

“With Alicona we found an all-in-one measurement system for the analysis of the most diverse materials and components.”

Picture © SKB and Posiva Oy  
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# An all-in-one measurement solution for materials of any kind

In their research on materials, Tampere University of Technology in Finland explores innovative approaches for a variety of technical applications. With Alicona they have found an all-round tool for the analysis of the most diverse materials and the geometrical verification of a multitude of components with different shapes and sizes.

The material selection is a key factor in the production of high-quality technical components. Technical innovations and new manufacturing processes are directly tied to the research and development of materials. Wear resistance, corrosion resistance and service life of components are determined by correct material selection for the target application.

## Evaluation of surface deformation, wear intensities and mechanisms

The Laboratory of Materials Science at Tampere University of Technology (TUT) in Tampere, Finland, conducts high-level research on the structure, properties, processing and use of practically any type of material. With the optical 3D measurement system InfiniteFocus G5 they analyze the morphology of surfaces, verify dimensioning, and evaluate surface deformations,

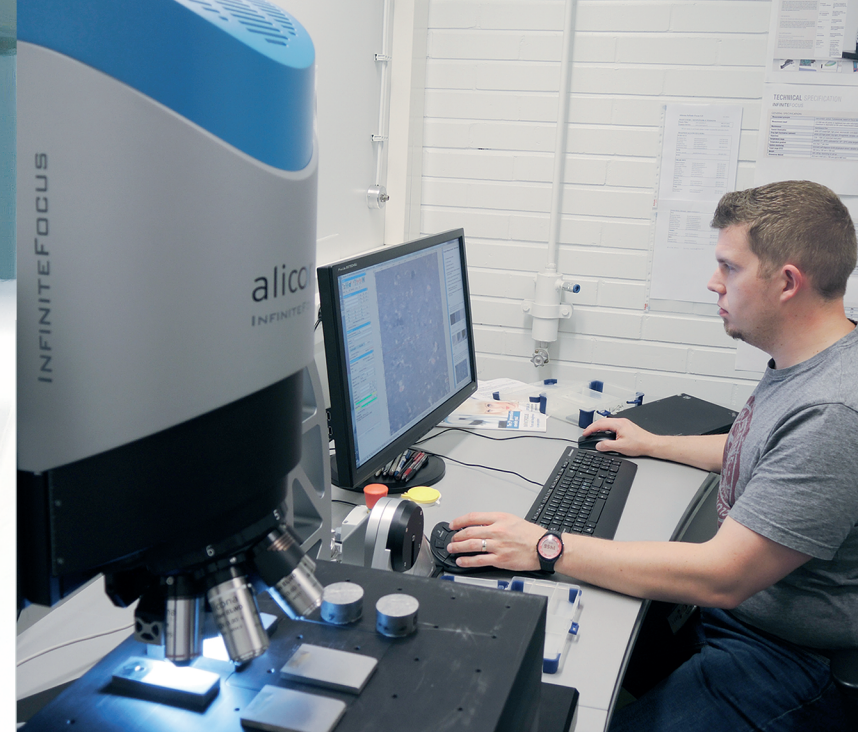
wear intensities and mechanisms. In strong collaboration with the industry, a broad variety of technical applications is covered. Measured materials include metals, polymers, textiles, wood, paper, ceramics, coatings and rocks. In addition, the optical 3D measurement system is used for full form measurement of various tools and components.

Since components in materials testing often contain fractured or deformed surfaces, steep flanks or rough surface topographies are regularly encountered. Alicona offers a unique solution to document the entire surface even with these difficult to measure features. “Initially, we were looking for a system that could measure specimens with both large areas of several square centimeters width and rough surfaces, like large wear or fracture surfaces with steep slopes. For us it was also important that the measurement system would be relatively fast. A third requirement was the possibility to do

measurements by rotating the specimen and have real 3D datasets as a result”, Niko Ojala and Jarmo Laakso, researchers at the laboratory, explain. “With InfiniteFocus we have found a measurement system that suits our needs. Due to the high demand and interest towards the system, the utilization ratio has been up to 24/7.”

## Geometric verification of FSW tools for sealing nuclear fuel disposal canisters

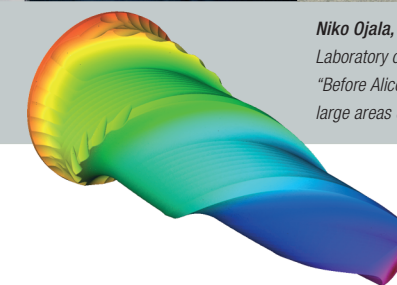
The Applied Materials Science research group at the laboratory offers service for companies in any type of material related projects. “In collaboration with two Scandinavian expert organizations for nuclear waste management, SKB and Posiva Oy, we were able to verify the geometry of a FSW-probe, which is used for sealing nuclear fuel



Niko Ojala, researcher at the Laboratory of Materials Science at TUT; using MultiMeasurement: With InfiniteFocus G5 Ojala defines the measuring routine with which several specimens are automatically measured one after another.



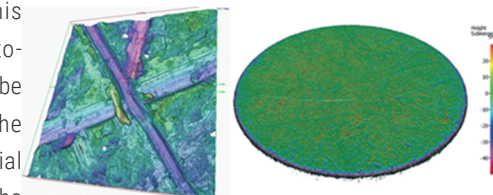
Niko Ojala, and Jarmo Laakso, Tampere University of Technology, Laboratory of Materials Science: “Before Alicona we only had an interferometry system, but it was not possible to measure large areas efficiently, in fact it would have needed days to do that.”



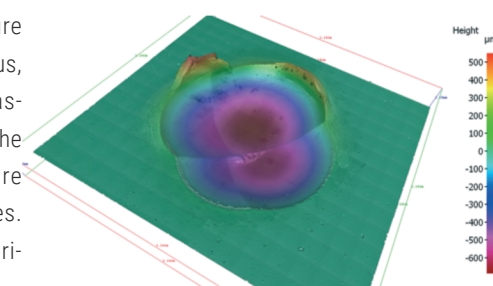
disposal canisters”, Jarmo points out. FSW (Friction Stir Welding) is a welding method in which frictional heat is generated between the tool and a target metal. This causes the metal to soften and weld together by mechanical intermixing. The probe is intended to be non-consumable, so the challenge is to prevent the probe material from melting, while it is traversed along the welding line. Thus, the accurate geometry of it is a key factor for an efficient welding process. With an AdvancedReal3D Rotation Unit in addition to InfiniteFocus they achieve full form measurements of tools and components. This enabled Jarmo to measure dimensions like length, diameter and radius, as well as roundness. Radii can be measured down to 2 µm in lateral resolution. The measurements show if components are in accordance to the specified tolerances. Form deviations are evaluated by comparison to CAD data.

“Previously we only had an interferometry system, but it was not able to measure large areas efficiently, in fact it would have needed days to do that. With Alicona we measure areas up to 200 x 200 mm at

“Full form measurement of a FSW-probe of SKB and Posiva Oy. With an AdvancedReal3D Rotation Unit in addition to InfiniteFocus the full form measurement is achieved.( © SKB and Posiva Oy, not allowed to copy without permission)”



Crushing pin-on-disk high-stress abrasion wear test: The Alicona measurement system provides numerical quantification and a detailed 3D surface characterization of the specimens both in full macro and detailed micro levels. (picture on left has surface area of about 3 mm2, while the one on right covers 1 000 mm2 area)



3D surface measurement of a steel specimen after five impacts by the high velocity particle impact test at -60°C temperature.

high measurement speed”, Niko and Jarmo explain. As measurements of large areas often also require long measurement depth z-ranges – as components can either have a curved form, large height differences or highly deformed surface – InfiniteFocus has proven to be the right tool.

## Easy quantification of material deformation on large measurement areas

By using the so called MultiMeasurement function, Niko and Jarmo found a feature that has proven to be very time-saving. “With MultiMeasurement we can set up an automatic measurement routine for about a dozen of specimens to be measured one after another or measure multiple locations in high-resolution. This saves both working and machine time for other tasks as for example night times can be fully utilized”, explains Niko. “Versatility and agility are important, as well as user friendliness, and that’s what Alicona gives us.”



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