Bar Peeling

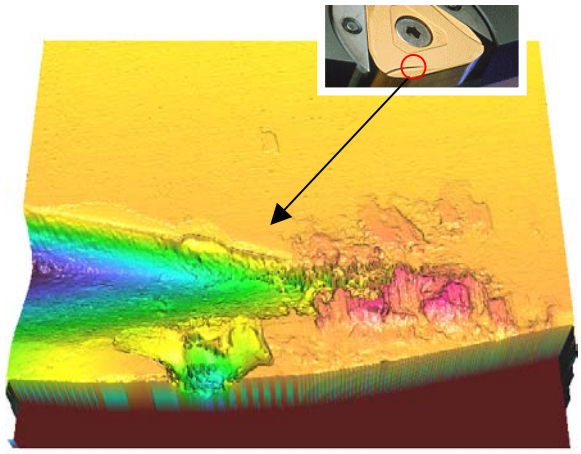
The Requirement

Output quality in the production of hydraulic cylinders, racks for steering systems and piston bolts is determined by the bar peeling process on steel rod. In this process, the material fed into the machine is processed by multiple rotating indexable inserts of hard metal at high throughput speeds. The tools wear quickly and must often be changed every two or three hours.

The consequence of breaks in the stressed blades is deep spiral grooves up to 30µm deep on the surface. These lead to scrap, since the following smoothing or grinding process cannot cope with such deep grooves.

A fast in-line method to capture the surface quality at the machine output during processing, with the capability of detecting groove formation and deducing tool wear is highly desirable.

Turning Machine



Worn tool blade.
Topographical scan using NanoFocus µSurf

The Solution

The OptoSurf OS 500 scattered light measuring instrument can be integrated directly into the machine and will continuously measure the roughness (So characteristic value) as the workpiece leaves the processing zone, at a speed of 1,000 measurements per second.

The sensor is encased in a protective housing to protect it from damage, and compressed air is blown into the housing to protect the lens from the oil mist. A compact fanless industrial PC outside the machine supplies the sensor with power (15V), and receives measured data, via a USB cable.

OS 500 measuring in-line during a turning process. The sensor is encapsulated and protected by compresed air against oil mist.

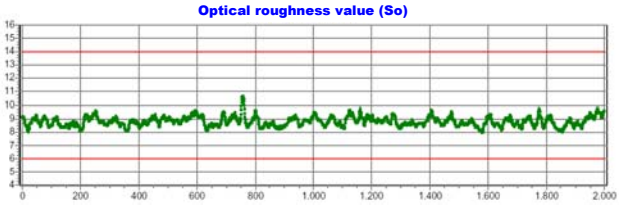
Turning Processes

Result

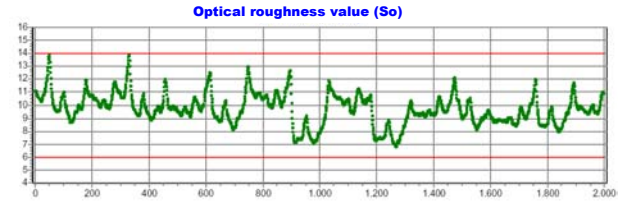
8,000 individual roughness measurements, using the optical roughness characteristic So, are made on each turned piece. Most informative is the Δso value, which shows the maximum peak-to-trough value. As soon as the tool wears enough to start grooving the surface, the Δso value exceeds a defined limit.

The data processing software uses defined limits (lower and upper), and signals, via an I/O card, when the Δso value has approached to within 10% of the upper limit. When the limit is crossed, the machine is stopped and the operator can change the tool.

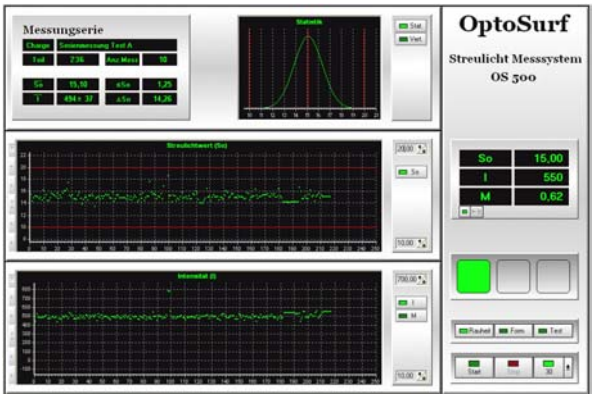
In-line monitoring delivers optimal usage of the turning tools, and the 100% check of the turned workpieces ensures delivery of groove-free parts to the customer.



Record of the optical roughnes value So along 100 mm of a satisfactory workpiece. The So value varies very little



Record of the optical roughnes value So along 100 mm of an unsatisfactory workpiece. The So value varies hugely



Software continuously captures data and provides a statstical display. SQL data base

Points to Note

The turned parts vibrate by more than 0.1 mm during measurement and are covered in an oil film. The optical properties of the sensor allow external vibrations of 0.2 – 0.3 mm without meaningful changes in the So value, so no special measures against this are required. However, locally blowing the oil film off does increase the accuracy of the measurement.

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