

Improved operations with Power Quality Analytics

Prevention of a liquid starter disturbance

At a glance

Power quality is a fundamental aspect of a reliable supply of connected loads and equipment. Very often, disturbances cannot be evaluated because in most cases, they only occur for a very short time. Power Quality Analytics, a service of Siemens PTI, addresses this challenge by:

- Permanent monitoring and analysis of the power quality to prevent faults
- Consulting services and mitigation measures to avoid disturbances and outages to finally reduce outage costs and to improve reliability of supply

For more than one year, Siemens PTI has been providing Power Quality Analytics as a service to a pump manufacturer who had experienced unclarified earth faults. Due to the permanent monitoring of the power quality at the industrial plant, the causes of the disturbances could be identified, and mitigation measures were taken.

Initial situation and challenges

At the pump manufacturer's plant, frequently large drives need to be started which are operated both directly and via frequency converters. In the past, unclarified earth faults have occurred at this plant. These have led to high outage costs due to damages at the switchgear.

The company decided to partner with Siemens PTI and set up a permanent power quality monitoring to observe the transient behavior of the system over a longer time span.

A SICAM Q200 was installed at the incoming feeder of the substation, from which the measurement results are transmitted to the Siemens PQA lab via Scalance LTE router for hourly evaluation. The powerful trigger options of the SICAM Q200 allow to determine the device-specific optimal settings to detect abnormal events, even under normal operating conditions

Detection of an abnormal event

After more than one year of power quality monitoring, an event was registered by the SICAM Q200 which had not occurred in this way before. It was classified by the PQA expert system as a short circuit. Consequently, an alert with corresponding escalation level was automatically sent to the customer.

The comparison with similar events which had occurred in the past showed that this was an anomaly. Due to the transient overcurrents and voltage drops over a period of about 2 seconds this was classified a potential hazard. The customer was instantly informed via PQApp messenger function, recommending further investigations of the event.

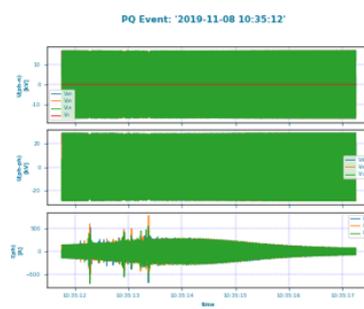


Figure 1:
Normal characteristic

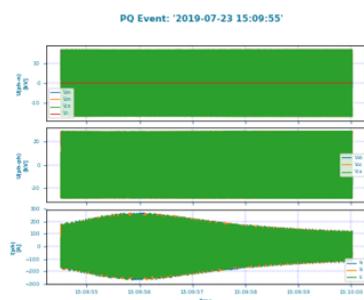


Figure 2:
Record of the disturbance

“The Power Quality Analytics service provided by Siemens PTI has helped us to identify the problem. Without these measurements and consulting support we would not have noticed the first disturbances which would possibly have damaged our system in the long term.”

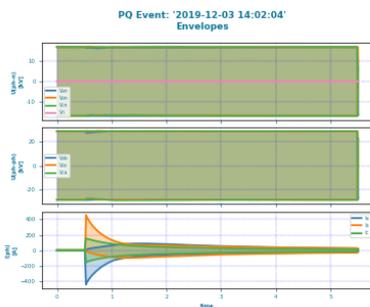
The system operator had not noticed any abnormal events, even though these had occurred several times – always in conjunction with the start of a large slip.

Identifying the root cause

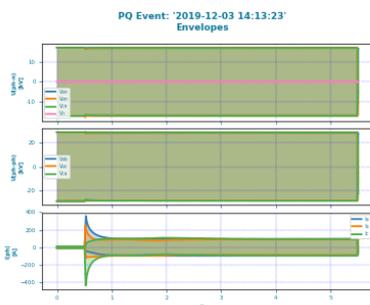
Finally, in an intensive dialogue with the client, the root cause of the malfunction could be identified: The problems were caused by a liquid starter of the slip ring motor, which had recently been modified.

The liquid starter is connected to the rotor circuit of the motor and controls the starting current and the starting torque. The start sequence consists of several phases. Due to modifications to the starter, a trigger was activated when the starter retracted. This could be seen from the detailed power quality recordings:

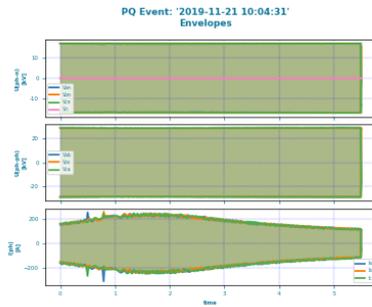
1. Transformer energizing



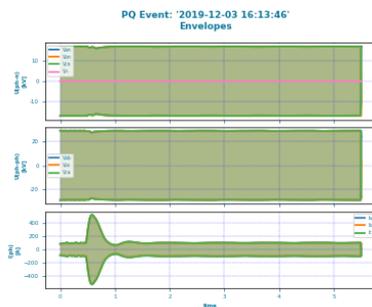
2. Slip ring motor ON (0s)



3. Retracting the starter (12s)



4. Bypassing the starter (30s)



Optimization of the system

Following PTI's advice, the starter's manufacturer performed an unscheduled maintenance. During this maintenance, the anomaly could be verified. The manufacturer stabilized the resistance by varying the salt content of the saline solution so that the transient voltage and current changes in step 3 no longer occur.

Summary

Due to permanent PQ measurements, AI-supported pattern recognition, and detailed discussions between the client's experts and Siemens PTI, the cause of the recurring earth faults could be detected. The mitigation measures that were taken have stabilized the system performance.

The pump manufacturer has extended the Power Quality Analytics contract with Siemens PTI to further enhance their system's reliability. Siemens PTI highly appreciates their contribution and feedback to continuously optimize the Power Quality Analytics service offering and PQApp to provide convenient and efficient support to our clients.

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