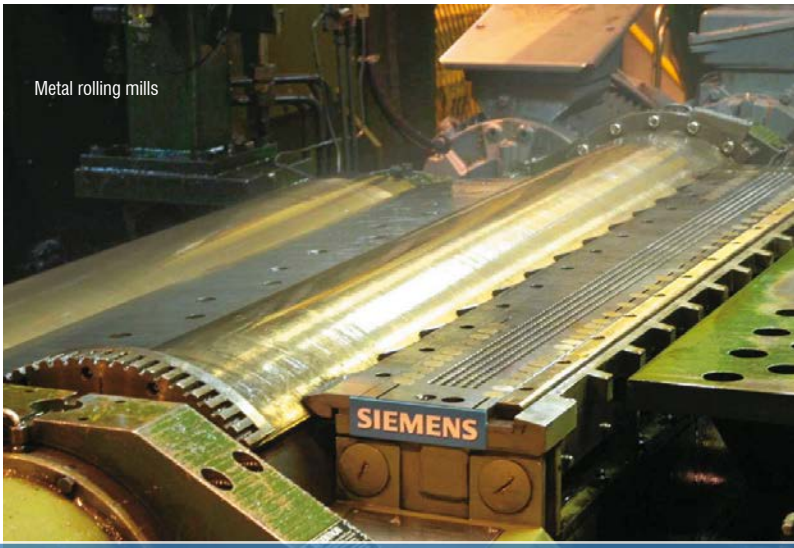
A119

Eddy current sensors
eddyNCDT



Flatness measurement in rolling mills

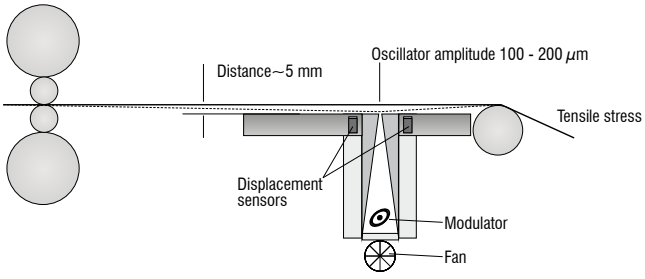
The requirements on the surface quality of rolled sheets are continually increasing. This may be steel sheet which is used, for example, for stainless steel fronts in kitchens, or also aluminium sheet used in the automotive field. The surface must be flawless to offer the customer a high quality visual appearance. Consequently, measurement equipment is employ- ed in rolling mills to acquire the so-called flatness of the rolled sheet. Flatness is taken to mean the surface evenness of the sheet in the unstressed state. Due to the enormous tensile forces when rolling the sheet, there is the risk that the tensile distribution varies over the width of the sheet and that the sheet will distort in a wave shape at the edges. Conventional measurement devices acquire the tensile stress using pressure sensors which are embedded in a measurement roll. However, due to this contacting measurement method, impressions of the pressure sensors appear on the sheet surface and are visible in the end product. Furthermore, only one measurement can be taken per revolution of the measurement roll. Due to a new type of method developed by Siemens, the contacting mea- surement is replaced by a non- contacting technique which exerts no force at all on the sheet and supplies continuous measurements.

In this case the sheet is pneumatically excited to vibrate. The amplitude of the vibration is acquired with non-contacting displacement sensors from Micro-Epsilon Messtechnik and from it the tensile stress is computed transversely over the width of the sheet. The significant advantage of this non-contacting measurement method is that no damage occurs to the surface. A further, equally important advantage is that no wear can occur on the sensors, so drastically reducing downtime and the costs for replacement parts. As a result, this increases plant availability and the quality of the sheet which con- forms to current and future quality requirements. This technique was only made possible by the application of non-contacting displacement sensors from MICRO-EPSILON which acquire the smallest changes in amplitude without any wear and with high dynamic response. The measurement system itself consists of the displacement sensors and the associated electronic evaluation unit in a 19“ rack.

Requirements for the measurement system

- Measuring range: 5.6mm
- Offset: 2mm
- Resolution: 6µm
- Dynamics: to 10kHz (-3dB)
- Temperature range sensor: 0...+150°C
- Temperature compensation: +10...+65°C
- Medium: air, oil (hydrocarbon)
- Protection class: IP67

Advantages

- Non-contact and wear-free measuring principle
- High resolution
- No mutual interaction on the sensors due to synchronisation

Principle