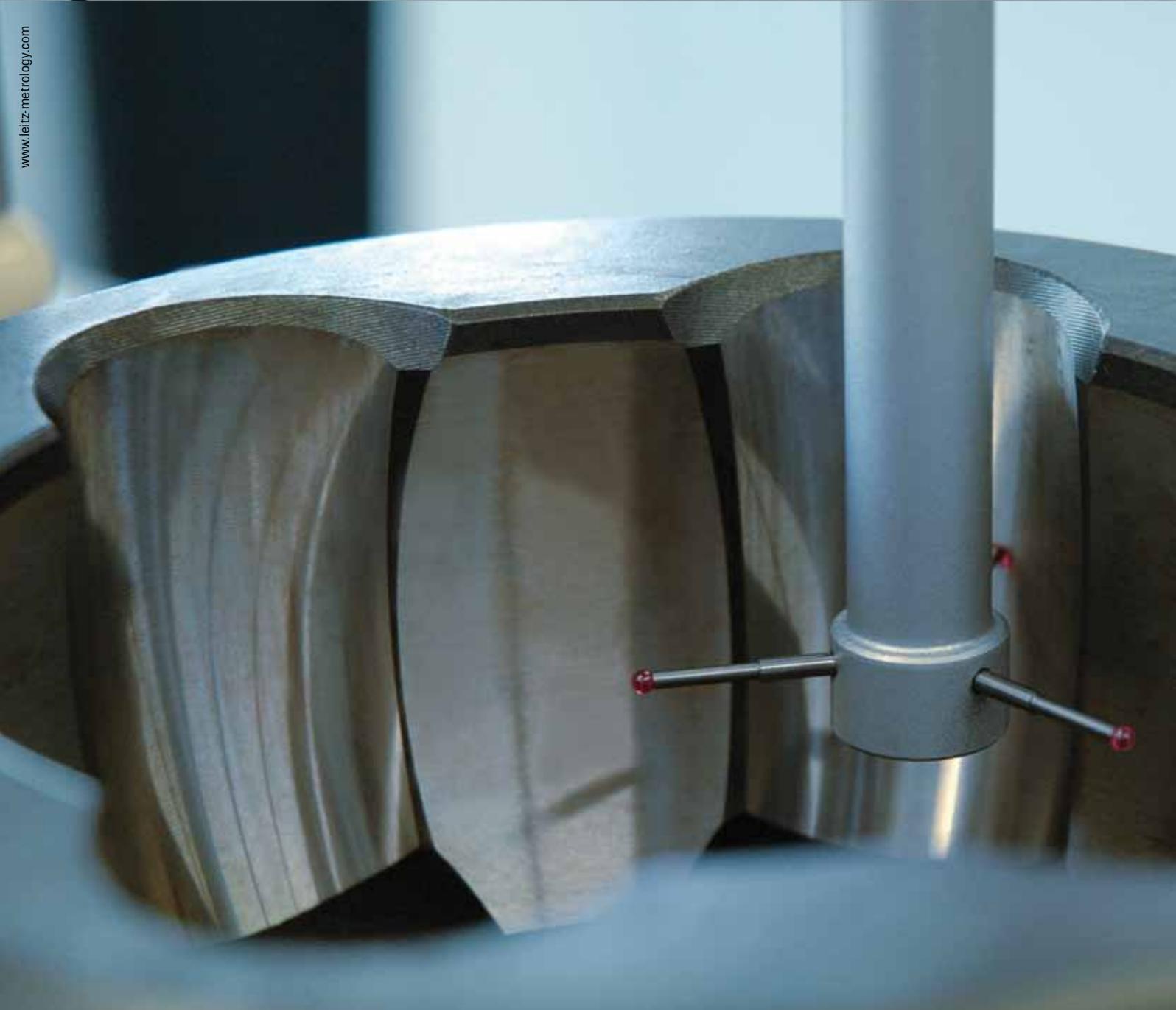




Case Study Grünewald Feinmaschinenbau
All-round coordinate measuring system facilitates
testing of constant velocity joints and tools

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Grünewald Feinmaschinenbau believes in offering a broad range of production services. Almost all processes are carried out in-house, from machining a hub on a special machine through to induction hardening drive components in the company's own hardening shop.

The Leitz Reference scans the ball races of the hubs with the help of a functional ball which resembles the balls which will later run in the ball race. In that way the time needed for measuring is drastically reduced.

Grünewald Feinmaschinenbau has facilities in Grävenwiesbach in Hesse and in Weilmünster and is a company that enjoys a complex challenge. This family-owned business produces various drive components for its customers to drive a diverse range of vehicles, such as HGVs, military vehicles, racing cars, ships or rail vehicles. Constant velocity joints in particular form a large part of the order volume. Flexibility is a must for this commission-based work and so the company's metrology also has to be flexible. With the universally usable Leitz Reference and the QUINDOS software, Grünewald is able to measure ball races as well as toothed wheel work of constant velocity joints in one measuring process - and obtain a reliable documentation at the same time.

For Grünewald, flexibility covers more than the range of parts they produce. In terms of batch size, the company also offers a variety of options for drive components, from prototypes to small, medium and large series. In addition, the company offers a jig making, tool making and special machine building service. What is the production strategy behind this approach? The company firmly believes in offering a broad range of production services. „Whether it is machining before heat treatment, toothed wheel technology or heat treatment, we have the expertise“, says Markus Grünewald who is the third generation Managing Director of the company. „Anybody can get a serial production going but when the batch size is small, you have to be able to control it. For example, when you are building a prototype and there is a change of material at short notice, you have to be able to influence the process directly.“ So it is no surprise that the proportion of specialist workers is more than 90 percent.

Grünewald is one of the first companies to have taken constant velocity joints into their production programme. A constant velocity joint transmits the torque evenly from one shaft to another shaft - irrespective of the angle between these two shafts. For example in a lorry the joints transmit the torque from the drive shaft to the wheels. Usually constant velocity joints consist of six balls that move between a ball race and the hub of an axle. A ball retainer encloses the balls and keeps them in their race.

Flexible duo: Leitz Reference and QUINDOS 7

Until recently, measuring all characteristics of ball races and ball retainers was a feasible but complex task for Grünewald. The company used manual measuring instruments and adjustment / calibration devices they had developed and constructed themselves. However, the production of these devices was costly and the application was complicated. In addition, the technological aspects and requirements of the automotive industry regarding measured data pushed the capabilities of these devices to their limits, so a solution had to be found.

Now, a coordinate measuring machine of the Leitz Reference series, combined with the QUINDOS 7 software scans and checks the ball races in an air-conditioned measuring room. Markus Grünewald explains: „These days we need a more comprehensive documentation for our customers. We were looking for a measuring machine that makes our handling easier and gives us flexibility in our work because we have to measure many different highly complex parts to customer-specific requirements. In addition, the shape and positional tolerances are very tight.“

In particular, Grünewald uses the system for measuring ball races and toothed wheel work of constant velocity joints as well as the geometry of tools. When Grünewald is monitoring a serial production, they use the Leitz Reference for the initial type testing as well as intermediate and final checks. The team also uses the measuring system for the





elements. The manufacturers of other measuring instruments were struggling to do that and were only able to offer us partial parameterisation."

Faster and easier: Documentation and determining process capability

In addition to the appealing software interface, there were other factors that influenced the decision in favour of Hexagon Metrology. The documentation needed for each part is now produced automatically; it is very easy for the team to produce test reports. Lothar Wilhelmi, QMB and Head of Operations, and Head of QA, Wilfried Knöpp, explain: „Initial type testing used to be mandatory only for larger series. Today this is also required for small and mini-series. That means we have to produce many more documentations than before and that is only possible with such a coordinate measuring machine."

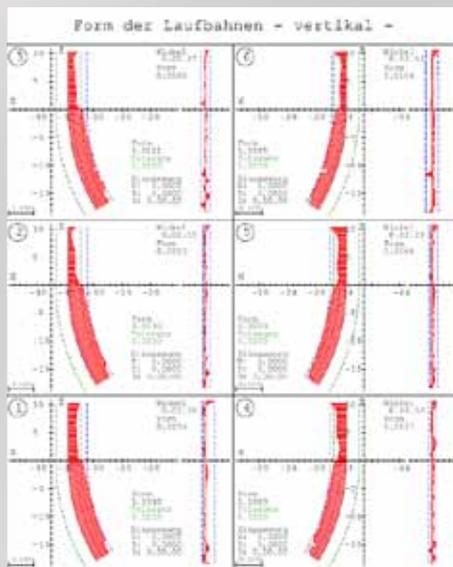
In addition, Hexagon Metrology's solution provides benefits for the calculation of process capabilities. This task used to take the team several hours but now the required time input has been substantially reduced. The coordinate measuring machine takes care of the measured data, which are filed in the certified qs-STAT format. Then the process capability is evaluated using statistics software. As soon as the process has been defined, the measuring system can also be used to determine tool life.

Another plus is the short distance between Grävenwiesbach and Wetzlar, the seat of Hexagon Metrology GmbH. When there is need for it, the metrology group's service and application technicians are quickly on site.

In spite of the fact that some of Grünewald's customers work with a measuring system by a different manufacturer, the decision was made clearly in favour of Hexagon Metrology. Markus Grünewald: „We will have to compare the results at the end with many different customers who all use different systems. We had mainly focused on the solution of our problem. The way Hexagon Metrology tackled the problem convinced us. We now have a flexible measuring system with software that is comparably easy to operate - and that was our aim."

Birgit Albrecht and Gerhard Ehling

Owing to different exposures and a large measuring range, technicians are able to measure many different components of the constant velocity joints, and different kinds of tools.



Parameterisation makes it easier for the measuring technicians to use the QUINDOS 7 software. The results are displayed in diagrammatic form on the reports for easy reference.

production of prototypes. Normally this work has to be done on the basis of drawings for the components.

Parameterisation as basis for user-friendly handling

In order to make the job of measuring as easy as possible for the Grünewald team, Hexagon Metrology used the extensive possibilities of parameterisation for programming the QUINDOS 7 measuring software. This works by using parameters for the description of all characteristics of the constant velocity joints as stated in the test plan or on the drawings, such as the number of ball races, the horizontal and vertical profile of the races and standard geometries. This covers a broad spectrum of components without having to write hundreds of measuring programmes. For example, the vertical profile of a ball race is circular in shape. The horizontal profile of the races is either circular, gothic or elliptic. All the user has to do is to enter the required shape on the software interface. The user can enter all parameters for the description of the measuring task on the QUINDOS interface, and the software will then generate the measuring programme independently. In this way, the measuring machine, together with QUINDOS 7, helps to reduce handling times significantly.

"Together with Hexagon Metrology we have defined the parameters we need", says Markus Grünewald. "That really makes our measuring task a lot easier. Now our team can make new programmes simply by putting together different parameter



Leitz

The Leitz brand as part of Hexagon Metrology stands for high accuracy coordinate measuring machines, gear inspection centers and probes. Leitz measurement systems master quality assurance tasks equally well both in metrology labs as well as on the shop floor. The development and production are located in Wetzlar, Germany. For more than 30 years Leitz has been offering its customers the best innovative measurement technology available. The primary goal remains offering modern solutions for demanding measurement tasks.

Hexagon Metrology

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