



Flexibly expanded

■ Satisfied with the swift and competent service offered by Nikon: the modified CAMIO software enables Alexander Tonn and André Schneider to fulfil all the quality assurance criteria for brake discs

Nikon swiftly integrates customer-specific measuring and inspection processes

WESO-Aurorahütte, an iron foundry based in Gladenbach, produces high quality brake discs for rail vehicles. Once the cast parts have been machined, numerous geometric features need to be measured, correlated and evaluated statistically. This can now be done effortlessly with measuring software which Nikon has modified according to the foundry's specifications.

"By moving into the field of railway engineering, we've entered a new market which will safeguard the future of our company," reports Alexander Tonn proudly. He heads the Certification and Quality Control department of the WESO-Aurorahütte GmbH iron foundry in Gladenbach. However, various hurdles had to be crossed to achieve this goal. The foundry, which belongs to the Viessmann Group, formerly focussed on supplying a wide range of cast iron parts for boilers to Viessmann, a central heating manufacturer. In addition, the Gladenbach-based foundry manufactures cast iron parts for mechanical engineering, agricultural engineering, pumps, gearboxes, engines, valves and cooling units. The batches vary in size from 1500 to 50,000 components per annum. On its automated moulding and casting lines – with moulds measuring 900 x 1100 x 200mm – the company can produce parts weighing up to 150kg. "As a result of technological progress, the demand for cast-iron boilers has declined," Tonn reports on the trend in central heating since the 1990s. Today, boilers used for central heating in residential properties are small and lightweight, and generally made of sheet metal which is remodelled and welded. As a result, the foundry in Gladenbach is receiving fewer orders from this industry. However, the company nonetheless wishes



With cast brake discs for rail vehicles, our foundry has been able to gain a foothold in a new and profitable market."

Alexander Tonn, head of the Certification and Operative Quality Control department at WESO-Aurorahütte GmbH in Gladenbach

to continue using its full capacity of around 30000 tonnes per annum, and safeguard the 400 workplaces in the foundry. "Our foundry specialises in producing small and medium-size batches of cast-iron components with cones, bridges, domes and perforations," Tonn reports. The search for suitable components finally led to brake discs for rail vehicles. "Due to their size, we can produce these components efficiently and well on our existing moulding lines. So they're an ideal addition to our portfolio. In addition, the batch sizes ordered by the brake and vehicle manufacturers correspond exactly to our capacities. So we seized the opportunity," Tonn adds.

Value creation

However, the brake discs require considerably more machine cutting than boiler components. For example, numerous cones, domes and bridges have to be overwound on interrupted cuts for ventilated axle-mounted brake discs and single-piece wheel brake discs. Numerous holes, counterbores, screw threads, grooves and perforations also need to be finished. The foundry in Gladenbach has invested in the heavy machining and processing equipment required for this purpose. "Our clients prefer to receive finished components which are completely ready to install. By investing in suitable manufacturing technology, we add significantly to the value of what we produce. We also have extensive expertise along the entire manufacturing chain, from the casting process through to machine cutting. This gives us an edge over our competitors," Tonn says, explaining the company's strategy. WESO is even able to offer surface coating and assemble the moulded and processed components.

As the foundry in Gladenbach has observed, railway engineering clients and supervisory authorities and institutes demand comprehensive quality controls. These are necessary to ensure a high level of safety when the brake discs are used in locomotives, freight cars, passenger trains and trams. Hence the foundry in Gladenbach has to repeatedly furnish evidence for machine capability and process stability. For this purpose, WESO-Aurorahütte uses Nikon's LK V coordinate measuring equipment. This is installed in a spacious, temperature-controlled measuring laboratory. Cast-iron parts weighing up to 150kg and measuring up to 1200mm x 2000mm x 980mm can be measured here with ease.



■ The WESO-Aurorahütte foundry produces up to 100,000 brake discs per annum in around 80 versions

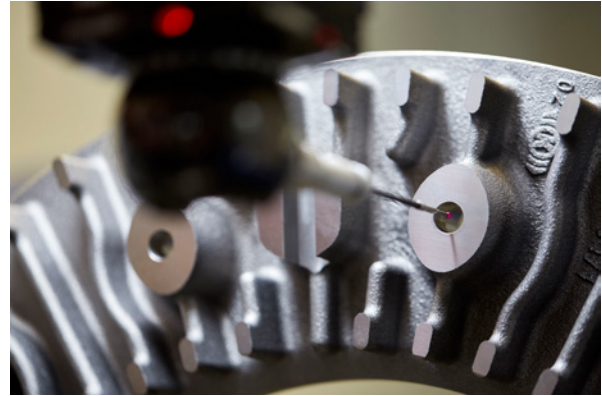
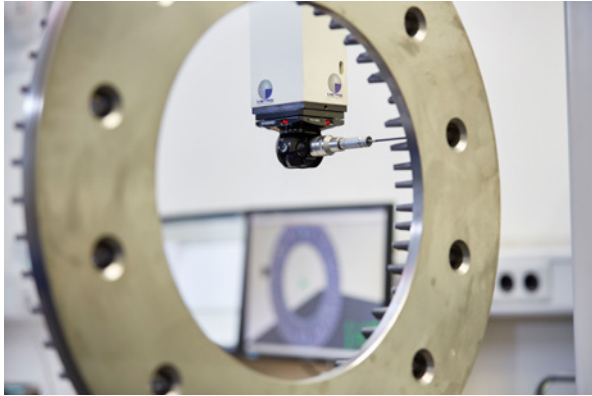
Statistical evaluation

However, the requirements regarding the brake disc features which have to be measured are particularly challenging. André Schneider, who is responsible for quality control in the measuring lab, explains. "Besides the diameters of holes, the depth of counterbores, the thickness and the overall diameter of the brake discs, we have to determine the positions of the holes and grooves, their positions relative to each other, and their positions relative to a virtual central axis. I say virtual, because the brake discs have a large hole in the centre so that you can push them over the gear wheel shaft. This means we can only determine the position of the central reference axis by evaluating other measurements."

The metrologists in Gladenbach were able to measure some of the relevant features using coordinate measuring equipment in combination with Nikon's CAMIO measurement software. However, it was difficult – and impossible – to determine correlations between features such as the symmetry of holes and milled grooves in relation to the central axis of the brake discs. On the one hand, this concerns the pitch circle diameter, and on the other hand the angular position of the six or eight holes and grooves. These measurements not only serve to ensure each brake disc is manufactured with precision and to high quality standards, but also to assess machine capability for the machine cutting. For the latter purpose, the recorded measurements had to be transferred to a database and evaluated statistically using dedicated analysis and reporting software.

Software swiftly customised

To rectify this situation, the foundry metrologists contacted the specialists at Nikon. Within a matter of weeks, a suitable solution was found. The experts first adapted existing measuring cycles and the inspection algorithms to evaluate the results with the required correlations. They then programmed a data interface which was able to present the required measurements in a standardised form for the required statistical evaluation. Working together with Schneider, the experts then used real customer samples in Nikon's training centre to develop suitable measurement methods and strategies for the cast components. As a result, staff in the quality control department of the



■ Within just a few weeks, metrology experts from Nikon modified the CAMIO software for the LK V coordinate measuring machine in order to provide reliable and fast readings for the angular position of grooves and mounting holes

foundry now only need a small number of individual measurement cycles on the coordinate measuring machine to record the required features of the holes and grooves, such as their relative angular positions and their position relative to the virtual central axis. The readings are transferred directly to a standardised database where they are then evaluated statistically. The results indicate the machining capability and stability of the processes. The evaluated data can also be used as documentary evidence. Schneider reports that he was fully satisfied with the collaboration with Nikon and with the resulting software update. "The programmers and service technicians collaborated closely with us and were quick to identify our special measuring needs," he emphasises. To summarise, Tonn adds: "In a matter of weeks, the metrology experts at Nikon were able to develop workable routines for measuring and evaluation. We were able to optimise these together in an ongoing process. The result, in a little less than three months, was an extremely efficient software update to CAMIO 8.2. We are totally satisfied with the way this works, and it meets all of our specific requirements. Using this software, we can now effortlessly furnish evidence of the quality of the brake discs which are cast and machine cut in our foundry, in accordance with all specifications. Nikon's qualified and swift service, based on their extensive metrological expertise, contributed significantly to our success. We can now hold our own as a serious competitor on the exacting market for railway technology." The foundry in Gladenbach uses the updated and modified CAMIO 8.2 software on the coordinate measuring machine to measure and evaluate individual cast components at the beginning of different production runs. It is also now able to swiftly and effortlessly generate statistical evidence on machine capability and process safety.

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