

Optical Metrology Application Note User Case Study

Application: Integrated automated optical measurement solution in a lathe.



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Bruker Alicona is a leading global supplier of optical metrology solutions based on the principle of Focus Variation.

Focus Variation works on the basis of moving a focal plane over a surface and collecting robust 3D data which can then be used to measure geometric form and surface finish from a single optical sensor.

Measurement processes can be fully automated and provide GD&T measurement capabilities across all industrial & medical sectors.

The systems are in use in Industry, Industrial Research, Universities and production facilities globally.

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Introduction

Increased productivity with reduced tool costs by means of a collaborative measuring system

In this application note, we describe the use of how a Bruker Alicona Optical Metrology sensor driven by a collaborative robot is used by Element Six to automatically measure tool wear.

The metrology system used for this measurement task is the Bruker Alicona Compact Cobot as shown below in Figure 1.



Figure 1

The knowledge of wear types and wear behavior has enabled Element Six, an expert in high-performance materials, to deliver a step change in performance with a new PCBN cutting material. One decisive factor during the testing stage was the implementation of automated test series. This and the ability to measure tool and workpiece directly in the lathe has made a significant contribution to "achieving the performance increase we have set ourselves as our goal," Element Six says.

Machining speeds of 300 m/min, predictable wear behavior and up to 50% longer tool life in hardened steel machining are the advantages that Element Six assures its customers from the automotive, aerospace and mechanical engineering industries. The latest generation of PCBN. PureCut™ are designed to provide complete control over the PCBN manufacturing process, resulting in significant productivity gains and reduced tooling costs. One of the devices that contributed to the development of the new material was the use of high-precision, automated Alicona measurement technology which are used for the analysis of various types of tool wear and wear behavior during different machining conditions. One critical factor in the test phase for the new cutting material was the implementation of automated test program which Element Six implemented with Bruker Alicona the collaborative measuring system CompactCobot. Using this the tool and workpiece surface finish are measured fully automatically directly in the lathe.

Automatic measurement and determination of wear in high measuring point density

In the development of the new PCBN generation, the focus was on the measurement of flank, crater and notch wear. The ability to automate test series has helped to make the development process as efficient as possible and ready for production. "Our productivity in the testing of cutting tools is limited by our information gathering process, primarily

regular measurement of cutting tool wear”, says Dr. Wayne Leahy, Head of Applications for Cutting and Grinding. He continues: “We purchased the Alicona Cobot system so that we could start to automate the cutting process. Gathering a large number of data points on wear behavior under different machining conditions was instrumental in helping us to optimize the new technology. This in turn helped us to deliver the step change in performance we were looking for.”

Integration into lathe

A key sector of Element Six's core business is the development and implementation of integrated production strategies in machining technology. The aim is the communication and networking of production systems, machines and measurement technology making the choice of a partner very important. They play an essential role in implementing fully automated production with machine-to-machine communication in the medium term and especially applies to partners in measurement technology. Production suitability, automation and the ability to connect to existing production and quality management systems are basic prerequisites that production measurement systems for quality assurance must meet. For this reason, Element Six, already a user of Bruker Alicona measuring instruments invested in an Alicona measuring system.

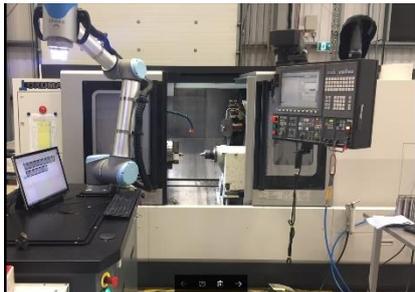
The CompactCobot enables this integration and networking in several ways. On the one hand, the optical collaborative measuring system is so robust that even in production high-resolution measurements are achieved with high measuring speed and in high repeatability. Automated unmanned measurements in production are achieved with an AutomationManager.

Also, the Cobot has interfaces such as TCP/IP, Modbus/TCP or Anybus and can thus be connected to existing production systems. This

integration enables communication between the individual machines and thus contributes to the implementation of self-controlling, self-correcting production.

With the CompactCobot, Element Six has started to implement this modern manufacturing concept. Both the tool, an insert, and surface finish of the workpiece are measured in the lathe.

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Then the robot arm returns into its original position. All measurements are carried out without unclamping components. The next step in planning is the automatic correction of machine parameters based on the measurement results. The Cobot transmits measured values or an OK/not OK signal to the lathe. If tool or workpiece do not meet the specified tolerances, the lathe automatically changes machine parameters and testing continues. In this way, the first part is already produced as a good part.

Simple operation: teach-in of measurement series without programming skills

There is another aspect that is decisive for the implementation of integrated production strategies with automated measurement technology. Measuring systems must be easy to operate without programming knowledge. The teach-in of measurement series by an administrator is carried out in only three steps. Special programming skills are not necessary. The measurement is started at the push of a button, the measurement result is independent of the operator. As it is with other Alicona measurement systems already in use, the new CompactCobot meets the high demands of users at Element Six. "It took about a day to train an operator on the Cobot. Handling and user guidance is extremely simple and intuitive," says Wayne Leahy.

Summary:

Using the Bruker Alicona optical 3D sensor mounted on a collaborative robot provides a solution to in process detailed measurements, also it allows the measurement of small features on large objects.

Details on Cobot systems can be seen at <http://bit.ly/2LljGMG>.