

Final quality control with new measuring system at voestalpine Grobblech GmbH

A digital image of each individual plate

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nokra has successfully commissioned an optical measuring system for final quality control of roll-bonded plates at voestalpine Grobblech GmbH, Linz, Austria. The new system measures the outside plate geometry, flatness and surface condition. It is the first in the world to perform high-precision plate thickness measurements over the entire surface area.

Voestalpine Grobblech GmbH produces roll-bonded plates at its production site in Linz. Roll-bonded plates combine the strength of steel, which forms the base material, with the special properties of the cladding material to achieve specific performance features such as high resistance to corrosion or abrasion.

As these plates have to fulfil the most exacting quality requirements, final quality control in production is crucial. The final measurement before shipment has to ensure that each individual plate complies exactly with the customer's specifications.

Previously, voestalpine Grobblech had measured the thickness, flatness and outside contour – e.g. camber and squareness – of the plates at just a few measuring points with hand-held instruments.

The project objectives

One of the project goals was to increase the works' output by automating and accelerating the final quality measurements. A further objective was to achieve better and more detailed quality documentation through process digitalization and the possibility to store all relevant quality data. Additionally, a solution was to be provided that would make it possible to identify and eliminate the causes of defects and use this data for process optimisation.

nokra proposed a system using its alpha.VR light section sensors, which had already proved their worth in flatness measuring applications in plate rolling mills. nokra's proposal also included the possibility to measure the plate thickness over the entire surface area, i.e. along the complete length and across the complete width of the product. This is a novelty in measuring technology for heavy-plate rolling mills and was, in addition to the guaranteed high measuring precision, a main reason for voestalpine to decide in favour of the nokra system.

The technology

The alpha.VR light section sensors scanning the top and bottom sides of the plates are integrated into a measuring frame.

nokra's supply scope additionally included the integration of a chain conveyor that transports the plates below the gantry through the system and of two laser velocimeters for plate speed and position measuring.

The system measures the plate thickness with an accuracy of +/- 100 µm. The flatness measurement is in compliance with EN 10029. Plate length and width are measured with a tolerance of +/- 5 mm and +/- 3 mm, respectively.

As part of the commissioning activities, repeatability and measuring accuracy were first verified using test plates. Then, measurements of individual plates were compared with the results of the manual measurements. The performance criteria guaranteed were not only fulfilled, but clearly exceeded in many cases. voestalpine issued the Final Acceptance Certificate (FAC) on June 30, 2021.

The system transmits the thickness, flatness and contour measurements to the process control level. The material inspection staff uses this information to verify the results and assess the plate quality, among other things on the basis of graphical 3D displays with false colour rendering.

A separate work station is provided for the quality control staff to add data from visual assessments or manual measurements to the measurements taken by the automatic system. All these data are jointly stored and visualised.

Plate flatness is evaluated using different standards and guidelines, such as DIN EN10029 for hot-rolled steel plate, SEL 408 for clad plate and ASTM A20. Practical experience has been showing that the system operates reliably even given the low-frequency vibrations in the foundations caused by nearby plate movements and a certain level of dust contained in the air. The maintenance effort for optical systems like this is rather low. nokra delivers the sensors calibrated ex works. They are regularly adjusted and verified at intervals of several weeks. These adjustments and verifications can also be automatically performed during the plate measurements.



A roll-bonded plate entering the new measuring system

The results

The decision in favour of the nokra system was a step into unknown territory for voestalpine because planar thickness measurements of heavy plates had never been realized before. However, it rapidly became clear that the system is excellently suited to document the plate quality, help enhance process understanding and optimise the processes.

The high resolution of the data acquired opens up entirely new possibilities for analyses. While it used to take the inspection staff one or even two shifts to measure a plate manually, the new system now provides more than a million measuring points in just ten minutes. Additionally, more comprehensive and reliable information can be gained from the precise, high-resolution and objective measurement data provided by the new system. Thanks to the time-saving measurements, a much higher throughput can now be achieved with the same number of operators.

Based on the new data available, it is now possible to analyse any irregularities detected on the plates more deeply, enabling the causes of certain defects to become evident for the first time and helping to get a better understanding of the overall roll-bonding process. The flatness data from the full-surface measurements, for example, can be used to optimize the rolling and leveling processes. Plasma cutting can now be controlled based on entirely objective criteria – i.e. without influences by humans - using the data from the contour measurements.

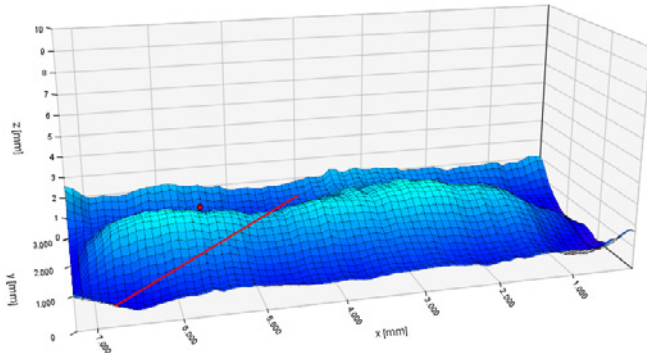
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About nokra

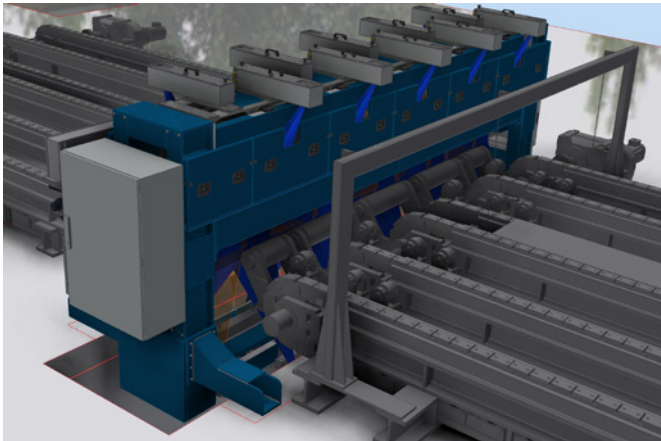
nokra GmbH is an international business specialising in high-end measuring and testing equipment for the manufacturing industry. nokra systems measure and inspect geometrical features such as length, width, thickness, flatness, profile, shape and position. The automated inspection systems and the laser sensors for the systems are developed and manufactured by nokra in-house. This enables the company to easily optimize a standard system for the specific use case on hand. nokra builds on comprehensive expertise from a wide range of projects addressing measuring tasks in the steel, aluminium, automotive supplier, plant engineering and automotive glazing industries.



The measuring system projects laser lines onto the plate surface



3D rendering of plate flatness; the red line represents the virtual 1-m ruler



Chain conveyors guide the plates through the gantry-type measuring system

Further potential with a view to gaining a deeper overall process understanding and achieving even more process security could be derived from using the system to measure the plates after each one of the about ten process stages of roll-bonding.

The new system provides a great advancement not only in terms of its high measuring precision, but also regarding the process digitalisation it enables. All the measured data are automatically stored and available for a virtually unlimited period of time. When rolling plates for special requirements, for example, it is now possible to access process parameters previously used to produce similar kinds of plates.

A positive side effect of the optical system is that it renders a photographic, high-resolution image of both plate surfaces. In this way, voestalpine can document that all the plates leaving the mill are free of surface defects. Additionally, the stampings can be checked to ensure that all data have been correctly assigned.

The future

The new system fulfills all performance requirements specified by voestalpine. From the outset, it was planned that the system should take over additional tasks in the future. This will primarily entail expanding its software capabilities to be able to perform data analyses that take into account a wider range of criteria. This would be applicable, for example, to pipelines intended for hydrogen transport. These products pose a new challenge as the cladding for this specific use has to comply with a number of new requirements.

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