Polytec had the chance to interview Prof. Dr.-Ing. Jörg Seewig, Chair of Metrology and Sensor Technology at the TU Kaiserslautern, about optical in-process measurement technology in the automobile industry.

The advantage of cost-efficiency

Professor Seewig, what are the main points of focus for you as Chair of Metrology and Sensor Technology?

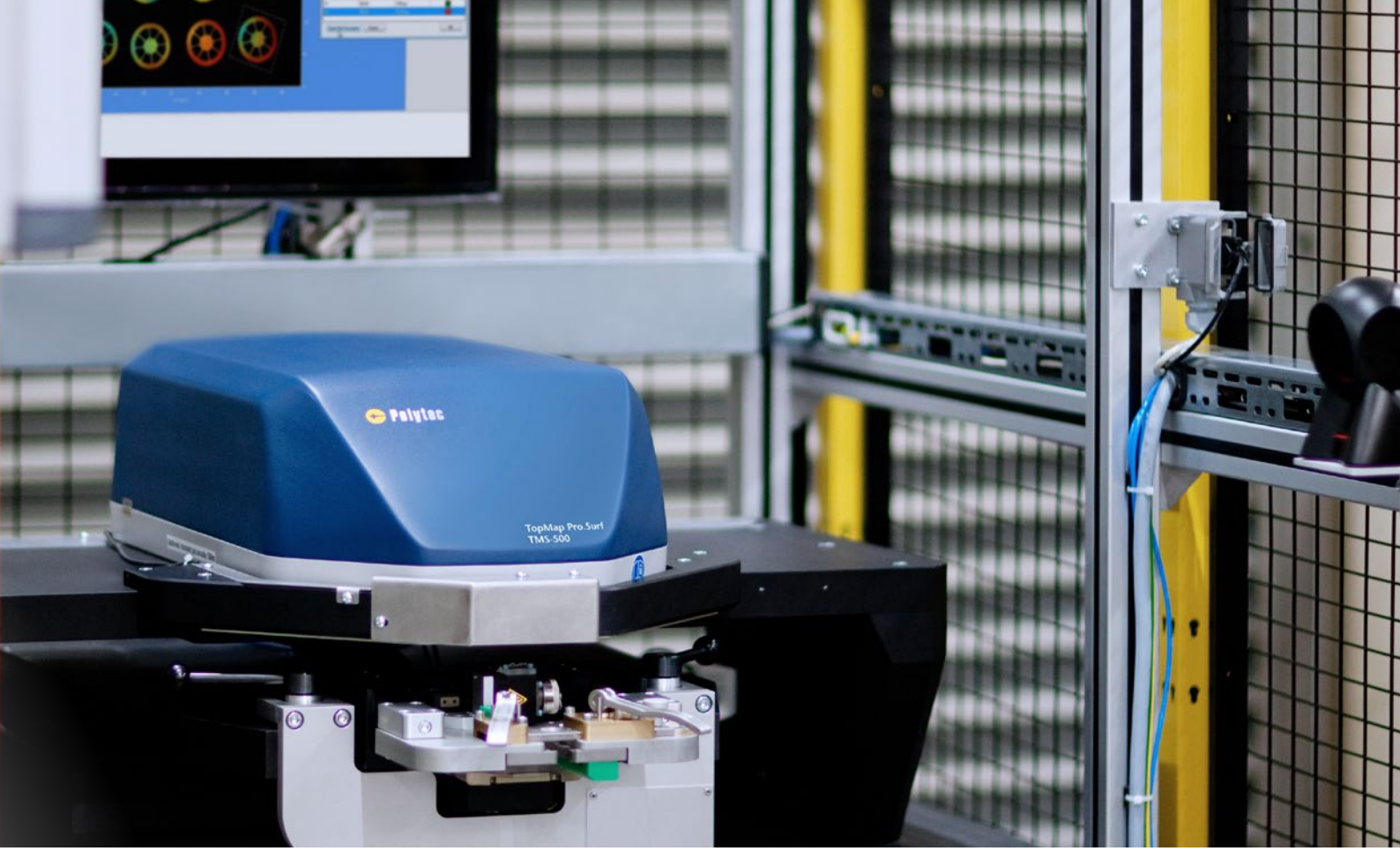
We are working on the basic principles and applications of optical metrology in manufacturing processes. We are still working out what our focal points will be as we are still in intensive discussions with our expert colleagues, for example from mechanics, manufacturing technology, material sciences and tribology. One main theme in these discussions is optical inprocess measurement technology, where a combination of surface measurements and material characterization is particularly appealing. This, in particular, affects composite materials. Apart from that, we are working on questions of parameter identification and the analysis of measurement uncertainty. Here we find it very exciting how we can include the knowhow from the other areas, for example, from manufacturing technology, the a-priori knowledge of manufacturing tolerances or from mechanics, modeling of material properties.

To what extent have the optical measurement techniques – that are new for many users – already found their way into use in the automobile industry and what is your opinion on their future importance?

In this industry, surfaces are still predominantly measured in the classic way, for example using tactile processes. There is a historical reason for this – the scale drawings all refer to the standards that have been prevalent so far. But the industry is increasingly using optical processes as well. There is a high level of interest in optical measurements in manufacturing where many different types of functional surfaces need to be tested that cannot be characterized by a simple profile section, for example particle surfaces or structured surfaces. In particular, the possibility of being able to measure surfaces directly on the production line is very exciting to larger car manufacturers; however, there is still no industrial standard that describes the measurement procedure in detail.

As a specialist directly involved in this field, what is the status of the forthcoming industrial standard for optical procedures?

The ISO 25178 standard which defines “Specification and measurement of 3D surface texture”, also covers optical 3D surface measurements, and while it is quite extensive, it does not necessarily help in practice. This is why, independent of the ISO standard, industry users are being asked to define standardized measure-



ment procedures with good reproducibility that are applicable to 3D optical surface measurements. After all, reproducibility of measurement values for measurements made at different times and in different locations is more decisive in the quality management chain than the requirement for traceability to a calibration standard. Instrument manufacturers such as Polytec provide excellent support in the development of stable measurement systems and standardized measurement processes that are optimized for their respective application.

What do you consider to be the most important advantages of optical surface measurement techniques?

In comparison to the tactile measurement techniques, optical procedures are fast, particularly with functional surfaces, as they acquire the entire surface in one pass. The high precision of the measurement is an important advantage because tooling machines are becoming increasingly precise and shape tolerances of the workpieces are becoming ever tighter. After all, according to the golden rule of metrology, the measurement uncertainty should be a factor of 10 below the tolerance specification. In addition to that, optical procedures offer the possibility of automatically optimizing the instrument setup thus generating an optimal set of parameters. In this context, cooperation between specialists from the instrument manufacturers and users on workpiece-specific evaluation of a stable measurement and evaluation process is of great importance.
The combination of short measurement times and using new optical measurement techniques in an early stage of the process chain also results in high overall cost-efficiency – an advantage that is currently very important to all manufacturers.

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