GREAT OPTIMIZATION EFFECTS

Source: Jos. Schneider Optische Werke GmbH

THROUGH SMALL MEASURES

Many companies still have gaps in the process chain, not only between design and production, but also at the interface to quality assurance.

Closing these gaps and using the digital data more consitently opens up enourmous potential for rationalization.

Jos. Schneider Optische Werke in Bad Kreuznach, Germany, has reduced the time required for creating the inspection plan by 50 percent through the integration of BCT Inspector alone.

Schneider KREUZNACH

BCT

Small Quantities

High Quality

In Germany, you can't get anywhere with camera lenses for the mass market. Jos. Schneider Optische Werke GmbH, which manufactures high performance photographic lenses, recording and projecting lenses for the film industry, industrial optics and precision mechanics under the brand Schneider Kreuznach, does not dispute this. The high perfomance lenses of this traditional company e.g. test the quality of LCD screens in production facilities, or produce sharp images of „racers" in radar traps, or reliably identify trucks from all over the world at tool booths on Germany's motorways.

The Schneider Group includes Jos. Schneider Optische Werke (Bad Kreuznach, Göttingen), founded in 1913, the subsidiaries Pentacon (Dresden), Schneider Optics (New York, Los Angeles), Schneider Asia-Pacific (Hong Kong) and Schneider Optical Technologies (Shenzhen). The company employs around 620 people worldwide, 390 of them at its headquarters in Bad Kreuznach.

The B+W brand, which stands for top-class photo filters, also belongs to Schneider-Kreuznach.

Customer-specific lens systems for applications such as autonomous driving in the automotive and commercial vehicle industries as well as for medical technology, as Dr. Ralf Mayer, Head of R&D and IP, explains, are still a young mainstay with great potential. These systems are normally connected to a control unit with rudimentary electronic intelligence, which evaluates the image data. The decisive factor here is not the maximum image quality, but rather the reliability of the display, as Mayer continues: „At the end of the production line, we have to check which distortion parameters occur with each lens in order to be able to correct them using software".

Data management with Teamcenter

The lens systems are much more complex than normal lenses, which could be constructed in 2D due to their symmetrical construction. But this is no longer the case at Schneider-Kreuznach, as designer Ralf Linn notes. He and his colleagues have been designing in 3D since 1996, initially with the I-DEAS CAD system, which was replaced by the NX software in 2012. At the same time, the company introduced the Teamcenter PLM system for product data management in Bad Kreuznach and Göttingen, which today also manages CAM data and NC programs. Currently, 32 Teamcenter and 20 NX licenses are available to the users, which were recently converted to version 10 with the support of Platinum Siemens PLM Solution Partner BCT.

As a rule, lens systems for automotive or medical technology are developed on customer order and manufactured in small quantities. Often these are research projects in which the product developers work very closely with the customers. The growing complexity of the systems is partly due to the fact that the individual components are installed where there is still space in the vehicle or engine compartment. In the case of a DLP projector for a head-up display, for example, this means that the light beam has to be deflected several times via mirrors, which is no longer easy to calculate in the head.

Viele Dinge lassen sich auch nicht mehr mit vertretbarem Zeit- und Kostenaufwand am realen Prototypen testen, sondern müssen vorab mit Hilfe der Finite-Elemente-Methode (FEM) simuliert werden, wie Konstruktionsleiter Dr. Norman Möller ergänzt. „Wenn das Abbild auf dem Sensor wandert, müssen wir auf theoretischer Ebene untersuchen können, ob es an der Verklebung liegt oder ob eine einseitige thermische Belastung die Ursache ist. Das kann man nicht mehr durch Tests herausfinden, weil einem sonst die Entwicklungskosten davonlaufen."

Many things can no longer be tested on real prototypes at

Company building of Jos. Schneider Optische Werke GmbH in Bad Kreuznach, Source: Jos. Schneider Optische Werke GmbH

reasonable time and cost, but must be simulated in advance using the finite element method (FEM), as design manager Dr. Norman Möller adds. „If the image moves on the sensor, we must be able to investigate on a theoretical level whether it is due to the bond or whether the cause is a one-sided thermal load. This can no longer be determined by tests, otherwise the development costs will run out."

In order to be able to answer such questions with FEM, users not only need reliable input data, e.g. the thermal expansion of certain materials; they also need to know the calculation systems well and be able to interpret the results correctly, as Möller further explains. Schneider-Kreuznach is therefore building up the necessary know-how in handling the NX Nastran software. With the help of FE analysis, the company wants to increase the degree of maturity in the early phase of product development in order to shorten the development cycles and have to build fewer real prototypes

Save Tremendously

With Many Small Measures

High time pressure in development

Product developers are under considerable time pressure with both customer-specific developments and catalogue products, as Mayer says: „The manufacturers of professional cameras present a device with a new sensor every year. We have to adapt to this in lens development, i.e. save a great deal of time with many small measures along the entire process chain. An important starting point for this is drawing management or the paradigm shift from 2D to 3D".

Although Schneider-Kreuznach has set up an integrated CAD/CAM process chain based on NX for five-axis milling and turn milling with driven tools, important information for NC programming, such as

Elimination of

unnecessary iterations

tolerances, is still transmitted drawing-based.

Mayer's ideas are to attach this information to the 3D model in the medium term as PMIs (Product Manufacturing Information), which of course only makes sense if it can be automatically evaluated for NC programming.

There is further potential for time savings in NC programming, as Mayer says. The creation of the programs takes comparatively long and their quality sometimes leaves a lot to be desired, which is partly due to the different level of training of the users: „We have to invest more in training," says Mayer, „to get to the point where the users program during the day and prepare the machines for the various jobs so that they can be run unattended at night," he says.

Schneider-Kreuznach is one step ahead of other companies when it comes to the organizational integration of design and production. An employee from the work preparation department continuously advises the design engineers on the design of their components for production, taking into account the machining possibilities and production tolerances of the existing machines. This contributes significantly to avoiding unnecessary iterations.

Automated inspection plan generation

At the interface to quality assurance, the company has succeeded in closing the gap in the digital process chain by introducing the BCT Inspector, albeit not completely, but still significantly reducing it. The additional software from BCT accesses the NX drawings and the production information in the model, automatically selects the quality-relevant features for the inspection process, clearly numbers them and compiles the dimensions, tolerances etc. to be inspected in a table of values. „This used to be a time-consuming and error-prone process because we had to manually enter the values into an Excel list," says Christoph Ackermann, design engineer in R&D. „By automating the extraction and stamping process, we save up to 50 percent of the time needed to create the inspection plans. Quality assurance today only needs to determine which characteristic is to be checked at which test station with which test equipment (measurement, teaching, visual inspection, etc.) and can generate the test plan..

The characteristic information

Lens for 1:1 Imaging.
Source: Jos. Schneider Optische Werke GmbH

is not yet transferred directly to the 3D measuring machine, but its connection is planned according to Ackermann. It would simplify the definition of the inspection points or surfaces to which certain dimensions refer during measurement programming. „Even if the characteristics are extracted from a drawing, they know their reference points or surfaces thanks to the associative linking of drawing and 3D model", explains BCT product manager Marko Weber the advantages of the software. The prerequisite is, of course, that the designers have correctly referenced the dimensions.

Quality assurance today already makes use of the possibility of programming the measurement operations on the digital model before the finished component is available. To do this, the CAD models are loaded into the machine's programming software via the Zeiss NX module. The digitization of the measurement programming allows certain activities in production and quality assurance to be performed in parallel, which saves time, especially in the prototype business, as Mayer says: „When the part comes from the machine, we no longer have to wait hours for the test program to be created.

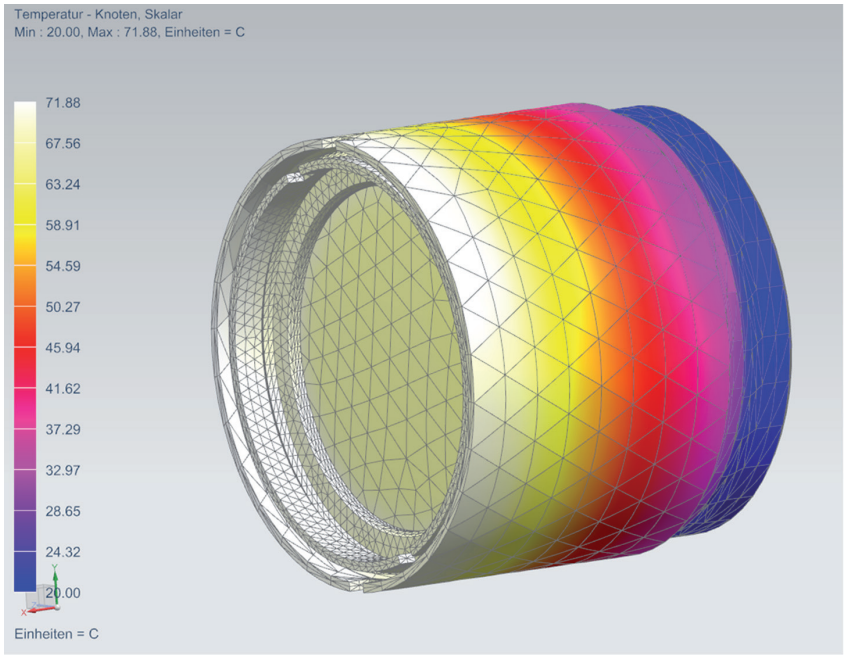
It is not yet clear in which IT system the measurement data and other quality data will be stored in the future. The only thing that is certain is that they are to be recorded electronically in order, for example, to be able to better understand which components from which batches are used in which products. Mayer says: „I would therefore like to be able to access quality information from my Teamcenter workstation directly from the production department".

50 Percent

Time Savings

Improving collaborationt

The integration of quality management into the PLM environment is a further step on the way to digital process chains. Not to forget the ERP integration, which requires some preparatory work, as Ackermann says. Today, the parts lists are still exported from Teamcenter as Excel tables, prepared manually and imported into SAP. Despite the remaining gaps, the benefits of the many integration measures are already making themselves felt: „We have clearly become faster, but this is not only due to the IT tools used, but also to better cooperation. Today, employees from optics design, mechanical development, electronics, quality assurance, manufacturing and purchasing work together efficiently in mixed teams. It's no longer just a matter of throwing something over the fence."



Temperature distribution, thermal simulation. Source: Jos. Schneider Optische Werke GmbH

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