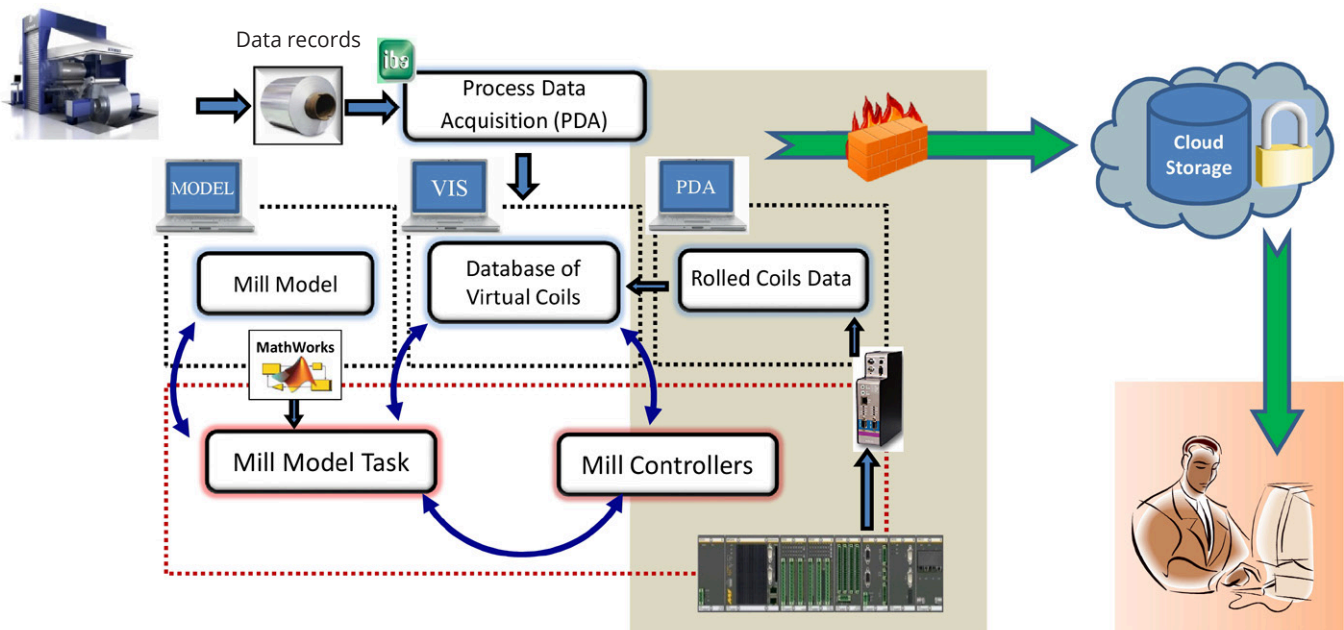


THE VIRTUAL ROLLING MILL

The journey towards the »cyber-physical system« starts in the Siegerland region

A 24/7 roller production with speeds of up to 2,500m/min, very small coil thicknesses of 5 µm or less, coil weights of up to 32 t and highly inflammable coolants do not allow any room for errors. A Simulink® model of the rolling mill, which validate the automation code created, provides a solution here to prevent them.



▲ The performance of the controller is critical for the cyber rolling mill.

»An aluminum rolling mill is a complex product. To transform it into the digital world requires the simulation of a number of technologically complex mechanical, electrical, hydraulic and pneumatic components,« Dr. Maksim Klinkov describes the initial situation of the project with Bachmann electronic. The product manager for automation at Achenbach is consistently pursuing here one aim: Achieving the maximum availability of the Achenbach rolling mills. For Dr. Klinkov, the benefits

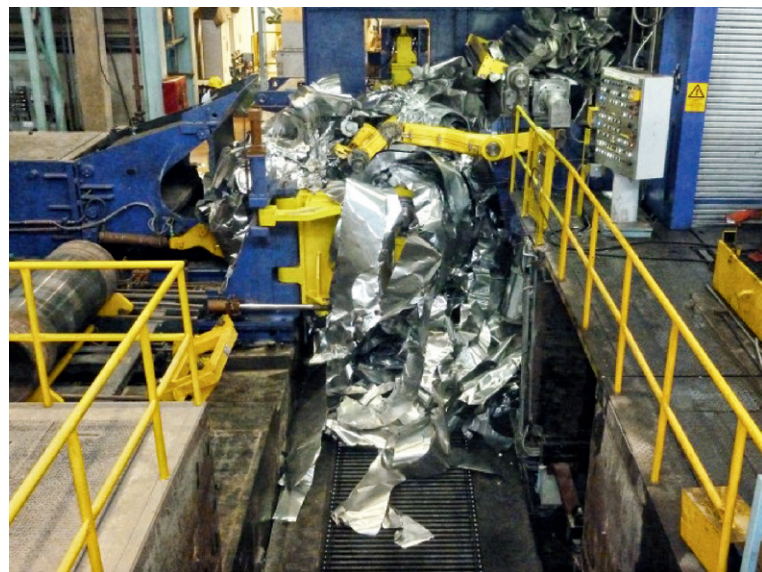
of a virtual model are obvious. He appreciates the serious effects that a controller can have that is not perfectly tuned to the system: »A fault may result in the tearing of a strip and, in the worst case, a fire in the machine, which can also be extremely dangerous for rolling mill operators. The high level of complexity in the process, the high rolling speeds and the large widths involved increase the risk of faults accordingly. Besides the repair costs, malfunctions also lead to high costs, due to the loss of

material and the resulting down time, since rolling mills are normally run in 24/7 shift operation,« Dr. Klinkov explains the problem.

How did project partners Achenbach and Bachmann actually handle the development project? They developed a Simulink® model of a typical rolling mill in order to continually check the quality of the automation code and test new functions. In addition to the electrical, mechanical and hydraulic functions, this also simulates



▲ The »indestructible« cyber machine is in actual use every day.



▲ Even minor faults have dangerous consequences in the rolling mill.

the forming process. This particularly includes models for roller temperature, roll deflection and the roll gap profile. The virtual rolling mill can thus be loaded with virtual coils in order to carry out a precise evaluation of the rolling process with regard to key criteria such as strip flatness or the accuracy of the strip thickness. This therefore enables the effect of control optimization measures to increase quality to be evaluated directly. The Simulink® model also maps the transient phases of the rolling process; These are calculated on an M1 controller in real-time parallel to the automation code of the plant.

The virtual rolling mill has been further developed in recent months, and its uses include serving as a test environment for the development of the new Achenbach OPTILINK® system for the digital

plant network. The cloud-based Optilink platform makes it possible with cloud technology to store large data sets generated by a rolling mill and its associated plants and then analyze the recorded data in dashboards and process graphics.

The virtual rolling mill is in actual use at Achenbach every day: The research and development department designs and tests new algorithms, builds virtual production databases and thus reduces the time required for onsite commissioning for the customer. The virtual rolling mill is also used for training purposes. For example, the future operators of a new Achenbach OPTIMILL® rolling mill can already before commissioning familiarize themselves with the Achenbach OPTIROLL® system without being exposed to the risks of an actual production run.



Achenbach Buschhütten GmbH & Co. KG is a worldwide system supplier of rolling mill systems for aluminum, copper, zinc and their alloys. The company is a global market leader for the Achenbach OPTIMILL® aluminum thin-strip and foil rolling mills, rolling mill automation and microfiltration systems. The traditional family company based in Kreuztal, Germany, has built the control systems using the Bachmann M1 automation system for more than ten years.

www.achenbach.de



» Our machines must meet maximum requirements and observe minimum error tolerances at the same time. The powerful M1 system provides us with the ideal solution platform. «

Dr. Maksim Klinkov,
Product manager for automation at
Achenbach Buschhütten GmbH & Co. KG