Light-gauge

Working with thin foil materials requires precise equipment

BY LAUREN DUENSING

Located in southwest Germany, the city of Pforzheim in the state of Baden-Württemberg is known as the Goldstadt, or Gold City, because of its long history as the center of the German jewelry and watch-making industries.

In nearby Remchingen, Germany, Burghardt + Schmidt GmbH manufactures precision slitting and leveling lines. The company was established in 1946 after World War II and focused on slitting as a result of regional demand for processing the small special alloys, such as gold, silver and titanium, required for making jewelry, according to Michael Unger, head of sales for B+S.

Today, the company has about 100 employees. It specializes in cutting, winding and leveling thin, delicate strips and has experience processing a variety of materials, including wire mesh, lead, gold, silver, palladium, molybdenum and niobium. The majority of the company's machines are exported to markets in China, Japan and Korea. Last year, as a result of increasing demand, B+S opened a sales office near Chicago.

"We have about 25 lines and machines sold into the U.S. market," Unger notes. "We consider the U.S. market to be special for us because there are no other companies at the moment who can work in this area. Therefore, we wanted to start our own subsidiary. At the moment, it is only sales,

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but in the future, we plan to establish technical service and support as well as production facilities."

One of the company's customers, MK Metallfolien GmbH, Hagen, Germany, also recently expanded into the United States with a factory in Duncan, S.C. The facility produces and manufactures precision foils and super foils for catalytic converters and solar panels as well as other renewable-energy markets.

MK Metallfolien concentrates on light-gauge stainless steel, special alloys and titanium and nickel-based alloy foils, says Gerhard Cloppenburg, managing director and partner. The company's equipment has the capacity to roll down to 0.0008 inch, and "for that, we need special machinery and equipment. Everything is tailored to customer specifications," he says.

MK Metallfolien has worked with B+S on several pieces of equipment, including a slitter and stretch-bend-level line in Germany, a slitter in the United States and another stretch-bend-level line, which currently is headed to the South Carolina facility for installation.

"We bought our first stretch-bend leveler from them in 2004," Cloppenburg says. "That has been running in Germany and running great. Therefore, we decided to buy the second from them."

The company's newest stretch-bend-level line can handle materials from 0.0012 inch thick to 0.024 inch thick and from 7.87 inches wide to 21.65 inches wide and runs at about 1,000 feet per minute.

Burghardt + Schmidt manufactures precision slitting lines for cutting and winding thin strips.

Flatness that meets specifications

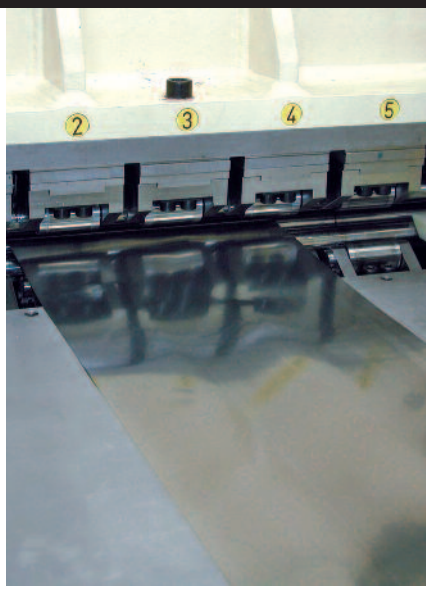
Leveling thin materials can be challenging, but Cloppenburg says it's necessary. "When you're in the stainless steel business, especially in the light-gauge foil, you need very flat material. It's important for customers to have flat material so it runs smoothly for further processing. Whether it's stamping or hydroforming, flatness is a key point."

Material goes from the rolling mill directly to the stretch-bend leveler and then to the slitter, Cloppenburg says. Throw annealing into the mix, and material heads from rolling to annealing, stretch-bend leveling and finally slitting.

He says sometimes material can meet customer specifications straight from the rolling mill. However, with "bright annealing, you get rid of the tension you build up during rolling and the strip is a little bit wavy. After annealing, stretch-bend leveling is mandatory in order to supply a flat product."

Stretch-bend leveling uses tension and

Left: Deformed chrome aluminum in front of a leveler.
Right: The same strip behind the leveler.



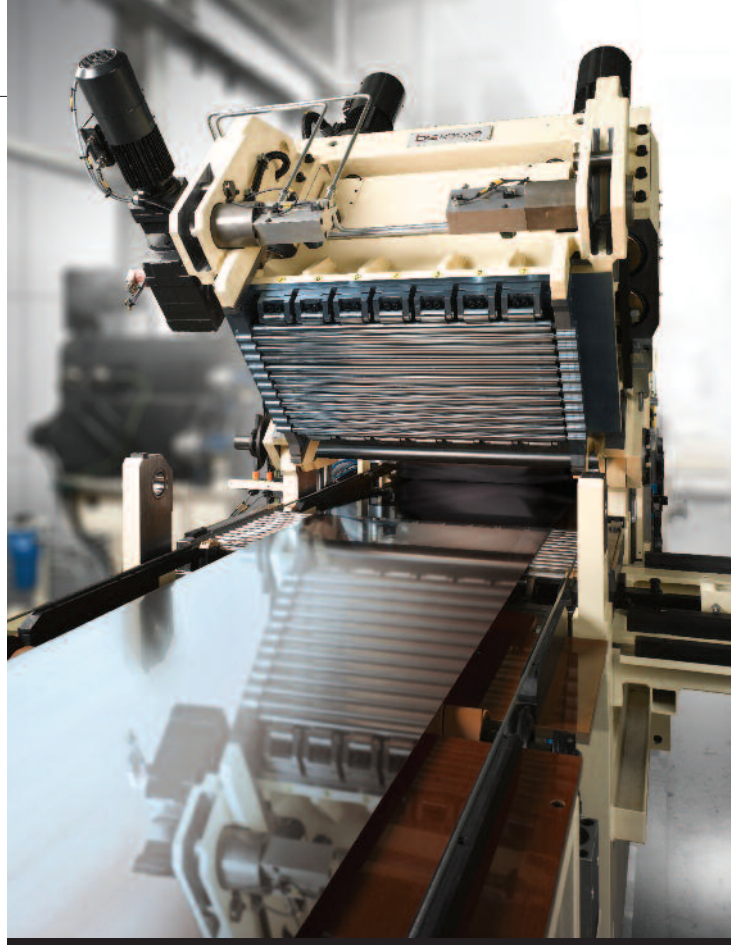
bending during the leveling process to reduce internal stresses and correct form errors such as waves, cross bow, coil set and camber. "Simply said, leveling is the lengthening of the short zones to equal the longer zones" in the material, Unger says.

With thin materials, the edge fibers are "insufficiently reached by bending the strip," Unger says. The strip will revert to its original shape after bending. Stretch-bend leveling employs several steps to ensure thin materials are rendered completely flat.

"The tension levelers that are available on the market today normally work with five to seven bending rolls," Unger notes. "We work with 23 pieces, and the lines for very thin materials have 37 rolls. In addition, we have adjustable backups, which is something a tension leveler normally does not have." The backup adjustment allows the operator to determine an area that needs to be leveled and "bend the leveling rolls in the area where there are shorter zones," he says.

The stretch-bend leveler also uses four bridle rolls in front of the leveler and four bridle rolls behind the leveler to create high tension. "Only with the tension and the leveling with the 23 rolls makes for the real leveling of thin strip," Unger says. "Without that feature, you will not have an effect or have a limited effect."

The cassettes in the leveling line also have special features. "For MK Foil, for example, we supply a cassette which is 0.47 inch with 23 leveling rolls and a 0.63-inch cassette with 23 leveling rolls," Unger notes. "Depending on the material, the cassettes can be changed easily and quickly to provide good results when leveling individual thicknesses."



Leveled strip with the leveler opened.

Precision processing

Thin materials also require precise strip guidance, "otherwise you will get wrinkles because the foil is very thin," Cloppenburg says. "It's similar to the aluminum foil you have in your household. The line has to be absolutely accurate and precise."

To ensure the coil is guided through the line properly, B+S offers a self-threading system. "At the beginning of the coil, we take it and thread it through the complete line automatically. No one needs to touch it, and it runs very fast," Unger says, with Cloppenburg adding the system saves time and increases productivity over manual threading.

In addition to self-threading, the entire line can be automated. "We have an automatic edge control," Unger says. "Also, at the recoiler, we have a table that leads the head of the strip to the mandrel, and at the mandrel, we have either a clamping system or an automatically working belt wrapper to wind the first layers around the mandrel."

MK Metallfolien's line has a pinhole detector, which determines if there are holes in the material. It also features an optical flatness measuring system, which measures the shape of the strip without touching it.

"The optical flatness measuring system is an optical camera system with 200 measuring points," Unger says. "It measures the flatness of the strip and gives signals back to the leveler, which then levels in the area where the measuring system says the strip is uneven. It's completely automatic."

The measurement system creates a map of the entire strip, generating data from the leveling operation. This allows companies to print reports for their customers to "prove what the system has done and the material's flatness," Unger says.

MK Metallfolien provides customers with a flatness measurement protocol to assure them the material they're receiving meets specifications, notes Cloppenburg. The company prides itself on its service, and, according to its website, is "determined to establish long-term, partnering relationships of trust" with customers, focusing not only on supplying materials but "cost optimizing along the value-added chain."

"Some companies that have a slitting line try to get by without a stretch-bend leveler," Cloppenburg says. "But if you want to supply quality product to your customer, especially to customers who do further processing like stamping or hydroforming, if they have flat material, it's an advantage because the next operation can run faster. If you have wavy material, you have to run at a lower speed. If it's stretch-bend leveled, you can process it at higher speeds." ■

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