



Automotive manufacturer increases productivity for cylinder-head production by 25 percent

Smart is...

Harnessing predictive analytics to boost productivity of cylinder-head production by 25 percent.

Daimler AG was looking for a way to maximize the number of flawlessly produced cylinder-heads at its Stuttgart factory by making targeted process adjustments. The company also wanted to increase productivity and shorten the ramp-up phase of its complex manufacturing process. Using IBM® SPSS® software, Daimler is now able to analyze the plethora of data obtained in the production process and gain deep insights into the key factors that influence product quality within each individual process step. The new findings allow early and targeted process adjustments.

The Daimler Group is one of the largest producers of premium cars and the world's biggest global manufacturer of commercial vehicles, with divisions including Mercedes-Benz Cars, Daimler Trucks, Mercedes-Benz Vans, Daimler Buses and Daimler Financial Services.

In a light-metal foundry in its Stuttgart factory, Daimler produces approximately 10,000 cylinder-heads per day. The 24-hour production processes are very complex and range from mould-making in the foundry all the way through to mechanical finishing.

For each individual cylinder-head, the company's production-line systems create a data record that allows accurate analysis of every phase of the manufacturing process. Daimler constantly gathers data on more than 500 factors including dimensions, times, temperatures, tools and many other attributes of cylinder-head production throughout the manufacturing process. If the finished products do not fully meet the tight tolerances, they have to be rejected and melted down.

Enormous volume of data hinders root cause analysis

Because of the large number of parameters that influence the quality of the final product, it was a tough challenge for Daimler to identify the crucial variables within the manufacturing process.

A wealth of measurements and data had been collected in giant spreadsheets for pattern recognition. However, only very experienced specialists were able to draw the correct conclusions – sometimes after several days of investigation.

The goal was to determine the decisive quality parameters that would enable Daimler to produce more cylinder-heads that can immediately be placed into the manufacturing process. Perfectly adjusted process variables should maximize the output permanently.



Business benefits

- 25 percent increase in the productivity of the cylinder-head production line.
 - 50 percent reduction in the time taken to ramp up the process to Daimler's target levels.
 - Enables rapid adjustments by monitoring the process in near real time.
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Predictive analytics provides high process transparency

Daimler decided to implement a comprehensive IBM SPSS Modeler data-mining solution to continuously monitor and control the production process.

Initially, the company focused on the production line for one specific type of cylinder-head, of which about 3,000 were produced per day. Before Daimler could use the full potential of data-mining and predictive analytics, it was necessary to collect all the relevant data from the whole production process with complete accuracy. The data needed to be stored, organized in terms of time and content, and prepared it for statistical analysis.

After six months of internal preparation at Daimler, a team from IBM installed the SPSS solution and supported the company with consulting expertise in data integration, complex data processing and modeling. Just three months later, the first useful analyses were available.

Now, the system runs overnight on a daily basis, automatically evaluates how the production process has performed over the previous day, and saves all the analyses. One Daimler system specialist is responsible for ensuring that the solution is working properly, provides the right information and delivers the desired analyses. Six foremen regularly access the SPSS analyses that are relevant to their specific roles, and use the results to decide whether they need to take any action or make adjustments.

The company quickly noticed that the manufacturing process was stable and could be adjusted continuously. As a result, Daimler was able to define a set of thresholds that showed when intervention was necessary in order to meet the required tolerances of the finished products. The IBM SPSS solution helps Daimler detect irregularities early and identify trigger factors in a targeted way, which has given the company an unprecedented level of process transparency.

Smarter Transportation **Minimizing reject rates with predictive analytics**



Instrumented



Interconnected



Intelligent

Daimler gathers data on more than 500 factors including dimensions, times, temperatures, tools and many other attributes of cylinder-head production throughout the production process.

The data is processed daily and automatically evaluated in various ways by IBM SPSS predictive analytics software. This enables comprehensive monitoring of all process parameters.

If a process variable exceeds a certain threshold value, the evaluations enable quick error localization and targeted process interventions – helping to avoid cylinder-head defects even before they arise.



Solution components

Software

- IBM® SPSS® Modeler
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Ramping up twice as fast, and increasing productivity

The benefits are obvious: The kind of insight that used to take the company three days of extremely hard work to obtain can now be gained within a few hours. When irregularities emerge, the people in charge now know exactly where to start with optimizations. For example, the company now replaces tools less often than it used to, which saves time and money. And because the production process is relatively stable, the 24-hour evaluation cycle is almost equivalent to real-time monitoring.

Daimler is also fully convinced of the decision to use IBM SPSS for process monitoring. Ramping up a complex process such as cylinder-head production to target levels usually takes many years. Using IBM SPSS the company has been able to cut this ramp-up phase in half. Moreover, in the two years since the launch of the new solution, Daimler has been able to increase productivity by about 25 percent. As a result, the company has already more than paid off the original cost of the project.

The notable success of the IBM SPSS solution has led Daimler to decide to use the solution to monitor and control all new cylinder-head production lines in the future. The company is convinced that this will enable it to halve the ramp-up phase of these manufacturing processes too. Furthermore, Daimler will also start to use this innovative technology within other areas within the group. The company has only just begun to realize its true potential.

About IBM Business Analytics

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