Fault Prevention with Power Quality Analytics

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Siemens PTI has been conducting power quality related studies for several decades. In many cases, power quality measurements were required in order to identify the root cause of disturbances and outages, which have led to a high amount of outage costs.

During these studies, it became apparent that many of the resulting outages could have been prevented if the power quality had been monitored and evaluated before the fault event occurred. For this reason, Siemens PTI has developed Power Quality Analytics, a scalable digital service to detect disturbances, to prevent damage to equipment, and to reduce outage costs in electrical grids.

Power Quality Analytics covers:

- Permanent monitoring of the power quality at selected locations
- Continuous data transfer to a Siemens PTI power quality lab
- Permanent evaluation of the power quality with advanced AI methods
- Final evaluation by an experienced PTI expert
- Early alerts in case of anomalies or danger
- Mobile access to analytics reports

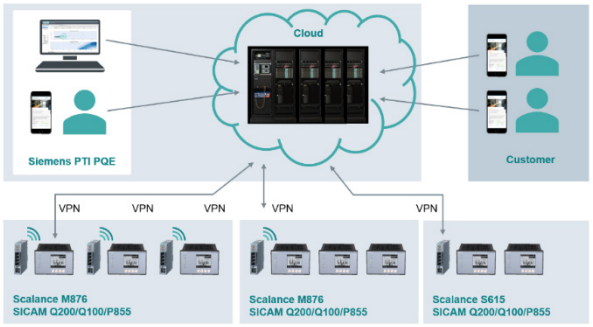

Figure 1 - Typical Power Quality Analytics Setup

Combining modern AI methods with extensive PQ experience

The biggest challenge was the efficient handling and evaluation of the large amounts of data, which typically ranges around 3 GB per month for each measuring point. In a first step, the data is automatically collected via a VPN-connection-based solution (Siemens Sinema RC) and imported into a Siemens PTI PQ database. After successful import, evaluation algorithms start to filter relevant events from "normal" events. However, it is not sufficient to only detect limit violations. Impending damage very often starts with significant signal changes even within the valid limits – and these anomalies must be detected as soon as possible to be able to take countermeasures. Therefore, Siemens PTI analyzed in detail which approach their power quality experts take to solve such problems and translated this knowledge into a software tool by applying AI methods. Although the experienced engineer plays a key role in evaluating the recorded events, AI is a very powerful means to speed up the evaluation process and supports the engineer by:

- Applying pattern recognition methods for signal identification
- Performing a cluster analysis to identify typical operation cases of a plant
- Detecting outliers with machine learning methods to identify anomalies
- Classifying events with an expert system

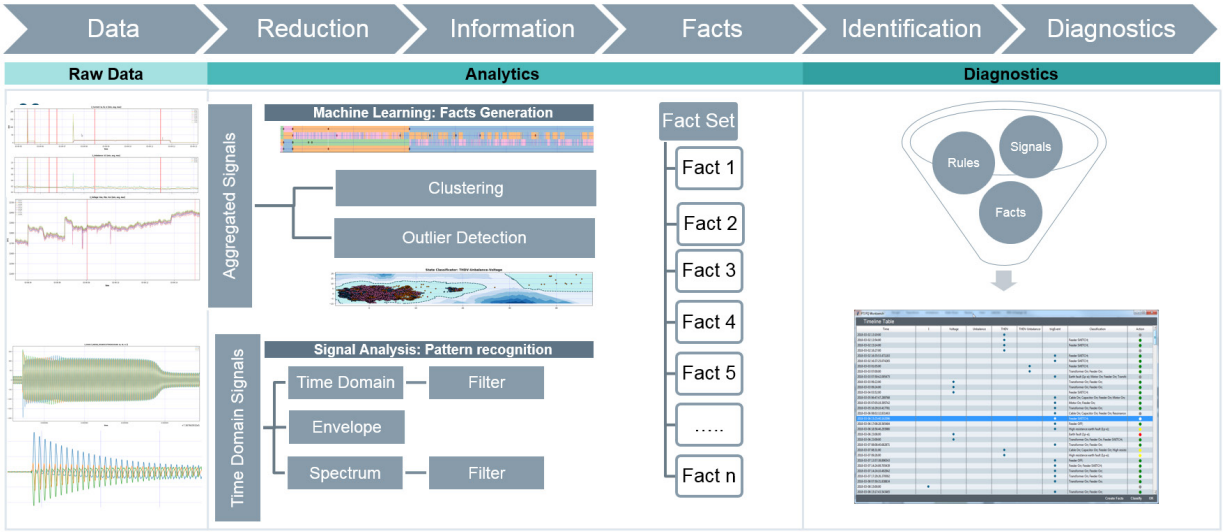

Figure 2 - Power Quality Analytics Workbench

All these methods are embedded into the power quality analytics process, which is initiated immediately after receiving new relevant data. Advanced visualization and the results of the AI components enable the Siemens PTI engineer to take the final decision on whether the system is running into a critical situation and the client needs to be informed.

Flexible service concept and reporting via mobile app

In the past year, Siemens PTI has been running several projects in different countries. Experience has shown that easy, permanent and immediate access to the system from everywhere in the world is essential to be able to react as fast as possible. Consequently, the Power Quality Analytics service has been extended with a mobile app which enables both the client and the expert to quickly access data, alerts and classification results.

Power Quality Analytics service packages are available for six months or longer and comprise monitoring and analytics, continuous support by a power quality expert, monthly reporting and access via mobile app. The monthly reports include an overview on the overall power quality performance of the systems and individual comments on significant events and anomalies. Upon request, Siemens PTI can also provide support during commissioning and extended grid consulting, for instance for overall system optimization.

For more information on our Power Quality Analytics service, please visit siemens.com/pqa or contact christian.blug@siemens.com.

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90459 Nuremberg, Germany

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100 Technology Drive
Alpharetta, GA 30005
United States

For more information, please contact our Customer Support Center:
Phone: +49 180 524 70 00
E-mail: support.energy@siemens.com