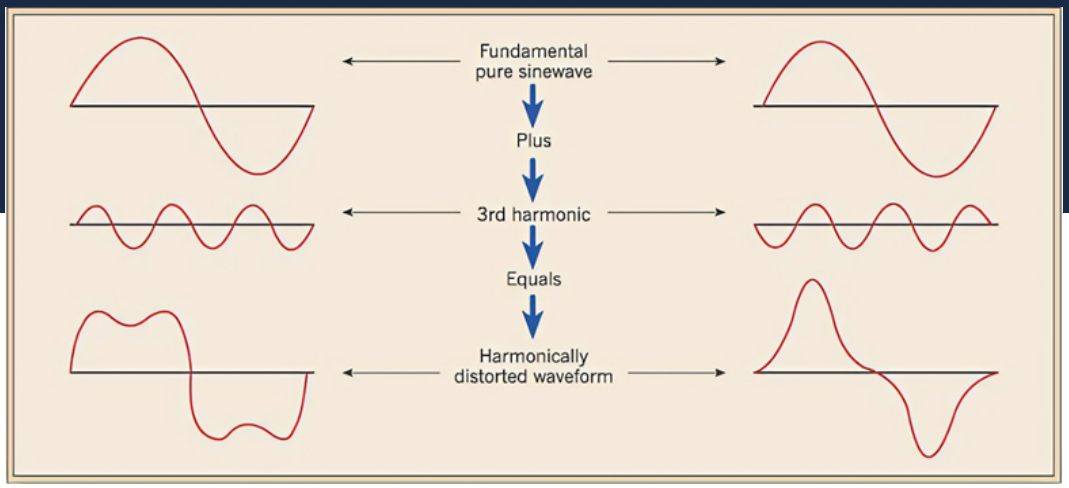

Figure 4: Voltage at load terminal in a harmonic distorted system

If you have ever experienced any of the above symptoms in your facility or would like to monitor and assess the status of the system in terms of power quality, do not hesitate to contact us for a system audit and comprehensive report.