Low-maintenance radar width measuring system enables a significant improvement in width performance in hot mills

PRESS RELEASE

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Radar width measuring at the roughing stand leads to a more stable rolling process despite the harsh conditions with high occurrence of spray water, steam and scale

Figure 1 (Source: Salzgitter Flachstahl GmbH):

The radar width measuring system enables stable width measurement at the roughing stand, fulfilling a key prerequisite for improving width performance

- The radar width measuring system was developed by IMS Messsysteme GmbH in cooperation with Fraunhofer FHR and Salzgitter Flachstahl GmbH and enables a more stable rolling process
- The robust, compact radar width measuring system offers significant technical and economical advantages compared to optical measuring methods
- Easy to integrate in existing mill lines
- No additional safety devices or measures required

Measuring the width of the material as precisely as possible is essential for product quality and the efficiency of the rolling process. The roughing stand is essentially the only place where it is possible to influence the material width in a targeted way, so being able to ascertain the exact measured variable this early in the production process is of central importance.

The harsh conditions that prevail in the area of the roughing stand, including the high occurrence of spray water, steam and scale, make it difficult to use optical measuring systems. Optical measuring methods require complex cooling and suction devices as well as extensive maintenance to be able to reliably measure the width through the view of the camera. These are factors that make the use of this method during operation and maintenance very costly. A radar-based measuring method offers a technically and economically attractive alternative.

It was already several years ago that IMS Messsysteme GmbH, together with Fraunhofer FHR and Salzgitter Flachstahl GmbH, developed a measurement system based on radar technology which for the first time enabled stable, precise width measurement at the roughing stand.

The final installation of the radar width measuring system took place at Salzgitter Flachstahl GmbH between the upsetting press and the blooming train, immediately before the roughing stand – a position that allowed the complete measurement of the width along the entire slab length before each upsetting pass. SMS group GmbH then integrated the radar width measuring system into the automation system. The measuring results obtained during real operations made it clear just how much potential the radar width measuring system has for the optimisation of width performance.

Reliable width measurement enables a more stable rolling process

The use of the radar-based width measurement system reliably solved several problems at once, contributing to a considerable improvement in the width of the pre-strip and thereby also the finished strip.

- A width error in the upsetting press caused by mechanical damage was initially detected using the radar width measuring system
- The residual width error after the repair of the upsetting press was ultimately corrected by implementing an adaptation model, which used data from the radar width measuring system, among other things, as an input variable

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- Thanks to the measures implemented, the positioning error of the upsetting press could be significantly reduced so that constant input conditions were ensured for the rolling process in the blooming train

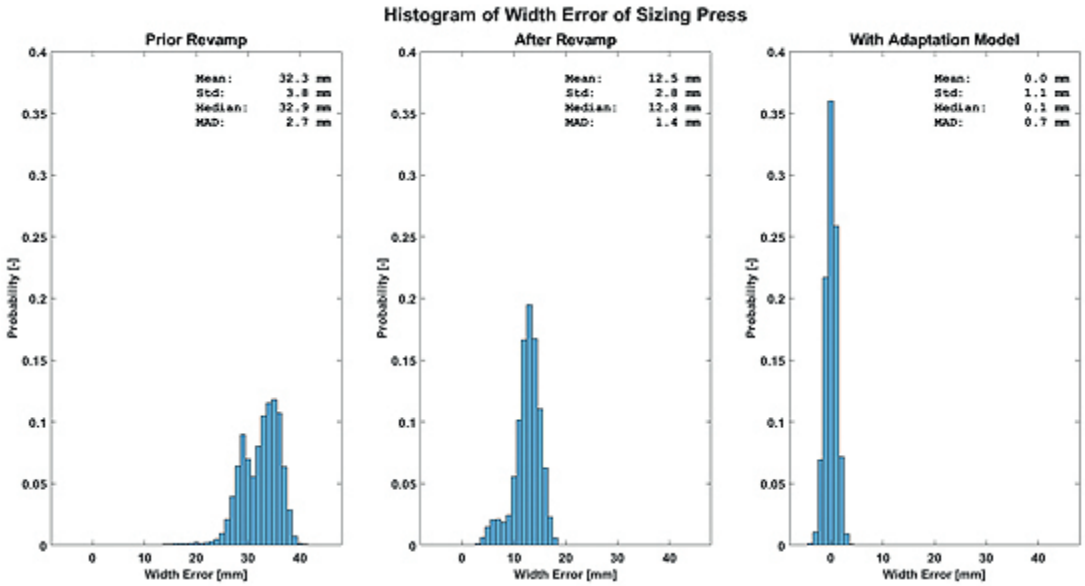

Figure 2 (Source: SMS group GmbH):

Histogram showing the width error of the upsetting press for 3 time periods: Period 1 before the repair of the upsetting press (left), period 2 after the repair but without the adaptation model (centre) and period 3 with active adaptation model (right)

The measured slab width from the backwards passes was also included as a measured variable in the subsequent calculations of the PSC® pass schedule calculator. Based on the measured width, an improved pre-calculation of the pass schedules took place for the remaining passes in the blooming train (known as adjustment). Thanks to the radar width measuring, the model error with regard to the pre-strip width could be further reduced to a significant extent. This led to even more constant input conditions for the blooming train, which to this day enables a more stable rolling process in the finishing mill.

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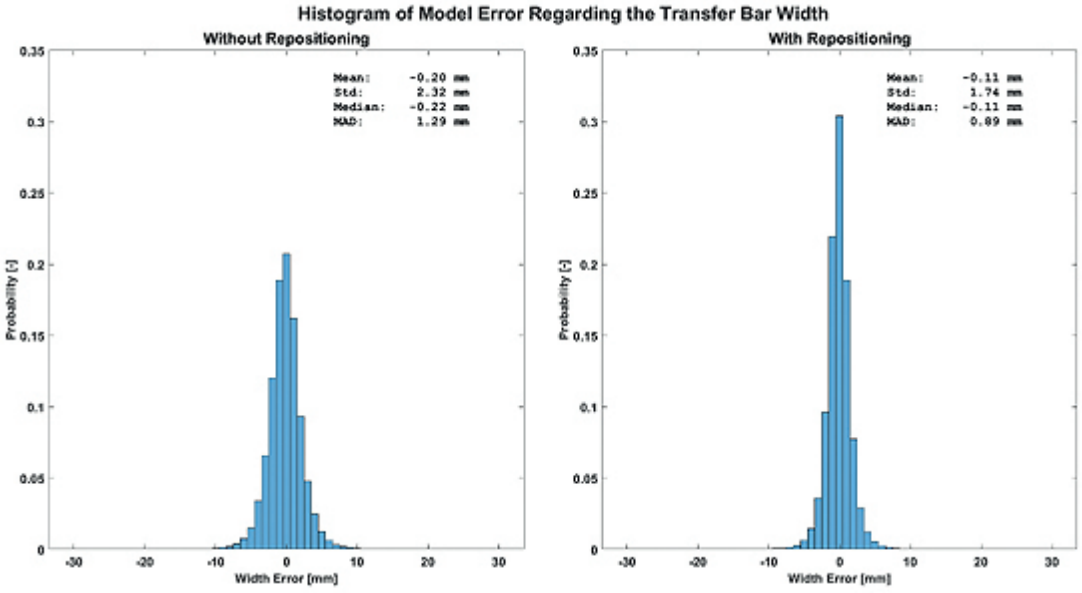

Figure 3 (Source: SMS group GmbH):

Histogram showing the model error with regard to the pre-strip width with (right) and without (left) adjustment based on radar width measuring in the backwards passes

> After we increased the availability of the radar width measurement system together with IMS and SZFG and then integrated it in our automation system as a measuring device, we have been able to achieve significant improvements in process stability. This was only possible thanks to the high reliability of the radar width measurement, even in the harsh conditions in the entry of the blooming train.

said Dr Olaf Jepsen, Head of R&D at SMS group GmbH.

Robust and compact measuring system with little maintenance effort

One of the key advantages of the radar width measuring system is the low sensitivity to steam and spray water, as this enables stable operation and precise measuring results under the characteristically harsh conditions that prevail at the roughing stand.

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Furthermore, the use of a radar width measuring system offers hot mill operators even more benefits:

- The compact and robust design, which comprises two separate units that measure the distance to the respective strip edge, allows the system to be easily integrated into existing hot mills, even where space is very tight
- The two system units are positioned on either side of the roller table so that falling scale and vibrations at the roll stand do not impair the measuring performance or shorten the service life of the system
- There is no need for complex suction and cooling devices as the system is not sensitive to the heat, steam or dirt
- The radar width measuring system is low maintenance and overall cheaper to run than comparable optical systems
- Additional safety devices and measures are not necessary due to the low transmission power of the sensors

The transmission frequencies of the FMCW radar sensors fall in the free frequency band between 57 and 64 GHz. As such, the system can be operated safely without time-consuming approval processes. Furthermore, the large band range enables high measuring accuracy.

The radar width measuring system was commissioned at Salzgitter Flachstahl GmbH back in 2017. Before the newly developed system was commissioned, its measuring accuracy and stability was first verified at the exit of the roughing stand by comparing the results with an optical width measurement system. Once it was moved to its final position right at the entry of the roughing stand, it was ultimately possible to achieve 99 % availability of the radar width measuring system despite the challenging conditions there. The maintenance requirements are primarily limited to the cleaning of the measurement window in the scope of regular maintenance downtime. Readjustment and calibration is only rarely necessary, for instance after retrofitting or conversion work in the measurement area.

> “Various measuring methods have already been investigated in this challenging environment. However, they all required so much maintenance and had such a high rate of error that permanent availability could not be ensured. Only radar width measuring offers excellent availability alongside minimal maintenance effort.”

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said Ingo Leckel, production measuring technology employee for wide-strip hot mills at Salzgitter Flachstahl GmbH, confirming the benefits of the radar width measuring system.

The radar width measuring system has since become a staple in the extensive product portfolio of IMS Messsysteme GmbH and has already been installed in numerous hot mills around the world. These customers have likewise confirmed the reliable performance and significantly more stable rolling process.

In addition to applications in hot mills, the radar width measuring system has since also been successfully integrated in heavy plate mills. The decisive advantage here is likewise the design of the system with its two separate measuring units positioned on either side of the roller table, enabling a measurement across the entire width area without building a costly superstructure.

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