Sharing Experiences

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Abstract:

Companies repeatedly determine that not all purchase parts fit exactly despite extensive specifications and controlled production. For fear of expensive recalls and complaints, many companies therefore go on the offensive and check all purchased parts despite extensive measurement reports. Many companies would be able to skip this time-consuming, resource-intensive work by having the measuring process of their suppliers checked and certified by external experts.

KEYWORDS: **CMM**, **measurement strategy**, **metrology**

There is hardly a single workpiece whose design parameters cannot be measured on a modern coordinate measuring machines (CMM). The problem: the increasing functionality on measuring machines has not only expanded their possibilities, but has also made their operation more complex. This means that even the measurement results obtained with the same CMM on the same workpiece under comparable environmental conditions can deviate simply due to the variety of definition and configuration options in the measuring software. However, the comparability of measurement results in modern, global industrial production and its ever tighter tolerances is now as important as accuracy (fig. 1). A first step toward the comparability of measurement results is to identify the influences on the measuring process.

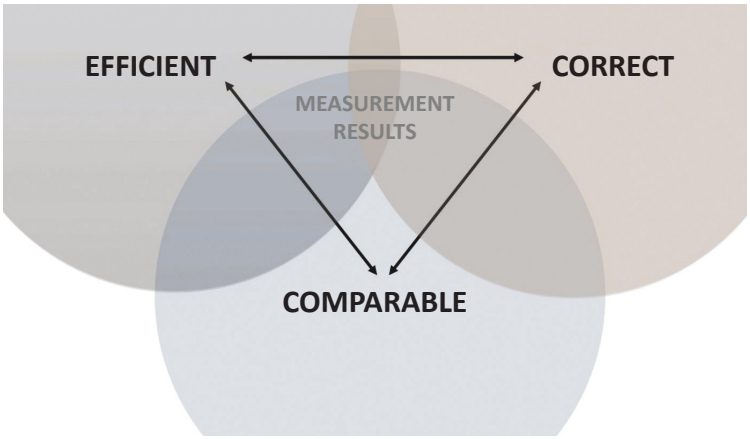

Fig. 1. Comparability of measurement results in modern, global industrial production and its ever tighter tolerances is now as important as accuracy.

Employees

It is widely known that temperature, vibrations and impurities can falsify measurement results. But, according to an internal ZEISS study, these factors have only a minor impact on the measurement result. The workpiece itself, the measuring machine including stylus and fixture, the chosen measuring methods and, finally, the user have a much greater influence on the correctness and reproducibility of the measurement results. According to ZEISS, the greatest deficits in the companies in the study were found in the qualification of employees and, in particular, the lack of standardization and documentation of the measurement strategies. With its Measuring Process Assessment, ZEISS demonstrates that trust in the results can be generated despite these wide-ranging influences and error sources. This offer can be used for ZEISS as well as non-ZEISS coordinate measuring machines.

Fig. 2. Assessors from ZEISS check the measurement strategy of companies.

Internally tested

Carl Zeiss Industrielle Messtechnik GmbH examined a measuring process for the first time in 2011 following an internal inquiry. Carl Zeiss Semiconductor Manufacturing Technology GmbH did not trust the results of its suppliers and measured every single part it received. In order to eliminate these costs in the future, those responsible had their suppliers checked and certified. The criteria and checklists developed by internal experts at ZEISS still provide the foundation for the Measuring Process Assessment that ZEISS offers to companies in all industries (fig. 3). The on-site assessment is conducted by experts who have measured for at least five years themselves, have attended measurement

training (AUKOM 3 or comparable) and have successfully completed assessor training monitored by the DQS. These assessors first introduce the topic at the customer and then analyze the measuring process using an extensive checklist. Furthermore, they answer questions from the technicians and explain the content of standards. During the assessment, they take a close look at everything – from the measuring lab and machine portfolio to the staff, measuring procedures and machine monitoring up to reporting and documentation. Furthermore, they conduct measurements on-site with a calibrated artifact to substantiate the results the checklist flags with actual measured values. During the evaluation analysis of the check, the responses to more than 100 questions are broken down into seven categories, each of which is weighted separately. In addition to the certificate and a short presentation of the result, the assessors also compile an extensive report that is generally around 25 pages and lists the weaknesses and concrete recommendations for action.

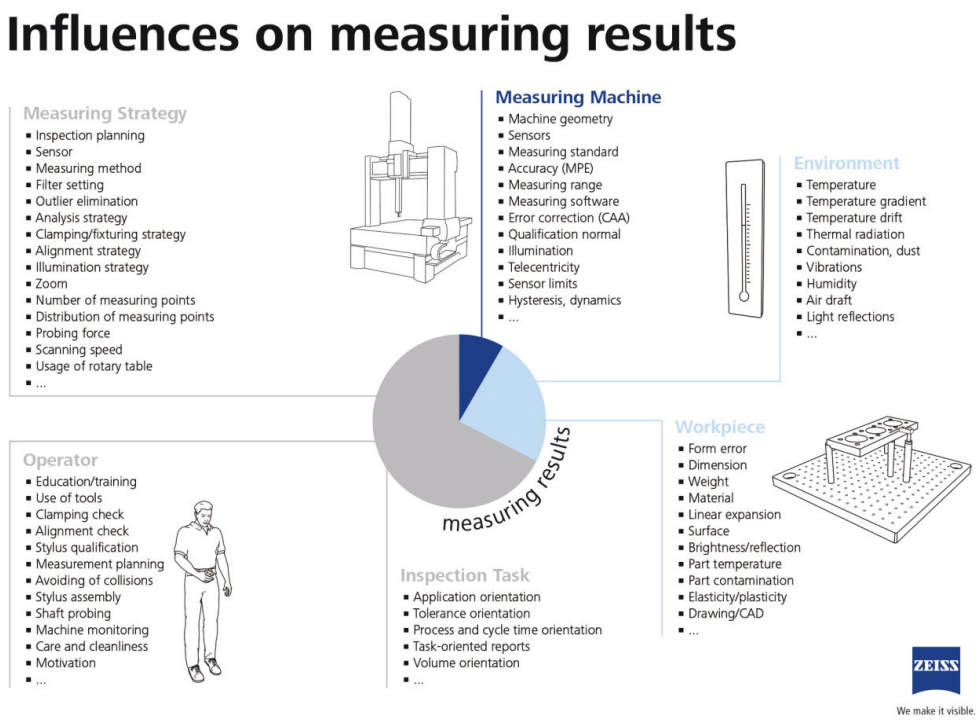

Fig. 3. Influences on measuring results

Benchmark engenders trust

Experience has shown that benchmark values create trust. Carl Zeiss Semiconductor Manufacturing Technology GmbH, for example, now no longer fully inspects the goods from supplier that have achieved a score of 80 or better on the assessment. This enables the company to cut costs considerably and reduce throughput times. The measuring process assessments are therefore now included in the annual audit program. This means that Carl Zeiss Semi-

conductor Manufacturing Technology GmbH regularly schedules measuring process assessments and other supplier audits which incorporate uniform reporting structures and tracks implemented measures. Furthermore, measuring process assessments are used for all new suppliers. As a result, it is evident at an early stage if a supplier is capable of not only manufacturing parts, but can also reliably qualify them. For example, measurement plans are generated immediately after a drawing has been approved, measurement strategies are coordinated at an early stage with the supplier and initial sample inspections are made on-site, sometimes together. This approach and close cooperation with the suppliers enables the company to considerably reduce its downstream costs and labor.

From internal to external

ZEISS has been offering this service to external companies for two years. In that time, more than 20 companies, largely automotive and optics suppliers, have been evaluated. But, it is not always about assessing the suppliers. For example, an automotive supplier in Mexico wanted to analyze the measuring processes at its own production sites. Although the company measured at a very high level, the parts did not work in production. The problem: the measuring tasks were interpreted differently from factory to factory. In other words, the measurement strategy did not work. This resulted in one site measuring a borehole for diameter, the other for fit. Thanks to the ZEISS assessors, the automotive supplier changed its communication process and formulated measuring guidelines that cover all measurement parameters and clearly specify when which compensating method has to be used (fig. 2). In addition to a flawed measurement strategy, experience has shown that sensor monitoring, temperature monitoring and the documentation strategy frequently impair the comparability of the measurement results. But not always and not everywhere. After reviewing the measuring process in three factories, the management of the automotive supplier decided to check the situation in its other seven plants. This ensured that they were no long comparing apples and oranges.