



**ACHENBACH
BUSCHHÜTTEN**

Achenbach Buschhütten | 57223 Kreuztal | Germany

High speed for ultrathin foils

Automation of high-performance rolling mills



bachmann.



Achenbach Buschhütten is a worldwide-recognized, independent and owner-managed family-owned company that can look back on an over 555-year tradition. The company headquartered in Kreuztal (Germany) was founded in 1452 as a hammer mill, later became an iron foundry and, since 1888, a builder of rolling mills. Achenbach today is a high-tech mechanical engineering company that belongs to the most important manufacturers of rolling mills for non-ferrous metals. For many years, the company has relied on the Bachmann M1 automation system to provide the control technology for its systems. Beside its performance, Achenbach has been convinced by the reliability and openness of the M1 system.

Achenbach began to work early with the light metal aluminum and built the first aluminum rolling mill as early as 1911. Fifteen years later, it was again Achenbach that invented coiling and uncoiling and so laid the foundation for today's strip and foil rolling mill technology. Today, the company is the world market leader and is considered the specialist for aluminum, fine strip and foil rolling mills as well as for rolling mill automation. The company's main attention is focused on the perfect integration of mechanics,

hydraulics and intelligent control technology with the goal of achieving maximum productivity of its rolling mills. The performance of the automation system thereby takes on a central role. "The openness and capability of the M1 system help us stand out from our competitors in terms of the functionality and reliability of our systems," says Roger Feist, Department Head for Function Technology at Achenbach Buschhütten GmbH.

Modular measurement and control system

For some years, the Bachmann M1 system has been at the heart of the Achenbach OPTIROLL® i2 automation system. As a complete system, it integrates the technological control system as well as the process management level of the rolling mills and operates the interfaces to production planning and control. The foundation of the integrated complete system is the powerful basic automation ("Level 0"). This encompasses all sequence controls, pressure and position control circuits as well as the related sensors. The technological control systems ("Level 1") encompass the quality- and productivity-determining functions, such as strip-thickness control and strip-evenness control, as well as the guide value control for the drives. The process management level is defined as "Level 2" of the integrated automation system OPTIROLL®. This contains all functions needed for process control at the rolling mill. These include in particular, operating and visualization systems, setup computers with databank-based pass schedules and powerful model functions. Data recording with wide-ranging reporting possibilities is the basis for quality assurance and process optimization.



▲ **Ingenious lay-out of sensors:** Achenbach technician Tim Schuhmacher calibrates an evenness measuring roll

Openness permits variety

Production planning and control is integrated through customer-specific systems into an ERP system ("Level 3") with production planning (PPS) or manufacturing execution systems (MES). "The open interfaces of the M1 automation system offer a wide range of possibilities for seamless integration into the complete system," says Thomas Schmidt, Group Leader for Control Technology at Achenbach. As standard, OPTIROLL® i2 provides process data over an OPC interface and receives through this interface the manufacturing instructions for the following metal strip, the "coil". "Through trendsetting system characteristics, we offer our customers marked advantages and set standards regarding ease of operation, productivity and reliability," says Thomas Blacksmith, describing the major goals, and is glad that "with the M1 I have a system that is both lean and powerful, and which is able to solve control tasks elegantly and without burdening the system."

Thinner than a human hair

With an Achenbach rolling mill, aluminum foils of over 2 meters in width can be rolled to a minimum thickness of 6 µm. For technical reasons, in the last rolling pass two layers of foil lying on top of each other run through the roller gap, which is controlled at a constant prespecified pressing force. In contrast, for thicker materials of 300 µm, for example, which can be rolled on the same machine, position control is used. For this, rolls weighing a ton must be positioned with a precision of 1 µm and controlled in a highly dynamically way. Not an easy task with a foil transport speed of over 2,200 m/min – faster than people can drive on most European expressways.

High speed requires high performance

The quality of the rolled product and the productivity of the system depend largely on

the precision and efficiency of the measuring technology used, which Thomas Schmidt calls "one of the key functions in the production process". For example, the better the evenness to be achieved in the roller product can be set, the faster the strips or foils can be transported through the rollers. The evenness of the rolled strip or foil is measured with a special evenness measuring roller from Achenbach. The tension distribution of the material, which can be taken as a reliable measure for the evenness, is recorded with high resolution over the entire width of the material.

200,000 measurement values per second

In an ingenious arrangement on various angle positions along the measuring roller, up to 70 piezoelectric sensors record the smallest tension differences and pass these measurement values on to the M1. "The data volume generated with high strip speeds is enormous, and the control circuits must really be extremely fast," says the roller mill technology specialist Schmidt as he explains the demands on the control system. In numbers: "The measuring rollers rotate at up to 3,000 revolutions per minute and with each revolution pass on to the computer over 4,000 measurement values with 16-bit resolution." This means that over 3 megabits of data per second must be evaluated to properly control the production process with a multitude of actuators. Bachmann electronic has developed a special interface for Achenbach that seamlessly integrates the proven measurement data recording into the control system in real time.

Controllable rollers with changeable mechanical dimensions (position, bending, camber) serve as active actuators. For thin strips and foils, the distribution of coolant along the rollers is especially important. Several hundred nozzles individually regulated by the M1 controller and movable along the roller axis distribute the coolant onto the rollers in the "WIN-SprayS®" zone cooling system patented by Achenbach. "And so we achieve extraordinary evenness on the strip or foil," adds Thomas Schmidt.

Flexibility is everything

Besides productivity and quality, flexibility is the third factor that determines the usefulness of a rolling mill. The User would like to switch over the system to different materials and strip thicknesses relatively quickly and as simply as possible. Here, the capability of human machine interface and SCADA (Supervisory Control and Data Acquisition) applications are of decisive importance. Here Thomas Schmidt welcomes the openness of the M1 system: "We can use global standards and, with the problem-free integration of C# applications, which run in the Microsoft.NETframework we are largely platform-independent and so not bound to proprietary solutions."

Availability decisively determines productivity

The availability of a system determines its productivity to a large extent. This means that the failure rate and possible downtimes must both be minimized. And so for Achenbach, the mechanical and electrical design were significant selection criterias for the automation system. "In terms of our operational conditions, we have identified in particular thermal and mechanical

influences, such as vibration, as failure criteria," reports Roger Feist on the results of extensive investigations in the field. Achenbach was especially convinced by the Bachmann M1 system's robust mechanical design, its fan-free operation at ambient temperatures of up to 60°C and the exclusive use of semiconductor memories instead of (moving) magnetic data storage media.

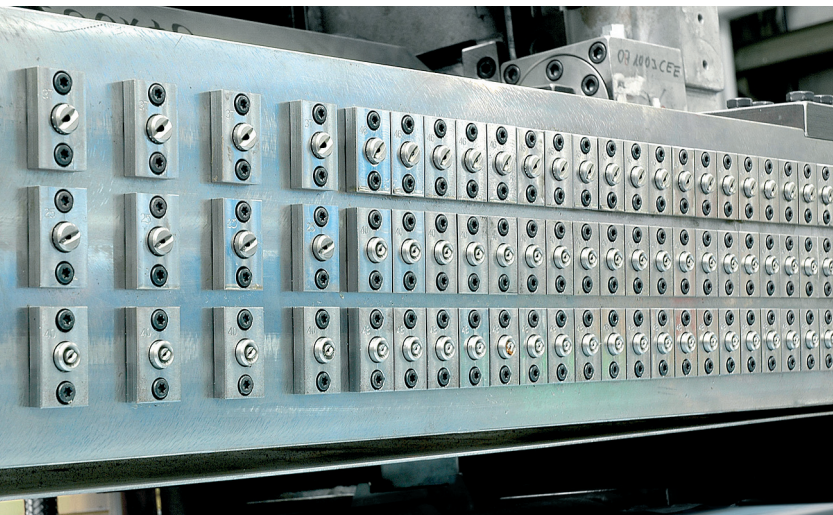
Proprietary solutions avoided

Ultimately, manageability, that is, operability and serviceability, help determine the productivity and availability of a system. Here, too, Achenbach sets standards. Thanks to the open system structure of the M1, proprietary solutions in programming could be avoided and the automation technology implemented consistently on the basis of the internationally valid standard IEC 61131-3. "That's important, since over 90 percent of the systems are shipped abroad, mostly outside Europe," says Roger Feist and adds: "But thanks to the universal network capability of the M1, remote servicing, if needed, is possible from every location in the world, for example via the Internet with the corresponding backup procedures."

Future-oriented solutions

"Technology for future concepts" is the philosophy that guides all thinking and acting at Achenbach. The company has the technological knowledge to carry out its customers' future ideas for production of first-class strips and foils out of metals such as aluminum, copper, zinc and their alloys using customized system technology.

Roger Feist is convinced: "With OPTIROLL® i2 and the M1 system as its core, we're very well prepared for the constant further development of our rolling mill technology." ■



▲ **Mitbestimmend für die Planheit des Bandes:**
Hunderte von individuell angesteuerten Kühlmitteldüsen