SKJERN PAPER USES AI TO IMPROVE PRODUCT QUALITY AND REDUCE WASTE

SKJERN PAPER, LOCATED IN SKJERN, DENMARK, HAS ALWAYS BEEN AHEAD OF ITS TIME.

The only paper mill in Denmark, Skjern Paper started production in 1967 with the idea of manufacturing paper exclusively from old newspaper, becoming an innovative leader in sustainability.

Today, Skjern Paper is owned by Buur Invest A/S and manufactures 75,000 tons of paper and board products each year from 100% recycled fiber.

The majority of its products serve end customers as:

- Cardboard cores in toilet rolls and kitchen towels
- Composite cans
- Cardboard in binders
- Solid board boxes
- Gift wrap paper rolls
- Sheet interlayers for pallet goods

The company's environmental and societal commitments extend to Circular Economy and membership in the UN Global Compact and its Nordic network.

Supporting its commitments to the environment and customers, Skjern Paper relies on innovation in its production. Using the latest technologies and processes, the company provides high quality, flexibility and just-in-time delivery to its customers – with delivery within 24 hours to most of Europe.

Recently, the plant manager at Skjern Paper looked to Artificial Intelligence (AI) and Machine Learning (ML) to take production to the next level.
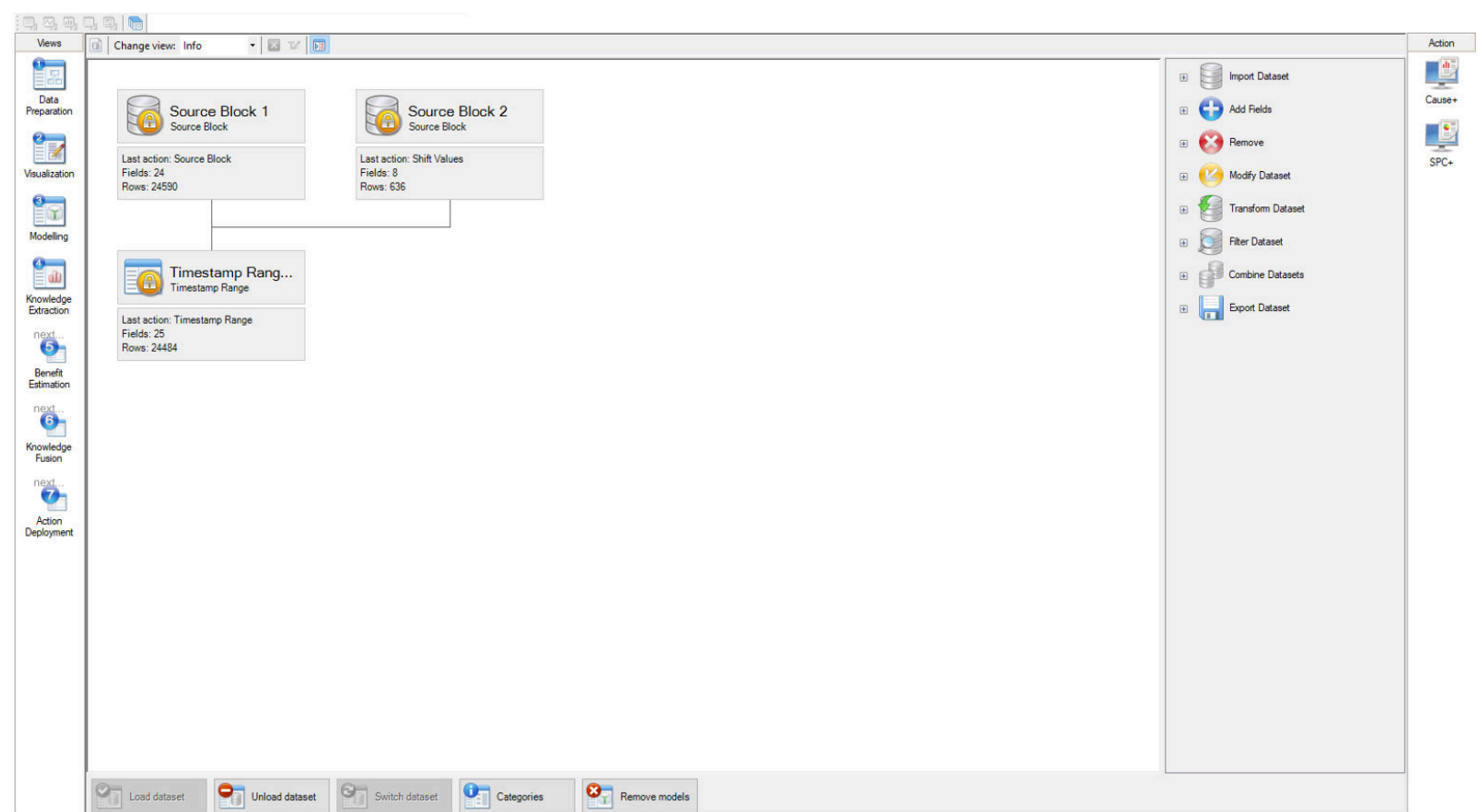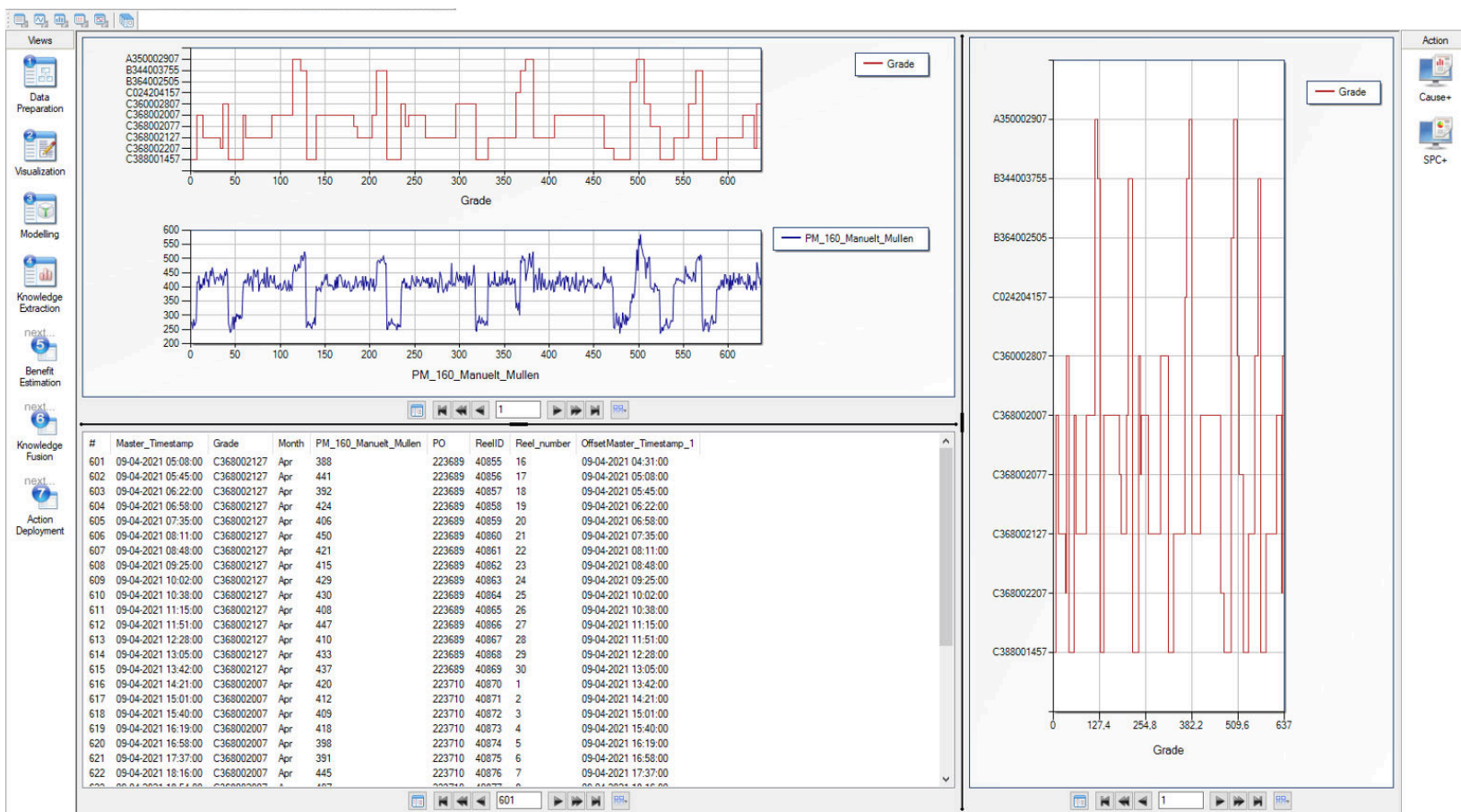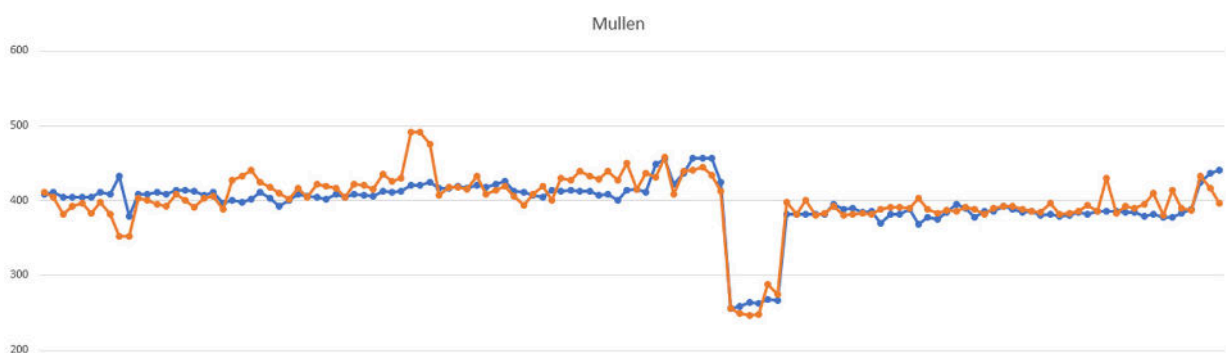
SKJERN PAPER

A STRATEGY TO LEVERAGE AI IN PRODUCTION

"I've been looking at the area of AI for some time," explains Skjern Paper's Technical Manager Erik Møller. "The industry has gained insight into improved efficiency using AI and ML. We decided to make digitization and production improvements through AI and ML part of our strategy."

GE Vernova partner, Novotek, introduced Møller to Proficy CSense, an industrial advanced analytics software package that predicts future asset and process performance. Møller was able to easily explore CSense's technical capabilities through a series of YouTube videos and demos.

"Proficy CSense looked very user friendly," Møller says. "I saw that it has the capabilities that we needed; the price was right, and [GE Vernova] was willing to provide six hours of free consulting to help us get started. I was interested to see what possible production issues we could identify when using the CSense product."

ACCELERATING AN INITIAL AI PROJECT

Paper plants have hundreds of PID control loops that can cause process variation and contribute to quality issues, if not maintained in a healthy condition.

At the same time, while Skjern Paper has extensive quality assurance systems, the team does not have many real-time ways to measure paper quality, making real-time quality control difficult. Operators would check quality samples for a whole reel of paper at the end of a production run, which involved a delayed lab analysis and the inability to adjust production earlier in the process.

With a goal of avoiding or reducing 5% of quality rejects, especially when switching between different products, Møller took advantage of free consulting with a GE Vernova AI and ML expert to jump start the analytics project.
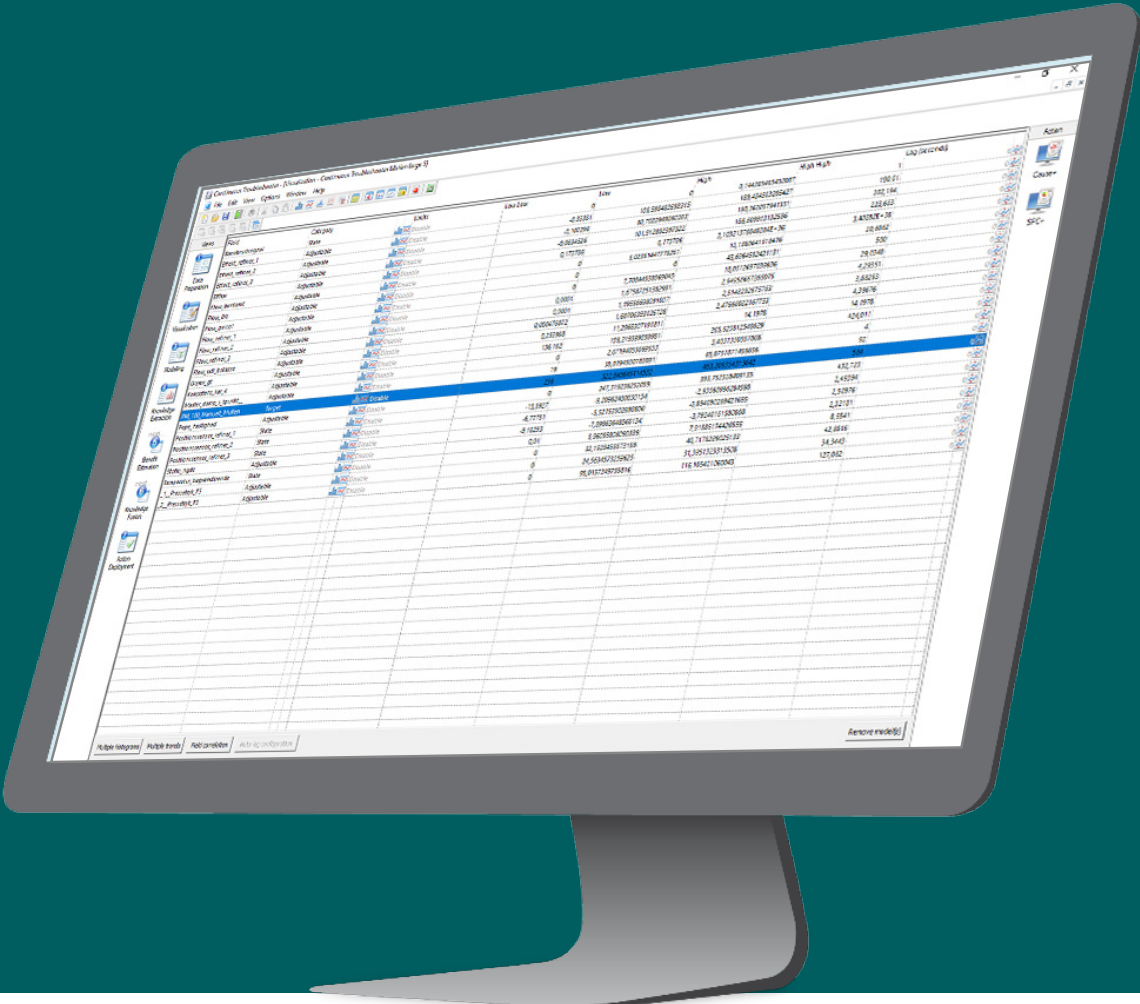
In six hours of consulting, Skjern Paper captured insights from the initial project. The team used Proficy CSense to:

1. **Analyze:** Used available data to discover causes of quality variation and rejects

2. **Monitor:** Monitored the health of PID control loops to reduce process variation

3. **Predict:** Created a predictive model from available data to predict product quality in real time, enabling real-time quality control to reduce quality rejects

Quality Prediction and Analysis: Paper Burst Strength

The team built a model in CSense around a quality parameter related to the Mullen burst strength of the paper. The Mullen Burst Test is an industry standard to measure the paper's physical strength and fiber bond. Skjern Paper has 20 data points inputting to the CSense model, which predicts the burst strength parameter.

Burst strength is a sensitive measurement, according to Møller, and a hard one to start with – however, even with that challenge, the team saw early predictive success.

"We built a rather fine model and compared data from the model with actual quality data later," Møller explains. "It is not completely aligned but showing good results. I'm quite pleased with it."

By examining data and applying the capabilities of CSense, Møller was able to discover possible causes of errors in the production line. When producing paper, manufacturers add dewatering chemicals. Møller discovered in the production process that they are producing scrap due to adding too much chemical to the pulp mix.

"The model provides instant feedback on the differences in the level of the chemical," Møller says. "It was the error in the production. When we had problems with dewatering, we would add more chemical, but in this case, we can add less. We had thought that more chemical was better in the production, but we have new insight with CSense. Now, we can reduce the amount of chemical used and reduce scrap – which decreases our costs. It is a great capability that gave us benefit straight away."

QUICK INSIGHT AND RESULTS

As the company moves from these initial insights and into production, operators will benefit from the real-time AI optimization.

This new insight from AI also supports the company's commitment to Circular Economy.

"When we finish implementing and adjusting the model, we will see a reduction in the scrap that we are producing," Møller notes.
*"We will get an early warning when quality is changing, and the operator will get an early indication. The master plan is to have the indicators in the SCADA system. We will be able to solve the reasons for issues by using the CSense visualization."*

"Decreasing scrap and chemical usage and increasing production capacity through CSense are all ways that we are helping the environment," Møller explains. "Also, as we use CSense more, we can gather data from the supply chain and optimize that way too. The capabilities are there, so it is just a matter of structuring the data and the model correctly."

In summary, after just six hours of consulting, Skjern Paper was able to realize:

1. **Analyze:** New insight was gained about how dewatering chemicals can affect product quality

2. **Monitor:** It was then shown how Proficy CSense can be configured to monitor PID control loop health to detect suboptimal PID control loops early to avoid process variation

3. **Predict:** It was shown how a predictive model can be created from available data and can be deployed to predict product quality in real time, enabling real-time quality control to reduce quality rejects and waste
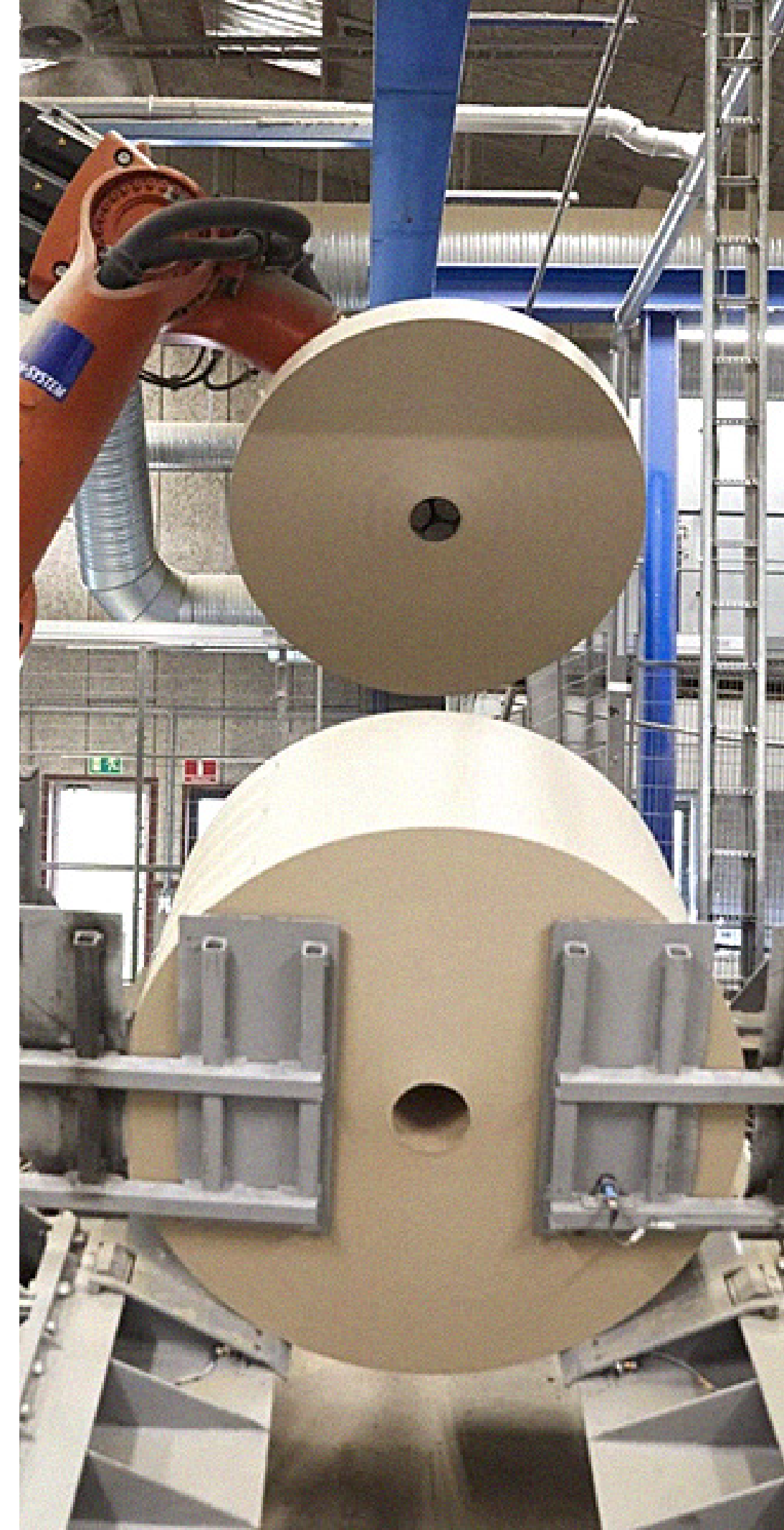
NEXT STEPS

While the initial project was about gaining some quick wins with a small model and realizing the potential of AI, Møller has a plan for next steps.

These include:

Taking the insights already learned and driving the realized process changes into production

- Constructing data that will lead to more insights

- Tackling downtime – starting with locking the data related to downtime, doing some manual manipulation of the data, then investigating how CSense can use that data

- Training additional team members on using CSense and having them take over from Møller's foundation of work

- Build a model to gain insight into increasing capacity

Skjern Paper will also be implementing Proficy Operations Hub for main PID loop monitoring and visualization.

AI Recommendations and Insights

With its journey into AI, Skjern Paper is continuing its tradition of being at the forefront and ahead of its time.

**What does the team recommend to other companies?**

"I would recommend Proficy CSense to other companies," Møller says. "Also, to proceed with AI, my advice is to start looking at how to get the dataset. We were quite lucky that I have been working with the data in the mill. The dataset that I have been producing is very compatible with CSense."

Lastly, Møller foresees quick return on investment related to Proficy CSense. The team has already gotten valuable insights so far in a short time.

"The more we use the Proficy CSense software," Møller concludes, "the more ways we keep finding to apply it. With AI, we can take production to the next level."
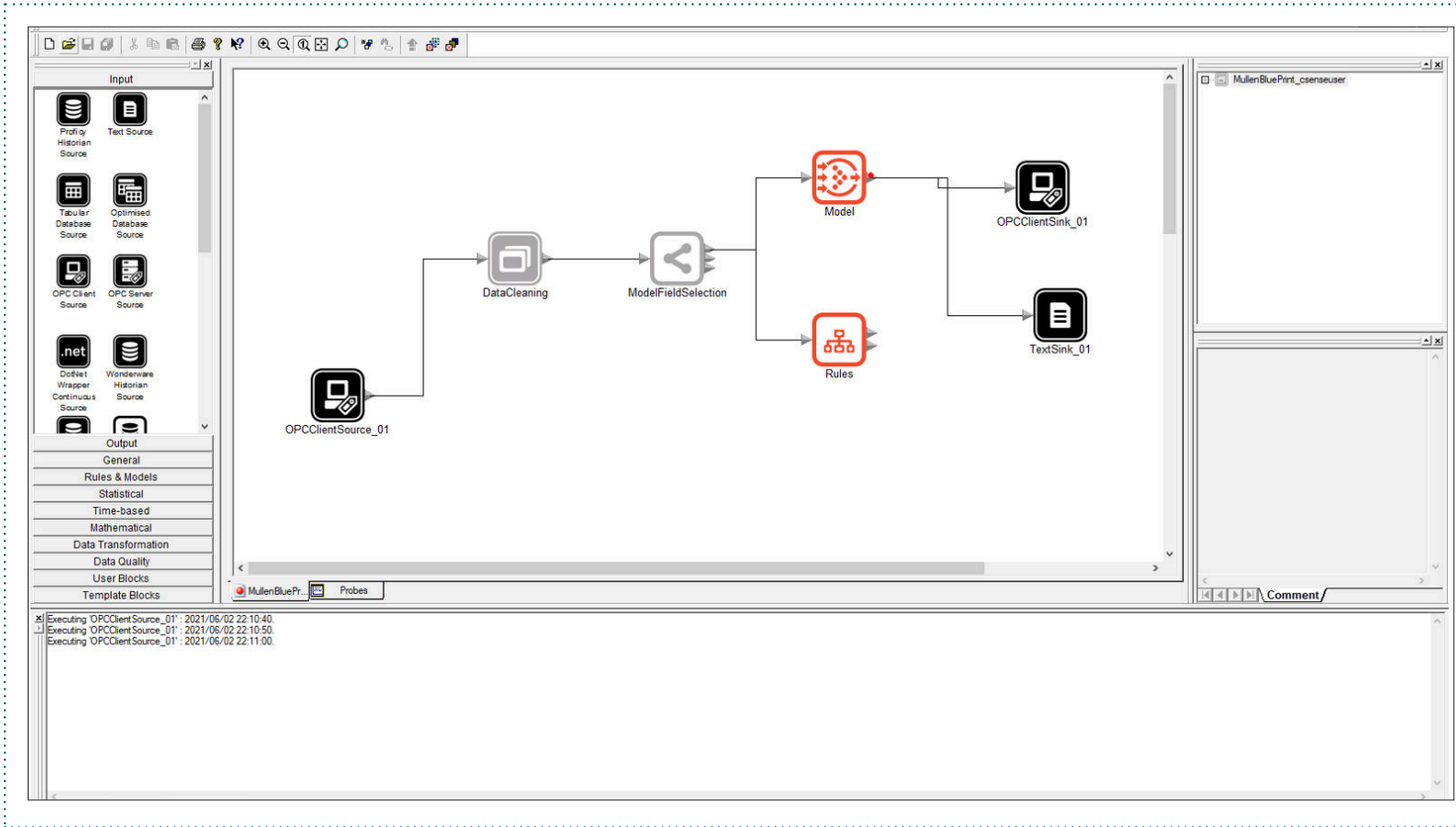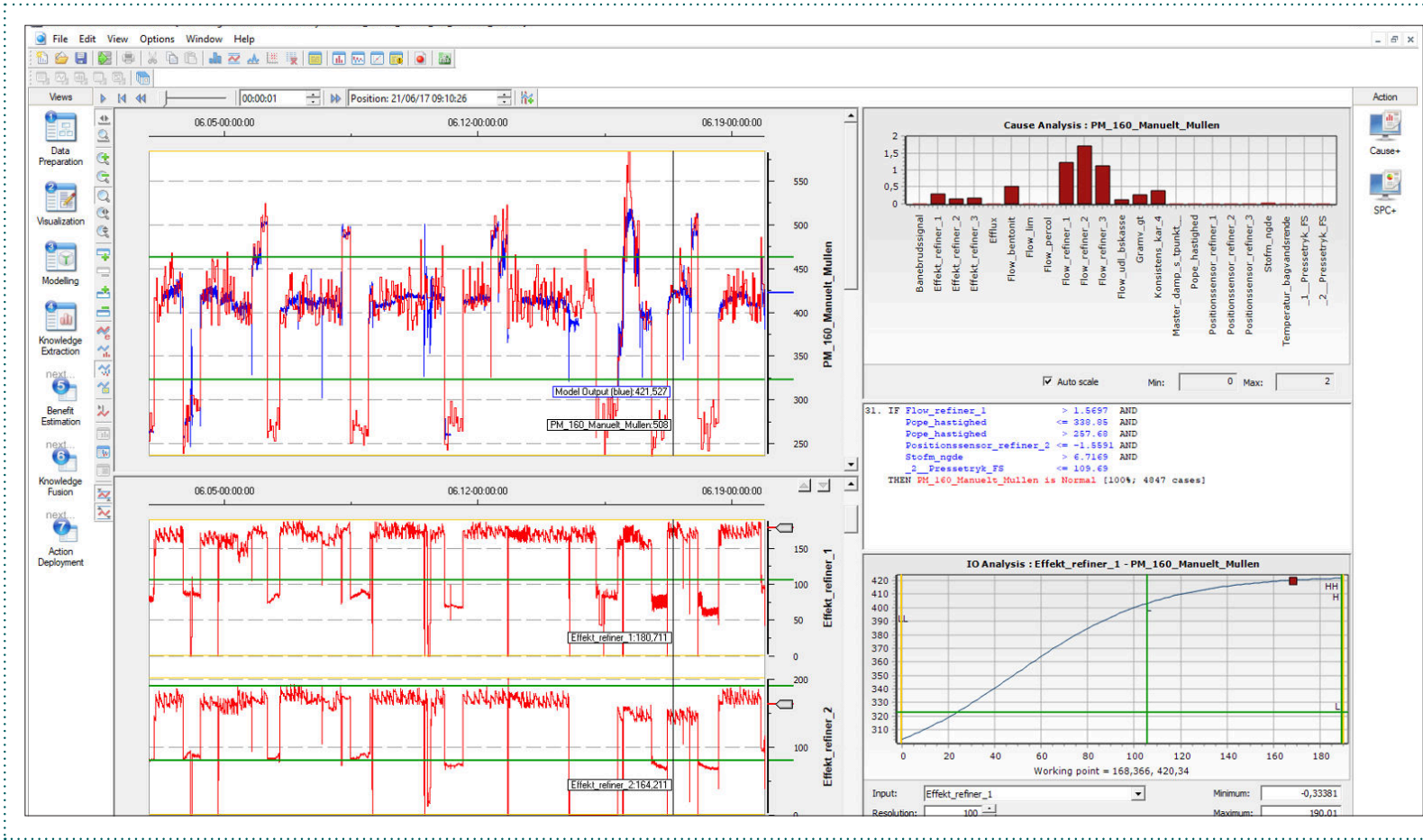
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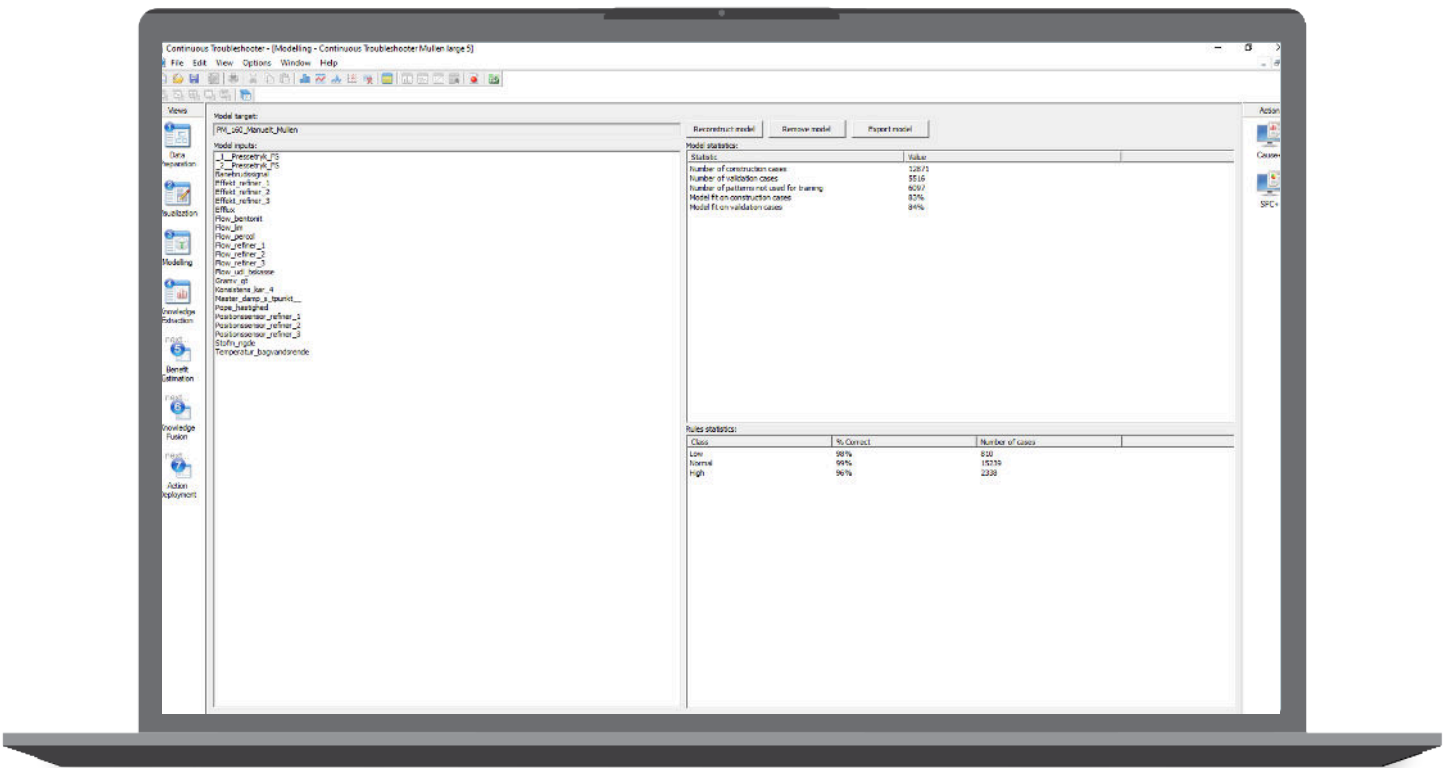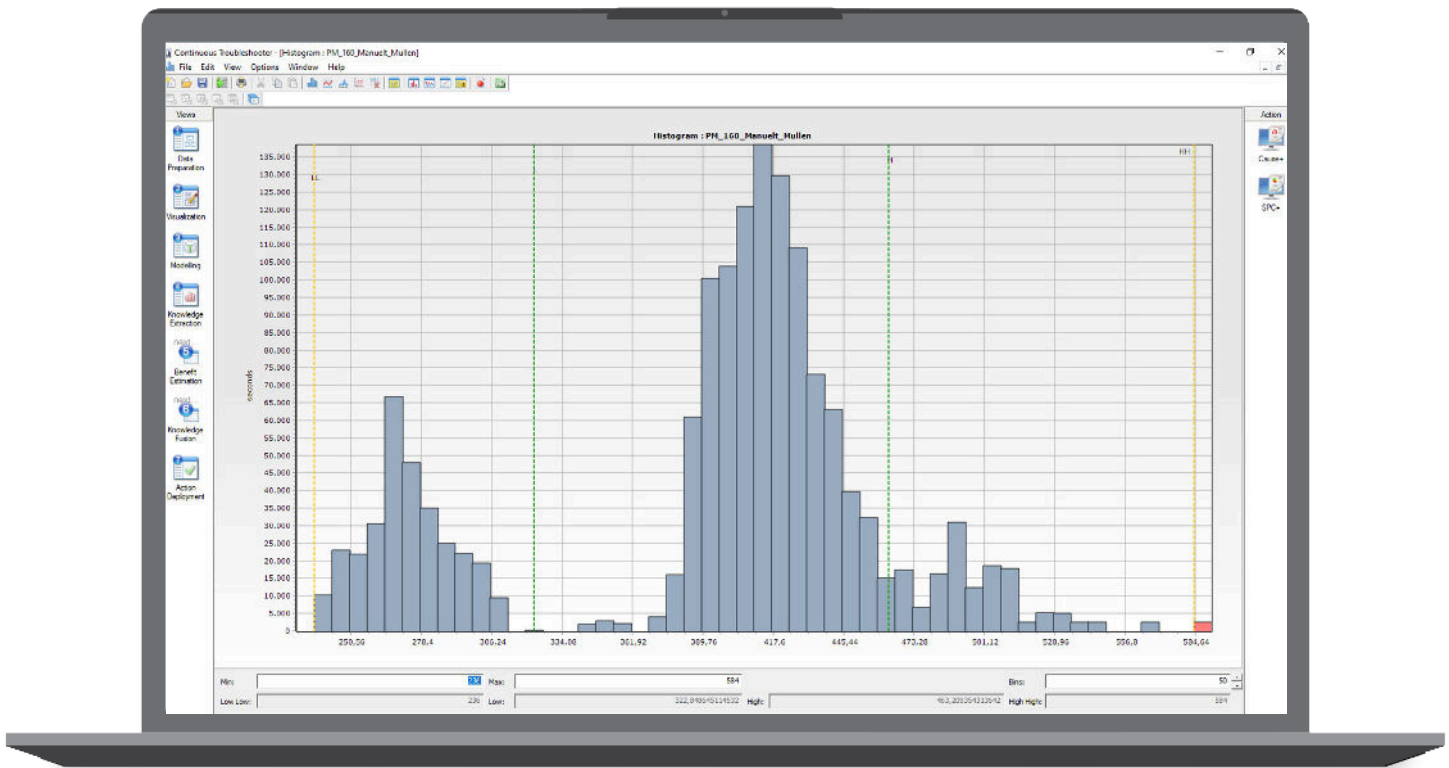
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