



"Optical surface metrology complements tactile measurement techniques"

We talked with Prof. Dr. Albert Weckenmann of the University of Erlangen-Nuremberg, Germany, about the limitations of tactile surface measurement technology and the opportunities of non-contact methods.

Polytec is headquartered in Waldbronn and you were also born in Waldbronn. Can we say that Waldbronn is famous for its experts in metrology?

That's a nice question for an introduction. Well, we are both working on making Waldbronn known as a nucleus for metrology. Waldbronn became known as the cradle of high-quality metrology with the establishment of Polytec. When I made my decision to dedicate myself intensively to metrology, I still had to "emigrate" in order to meet like-minded people and to find the right technical-scientific environment.

Today, Polytec is a kind of incubator for young professionals as well as a flourishing company. This shows our young researchers how successful you can be with metrology, and at the same time, how interesting optical measurement technology is.

So it can surely be said that Waldbronn's atmosphere offers a globally successful climate that at least favors metrology and offers great perspectives to interested people. Today it is no longer necessary to "emigrate" in order to make a fortune in metrology.

In manufacturing industry, most of the surfaces are still characterized by tactile measurement techniques even though optical methods provide many advantages. Why do you think manufacturing metrology is still dominated by tactile methods and what should be done to get a higher acceptance of optical methods?

There are historical reasons. Surface parameters were defined for the first time in the middle of the last century when the expert community put its faith in tactile methods. Other methods were simply not available. At that time there were neither optoelectronics nor computers. Only tactile measurement parameters could be defined

for specifying workpiece surfaces, established in standards and noted on technical drawings along with which measurement instruments were available at that time.

Technologies have since advanced in terms of surface requirements, manufacturing procedures and measurement techniques. When well defined, established and standardized parameters are changed, the entire chain – from standardization via design, manufacturing, quality assurance up to the measurement techniques and the interpretation of the results – must keep pace with the development.

Almost all of the people involved in specifying, manufacturing and quality assurance, such as operators, technicians and engineers, must be retrained, and the question arises whether the "old" technical drawings are still valid. So there are some very good reasons why people involved with production measurement technology have very conservative attitudes.

Optical methods are therefore being introduced very tentatively into surface measurement technology. The acceptance can be accelerated only moderately through measures that are aimed at conviction and acceptance. This in turn means investment in trade fairs, printed material, measurement examples, discussions, training courses and so on.

As an expert in the field of metrology, which advantages of optical surface measurement techniques provide the most benefits to the end-users?

The benefits range from the fast, two-dimensional application to the capture of a three-dimensional topography with an extremely high density of points. Also, the evaluation procedure should be appropriate to product functionality. Unfortunately this is missing in most cases.

Today, industry has the most experience with tactile techniques and if a new approach like optical is introduced, users always want to compare the results. It is however not always possible to compare them directly. What can you say about the conditions required to compare results from two different measurement techniques?

It is better not try to compare results with one another. The comparison is misleading in all aspects. By the way, what can be done with the measurement result? If you want to determine the expected functionality, then many of the standardized parameters such as Ra, Rq, Rz and others are hardly of any use for it.

Nobody can and should aim to replace tactile measurement technology. In areas where this technology is established, it will continue to be applied. It makes more sense to use the many fold advantages of the optical data acquisition for new applications and to extend the computerized evaluation in such a way that the degree of the expected functionality can be predicted. ►



TopMap systems offer scan ranges of up to 70 mm – e.g. for measurements at the base of drilled holes. The telecentric light beam path avoids shadowing effects.