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ASTECH
Angewandte Sensortechnik

SUNDWIG

# Highly precise speed measurement for mass-flow control

***The high performance of a 20-roll mill stand can only be realised with modern electronic control technology that helps to obtain high strip quality. Modern constant volume controls require reliable dynamic speed values that can be advantageously recorded by the VLM 200 SD. This opens up a new perspective for the realisation of exact strip thickness.***


*VLM 200 SD Velocitymeter in SUNDWIG 20-roll mill (left side)*

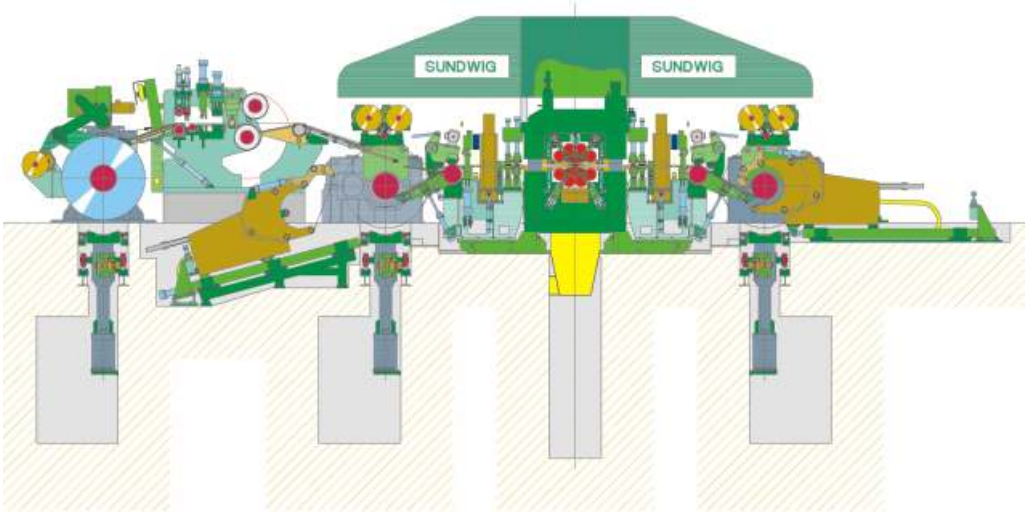
Since the start of the twentieth century, the PLANSEE Company has been one of the most important producers of tungsten, molybdenum and tantalum with many years of experience in the manufacture of alloys and their processing, from semi-finished to finished product. Molybdenum and its alloys are mainly used as materials because of their high mechanical stability at high temperatures. In nature, tungsten is found in more or less the same quantities as copper and has the highest melting point of all metals of 3410°C. The most frequent usage is the incandescent filament for different lamps. Tantalum is particularly acid-resistant and used in many areas of medical technology. The production profile of high-performance materials of PLANSEE AG is completed with semi-finished and finished products made of niobium, chromium and their alloys. The resulting sheets, wires, bars and strips are used in lighting technology, electronics, high-temperature technology, aerospace industry, chemical apparatus construction, power engineering, medical and biotechnology. PLANSEE manufactures hot and cold-rolled plates or strips in large automated plants. The most modern extraction and filtering units ensure all processes meet the highest environmental standards.

*Control panel of the mill stand*

**High technology demands**

The highest demands, e.g. thickness tolerances of < 1.5 µm are made on cold-rolled strip products. In the process, incoming thickness variations of up to 50 µm must be corrected in less than 20 m/s.
In order to support these high demands at the heart of the strip production, the SUNDWIG 20-roll mill constructed in 1980, was modernised through the installation of a fully hydraulic adjustment and a new thickness control in 2000.

The strip mill is designed for strip widths of up to 450 mm wide. High-performance materials like chromium-molybdenum or tungsten-molybdenum strips are processed. The material properties require high rolling forces. In order to ▸



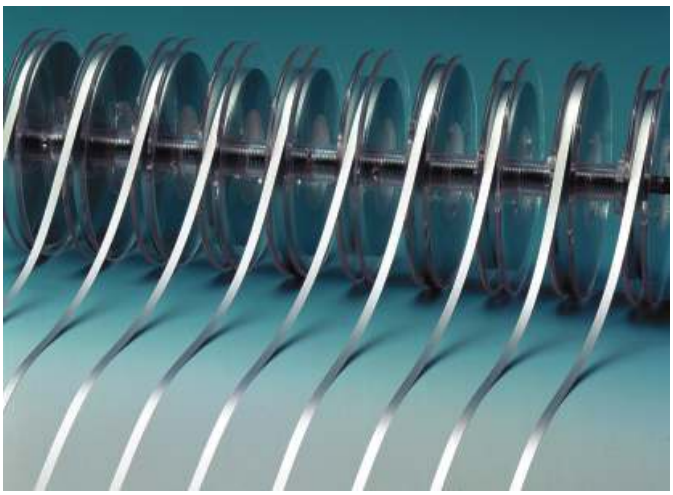

*SUNDWIG 20-roll mill stand*

**Particularities of the SUNDWIG Four Column (SFC) 20-roll mill**

- Direct hydraulic adjustment with low-friction synchronising cylinders (rise time: 10 - 20 m/s)
- Guidance of the upper part of the stand in columns and hydro-dynamic lubrication
- Swivelling of the upper part of the stand over the screwdown cylinders
- Support-roll bending system firmly mounted to the stand by means of hydraulic cylinders
- Hydraulic suspension of the intermediate rolls
- High torque transmission on the second intermediate rolls by means of maintenance-free driving shafts
- Axial displacement of the first intermediate rolls in order to influence strip flatness on the edge
- High displacement speed of the first intermediate rolls due to the push-push system
- Patent-protected strip cooling system to achieve highest cooling capacity (SUNDWIG impinging jet cooling system)

determine exactly the rolling speed of strips with very shiny surfaces the technological control concept based on the mass-flow principle, SUNDWIG utilised the VLM 200 to record belt speed. It is a compact speed sensor from the VLM 200 family developed by the ASTECH Company, which already has been tried and tested in many mill applications. The device records, without slippage, the actual belt speed and is therefore ideal for being used for constant volume control (mass flow). The VLM 200 SD-series is specified with an accuracy of 0.05% and a reproducibility of 0.03%. This was established in external tests.

The VLM 200 owes its high degree of accuracy to the latest leading-edge technology using the dimensional accuracy of semiconductor manufacturing for the optical sensor. Production tolerances in the nanometer range provide the unique dimensional accuracy of the sensor proved identical after many thousands of experiments, and therefore guarantees a constant quality. Unlike laser systems, since the VLM 200 operates via white light, protection regulations are unnecessary.



*MY-ESS ribbon for halogen and high-intensity discharge lamps*



*Air purge production and connection box for VLM 200 SD devices*

**Convincing results**

The triggered synchronous operation, the rapid hardware and the plausibility check of raw signals for the first time allows low as well as high operating speeds, delivers accurate measured values for a highly precise control of the initial thickness. These new advantages are essential to obtain the close manufacturing tolerances for the production of precision strips, both at small speeds and in the acceleration phases. The connection of the mass flow control system with the integrated VLM 200 SD has shown that, in the thickness range of 30 to 100 µm, the customers' demand of 1.5 µm was clearly met. The results were, with 0.5 µm, at the detection limit of the thickness measuring system and therefore spoke for the excellent quality of the control in interaction with the extremely precise speed measurement of the VLM 200 SD developed by ASTECH. Samples from the final customers confirm that, at normal as well as low belt speeds of 18 m/min and under. Thanks to this mass-flow control, advantages over the pilot control could be achieved, especially during acceleration phases.
With respect to the short molybdenum strips, this has a particular economic importance because of the high quality of the usable strip length. Consequently, the herein presented solution should pay for itself within a very short time. Since its commissioning at the end of 2000, the system has functioned reliably in the daily production process. ■

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