Power Quality Assessment with SIMEAS

Measurements, Analysis and Solutions

At a glance
Power quality related problems, such as harmonic distortion or voltage dips, are coming to the fore for utilities as well as for industry. The cause of the problem as much as the optimum solution, vary substantially from case to case.

Siemens Power Technologies International (Siemens PTI), in conjunction with Siemens Energy Automation (Siemens EA), offers various services related to such problems:

- Measurement and interpretation of the power quality parameters (short- and long-term)
- Preparation of meaningful reports
- Identification of the origin of disturbances
- Recommendation of problem solving strategy
- Design of optimized solutions
- Continuous monitoring and support
- Equipment and training to manage power quality

The challenge
Power quality problems can have a number of short-term and long-term effects on networks and equipment. In severe cases it can result in the damage of equipment and expensive production losses.

Some problems remain undetected for months or even years, and adverse effects also show later. It is therefore essential to measure and continuously monitor the quality of the electrical power.

Our solution
Siemens PTI and Siemens EA offer everything required to comprehensively monitor and manage your power quality.

Basic measurements (fingerprinting)
Siemens PTI offers power quality measurements over a reasonable time period (e.g. 7 days) using a portable SIMEAS Q80 recorder to track the main power quality parameters.

![Power Quality measurement with SIMEAS Q80](image)

**Figure 2: Power Quality measurement with SIMEAS Q80**

The following parameters will be measured, evaluated and compared to the limits of international standards like EN 50160, IEC 61000, IEEE 519 or any other:

- Power frequency
- Voltage magnitude variations
- Voltage dips and surges
- Voltage unbalance
- Harmonics (up to the 50th)
- Transient disturbances up to 5 kHz
- Flicker ($P_{st}$, $P_{lt}$, $P_{fl}$)

![Example of excessive harmonic distortion](image)

**Figure 1: Example of excessive harmonic distortion**
Siemens provides the customer with a ‘fingerprint’ of the power quality of his electrical power supply system enabling him to properly decide on the appropriate measures, e.g. advanced measurements, fault localization or the design of mitigation equipment.

**SIMEAS Power Quality Recorders**

Siemens EA offers the right product and support for any customer to monitor his power quality at the supply point or within his own network. The following equipment is available:

- **SIMEAS Q80 Power Quality Recorders**
- **SIMEAS R Digital Fault Recorders**
- **SIMEAS R-PMU Phasor Measurement Units**
- **Configuration and analysis software**

Siemens EA will assist in selecting the correct type of recording device, measurement points and in configuring the connected devices. Different connection methods or system configurations allow for the construction of flexible measurement networks.

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**Figure 3: SIMEAS Q80 configuration and communication**

**Training**

At Siemens Power Academy TD we offer training courses which will instruct the customer in how to continuously monitor his power quality, analyze the results, perform advanced fault localization and install and configure his own recorders. The following courses are currently available in English and German language:

- **Basics of power quality of electrical power supply systems (9CA4140-0WE00-0DB1)**
- **Application and practice of digital fault / disturbance recording system SIMEAS R (9CA4140-0WE00-0DB2)**
- **Application and practice of systems SIMEAS Q, P and T (9CA4140-0WE00-0DB3)**
- **Expert workshop on power quality of electrical power supply system**

Further Information can be found on the Siemens Power Academy TD website: [www.siemens.com/energy/power-technology](http://www.siemens.com/energy/power-technology)

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**Application example**

On the commissioning of a Combined Cycle Power Plant (CCPP) problems were experienced with voltage transients on the medium- and low-voltage supply system. Measurements showed a considerable high-frequency content in the voltage due to the commutation of large electronic drives.

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**Figure 4: Example of excessive repetitive transient voltages resulting in the slow degradation of insulation**

A parallel resonance caused by cable capacitances and the supply impedance exited damped oscillations at each commutation.

The solution comprised the design and installation of a medium-voltage high pass damped filter. The filter was designed to reduce the harmonic distortion levels and the magnitude of the transients to levels below standard limits. This improved the voltage wave and ensured the trouble free operation of all equipment connected to the network.