Success story

Global paper manufacturing company reduces costs while maintaining quality, using solutions from the Umetrics® Suite of Data Analytics Solutions

A global paper manufacturing company has implemented SIMCA®-online from the Umetrics Suite of Data Analytics Solutions to monitor the production process in real-time and to predict paper quality output. With Control Advisor, a module within SIMCA-online, the system can also predict process outcomes and recommend adjustments of machine settings to further optimize the process. After the implementation, the company has seen a reduction of operational costs while at the same time maintaining paper quality.

An unexplained shift in smoothness levels

The company was founded more than a hundred years ago. Today it is one of the world's leading producers of fiber-based packaging, pulp, and paper, operating in more than 24 countries.

A few years back, the company saw a consistent negative shift in smoothness levels – one of the company's quality characteristics – for one of its customers. The shift had occurred over the span of one year and the cause of the shift was not very well understood.

In the production of paper, thousands of variables are constantly changing. In this multivariate world, the company had to somehow understand what had caused the shift in smoothness levels and how to get back to previous quality levels.

Starting off: summarizing huge amounts of data

The company decided to leverage historical data and use multivariate modeling to identify the key process variables that were correlated to the shift in smoothness and to develop a strategy for the operators to get back to the desired smoothness and maintain that level.

The company extracted one year of operational data from its PI Data Server (OSIsoft) at one-minute intervals for 600 reels

of paper, corresponding to a 10 percent sample. The data was selected so as to capture all the seasonal variation. The company identified 80 key process variables that were highly correlated to quality output.

Paper production is a continuous process where data is collected at high frequency intervals. However, the quality outputs are collected at a much lower frequency and are measured for each reel. The challenge is to summarize the overwhelming amounts of data without losing information and from that be able to predict the finished reel quality.

Multivariate data analysis makes it possible to handle highly correlated and huge amounts of data. To capture the variability within a reel, each reel was treated as one batch. Using a method called batch-wise unfolding, the trajectory of the process variables can be monitored over time during the whole duration of a batch. In this way, the variability within a reel can be summarized and related to the final quality.

Next step: building a model to control and optimize the process

A predictive model was then built in SIMCA-online. The model had to be validated to see which variables were only correlative and which were causal. The company used a methodology called Model Predictive Control, where predictions are used to control and optimize a process. Using multivariate data

"The company experienced a negative shift in a quality output but could not trace the cause of the shift."

analysis of historical data, the company identified seven variables to be correlated to smoothness levels.
Of those seven, five were confirmed to be causal through validation testing.

In SIMCA-online, there is an optimization module called Control Advisor. The Control Advisor gives recommendations for the best set of process adjustments to get a desired result. Following the recommendations from the Control Advisor, the company made adjustments to the five causal variables and, as predicted by the model, got back to quality and to the desired smoothness level.

Result: a reduction of operational costs

A paper mill generates an overwhelming amount of data and the processes can be very complex. That data and complexity could now be summarized in a meaningful way with actionable tools for non-experts.

Instead of trying to optimize a single unit operation, the system can monitor and control multiple variables in multiple units in real-time. When operators now had a tool they could act on to optimize the process, for example the time to diagnose a process deviation or to reduce the amount of off-specification products, the company saw a following reduction in operational costs and a more efficient use of resources. The system also made it possible to sustain the improved states over time and to transfer process knowledge across sites.
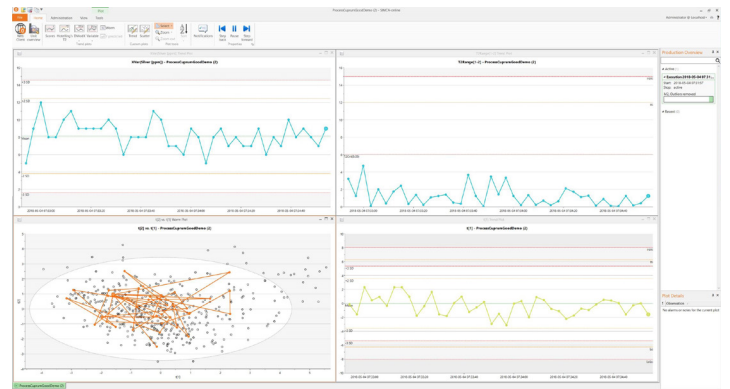
The customer:

E.ON Elnat 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:

Develop a data-driven strategy to maintain and control quality parameters, such as smoothness levels.

The solution:

Using SIMCA-online and Control Advisor to both predict and control quality parameters.

The result:

A reduction in operational costs while maintaining quality output. A more efficient use of resources with a tool for the operators to identify and diagnose process performance in real-time.

SIMCA®-online and Control Advisor (a module embedded within SIMCA-online) are part of the Umetrics® Suite of Data Analytics Solutions for real-time process monitoring, multivariate analytics, and model predictive control.

Sartorius Data Analytics AB

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

sartorius.com/umetrics