

Success story

Predictive Maintenance With SIMCA[®] Promises Significant Savings for a Major Energy Provider

To thrive in an increasingly regulated and competitive industry, energy providers are rethinking the way they do business, and taking innovative approaches to maximize efficiency and reliability. Maintenance of energy meters is an important but easily overlooked area where improvements have the potential to deliver big savings. Swedish energy provider E.ON Elnät Sverige AB is using Umetrics[®] Suite from Sartorius Data Analytics to develop a powerful prediction tool that can analyze the enormous quantities of data collected from the smart meters on its 1 million customer network. Using SIMCA for “big data” analytics and pattern recognition, they have created a prediction model that not only identifies failing meters, but has potential to predict problems well before they happen, so that they can be addressed more cost-effectively. Once implemented in a real-time environment, this approach could lead to significant reductions in labor, time and engineering costs.

When failure is not an option

Every day, a number of meters on E.ON’s grid break, and many more may be showing signs of deterioration. Since malfunctioning meters can lead to billing inaccuracies, energy waste and significant loss of revenue, rapid and reliable detection of faulty systems is a high priority for E.ON’s Meter Data Management (MDM) team in Sweden. Sending technicians out for repair or replacement can be costly, especially if an alarm turns out to be false, which is not uncommon. Faults must therefore be diagnosed accurately and triaged with a high degree of confidence in order to trigger appropriate responses. If deteriorating meters can be detected earlier and with greater certainty, failures and unnecessary service visits could be prevented, and more efficient servicing schedules could be planned in advance. This proactive “predictive maintenance” would translate into significant cost and time-savings.

Extracting more value from data

Sweden was the first European country to fully convert to automatic meter reading, spurred on by legislation that called for monthly readings and greater transparency of energy consumption. Smart reader technology enables more

frequent data collection than required by law. As a result, a vast amount of time series data streams into the MDM every day. The volume of incoming data is expected to rise sharply over coming years, as new regulations drive daily or even hourly readings. Hidden within this mountain of data is valuable information about energy consumption and meter performance. Martin Berntsson, a data scientist at MDM’s Smart Meter Analysis Center, suspected that pattern recognition was the key to seeing the hidden data needed to improve predictive maintenance. He set out to develop a robust model that could reliably sift through the information and make predictions based on telltale energy consumption signatures.

Simplifying complexity of “Big Data”

To find and distinguish abnormal usage patterns from among the many normal traces in their data sets, Berntsson and team knew they would need software that could cope with large, complex data sets with tens of thousands of variables. In addition, there would be gaps in the data resulting from missed time collection points. Crucially, the software would need to give them access to their preferred “data projection” methods to effectively identify, classify and maximally

“The company wanted to develop a real-time prediction tool that would significantly reduce labor, time and engineering costs.”

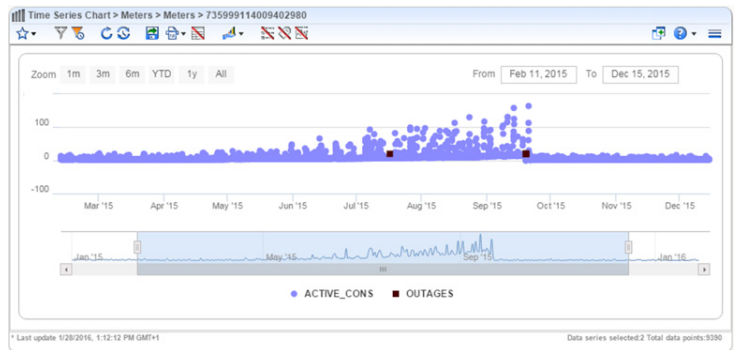


separate the various diagnostic patterns. Much as a camera can be moved through various angles to capture different aspects of a scene, projection methods apply mathematical transformations to project the data onto different axes. Such tools can aid data interpretation by revealing strong patterns and correlations, and also reducing dimensionality (Fig).

Predictions with insight

Using SIMCA software and a powerful discriminant analysis technique (OPLS-DA), the team created and successfully validated a prediction model that accurately detects and distinguishes meter deterioration patterns. Moreover, the SIMCA based solution provides insight into the underlying causes of poor predictions, so that the model can be continually improved as new data are acquired. The model is now ready to be prepared for a real-time environment. Upon completion, this tool will help engineers identify meter problems sooner and with greater efficiency – saving time and money. In future, this approach could be extended beyond predictive maintenance to energy usage forecasting.

A broken meter showing an increased reading with constant consumption.



The customer:

E.ON Elnät Sverige AB is part of the international energy group E.ON SE, one of the largest energy providers in the world. The privately held company owns and operates an energy grid that services ~1 million customers, 60% of whom are concentrated in southern Sweden.

The challenge:

Every day, a number of meters will break or show signs of deterioration. Like finding a needle in a haystack, E.ON needs to analyze data from its 1 million meter grid to predict potential failures with confidence. Early identification will yield significant cost savings.

The solution:

Umetrics Suite SIMCA software was used to create an analytical model that can automatically recognize characteristic meter deterioration patterns through multivariate analysis of time series data.

The result:

A powerful prediction tool that can be implemented in real-time to identify problems early, saving time and money. In future, this approach could potentially be applied to forecast energy usage more accurately.

SIMCA® solution from Sartorius Data Analytics

SIMCA® Multivariate Data Analysis Solution to help you see what others don't. SIMCA is part of the Umetrics® Suite of Data Analytics Solutions, a family of proven data analytics solutions that work seamlessly together.

Sartorius Data Analytics

Phone: +46 40 664 25 80
E-mail: umetrics@sartorius.com

