

Thinner walls, stranger shapes, smaller holes

Leiden, 13 november 2009. As of next week, the Fine-Mechanics Department (FMD) of Leiden University and the Leiden School for Instrument Makers (LiS) will be stretching the boundaries of what is possible yet again. Then, they will start using their latest high-tech acquisition: the new ultrasonic milling machining with which you can machine hard materials such as ceramics. With the machine the members of the FMD will create a new generation of parts for measurement equipment at a higher quality. The machine puts Leiden's mark on the technical ceramic's map. The combination between polishing, ultrasonic (high frequency) machining and an advanced control system results in micrometer¹ precision and a unique level of control.

The more difficult, the better

Sometimes this seems to be all that scientists are thinking. And the FMD's technicians are the ones that constantly have to come up with new solutions. However, quite often what's commercially available just isn't thin or small enough. Therefore the technicians want to take it one step further, and simultaneously design the equipment and explore the boundaries of (im)possibility. This can be done by producing home made technical ceramics – next to metal, plastic and glass parts. Because of the high level of control the machine offers and the multitude of shapes it can produce, you can do almost anything with it: thinner walls, exotic shapes, deeper and smaller holes, and all of that with extremely high precision.

Why ceramics?

Putting ceramics in your vacuum system of microscope. It sounds like advanced pottery, but there is more to it than meets the eye at first sight. For those who build equipment, technical ceramics is an interesting material. It's not susceptible to chemical reactions, it can withstand extremely high temperatures, and is longwearing. In other words: A fine material to make parts and machines of. But, the demands of the scientists keep increasing, and the parts industry can provide often aren't small or strange enough. This is why Leiden University and the LiS decided to acquire their own ultrasonic milling machine together.

From dreaming to reality

The disadvantage of hard materials such as ceramics, is that they are difficult to machine. You need diamond tools to do so. When you machine ceramics by hand, you typically need five or six tools per part. The new machine solves this issue: with only one tool you can make a more beautiful part in less time. On top of that, the combination between polishing and ultrasonic (high frequency) machining gives a smoother surface and a more precise shape than was possible until now. In stead of "what kind of product can we order", the technicians now ask: How good a product can we make? By putting the production abilities of the machine next to the design practice, the boundary of what is possible is stretched – yet once more. Of course every technology has its limitations. But

¹ Een micrometer is een duizendste millimeter

where these limitations lie for technical ceramics, is exactly what they are going to find out at the FMD and the LiS. So it's about time to come up with new dreams, and to try to make them come true.

An old cooperation

To further transfer the knowledge the technicians in Leiden acquire, the LiS plans to start a training program on technical ceramics machining. At the moment, such a program doesn't exist in the Netherlands yet; technicians get in-company training for ceramics machining. By starting this training program, the LiS fills a need of industry, and the Netherlands obtain another expertise. The cooperation between Leiden University and the LiS isn't a new one. The LiS has been founded by the Leiden physicist and Nobel Prize winner Kamerlingh Onnes. His goal was to train excellent technicians, who – in their turn – will help to further advance science. With the ceramics machining program the cooperation is deepened once more.