Bridging the Gap Between Conventional Machining and Ultra-Precision Machining

Interview conducted by Alexander Chilton Mar 17 2015

Ralf Dupont, President at Levicron GmbH, talks to AZoM about how Levicron's air bearing spindles are bridging the gap between conventional machining and ultra-precision machining.

Could you provide our readers with an overview of the history of Levicron and the markets within which you operate?

The starting point of Levicron was my doctorate and my time at university where I got the opportunity to combine everything needed to design, optimize, manufacture and test air bearing spindles.

My work for two major spindle manufacturers in Switzerland and the UK guided me to the point where, on the one hand, I clearly recognized market potentials for aerostatic tool spindles for milling and grinding applications and where I learned how (and how not) to manufacture parts for ultra-precision spindles.

As none of my former employers were willing to see this potential, I moved back to Germany and founded Levicron back in 2010. During the year 2011 and with an invest of several million Euros, our production was set up covering CNC-milling, turning bore grinding, cylindrical grinding and diamond turning. At the end of 2011, the pilot batch of our ASD-H25 and ASD-Cx ultra precision tool spindles were shipped to customers.

Back in 2013 AMETEK Precitech from Keene US, a leading force in ultra-precision machining solution, partnered with Levicron to offer the next generation of ultra-precision milling and grinding solutions to customers and is now our exclusive distributor of Levicron

tool spindles in the Americas and Asia.

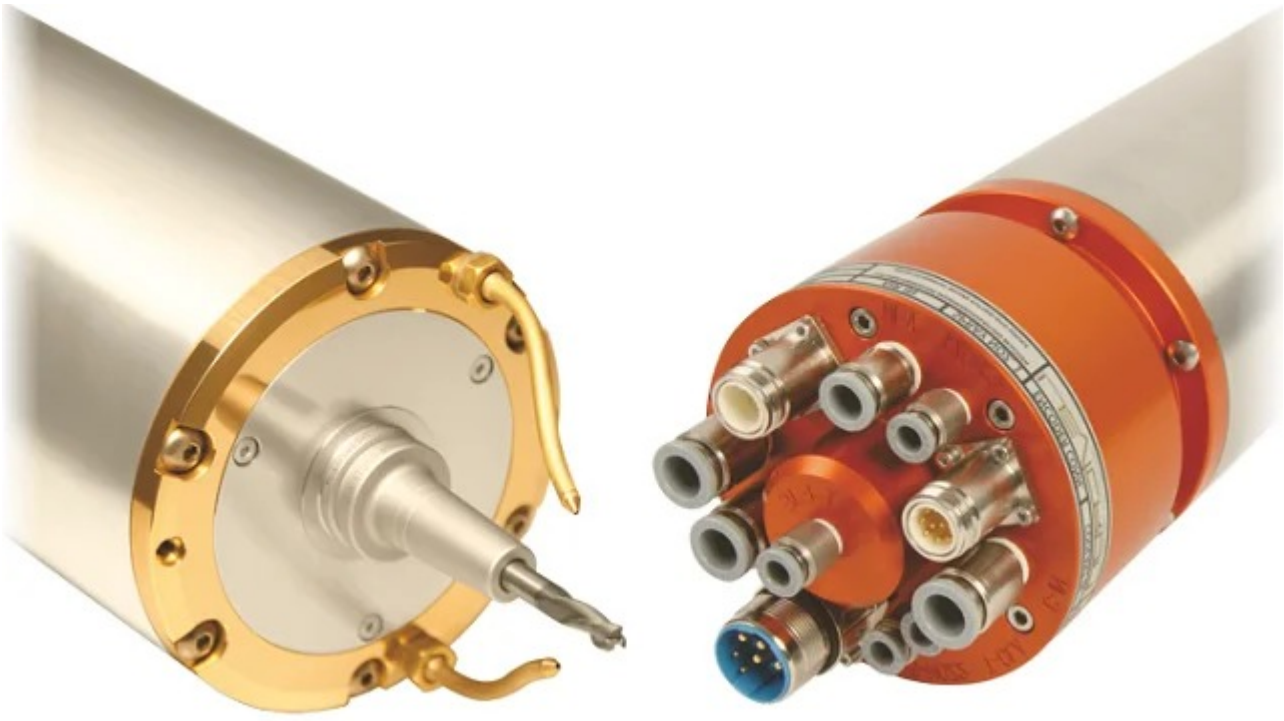

Image Credit: Levicron GmbH

Their ultra-precision properties with respect to error-motion, dynamics, speed and thermals and their automated tool change capabilities, especially with our ASD-H25 and its HSK tool interface, opened us the market for both CNC and ultra-precision machines. This again leads to two main applications for our tool spindles, milling and grinding.

With the development of our ASD-Px that offers higher loads, stiffness and thermal stability than any other ultra-precision work holding spindle on the market at the same or better precision and speeds Levicron now offers a full range of ultra-spindle solutions for both ultra-precision machining and CNC machining.

Precitech's direct sales, service and application engineers are able to deliver Levicron's innovative products to a broader market – how did this partnership arise and how long have the two companies been working together for?

I have known Dr. Jeff Roblee, Divisional Vice President of Technology of AMETEK Precitech, for a long time. He and Keith Kowalski, former Divisional Vice President and Business Unit Manager of AMETEK Precitech and now with AMETEK Zygo, were visiting us back in 2013.

Keith Kowalski saw mutual benefits in working together and an agreement between AMETEK Precitech and Levicron settled our official partnership. Both companies had been true partners from the beginning and meanwhile people from both sides work closely together, even outside the existing agreement.

Could you explain to our readers the basic technique of how conventional machining works?

Conventional CNC machining targets performance, high material removal rates and large batch sizes. To achieve this, these machines need to run autonomous and have to include automated tool change, tool clamp status monitoring, automated tool length measurement and several closed-loop safety features. Here the operator becomes less important and gets partly replaced by automated systems.

How does this technique differ from ultra-precision machining?

First at all, ultra-precision machining targets on not only very high precision, but also on optical surface finish and thus requires to be simply more precise than conventional CNC machining.

Not only part dimensions are important, but also surface quality and form. To achieve this the machine and the operator are key. Machine solutions, machining strategies and metrology differ from CNC machining.

ASD-H25/Cx aerostatic ultra-precision tool spindles from Levicron bridge the gap between the two techniques. What are the main advantages of using these tooling spindles?

Our ASD-H25/Cx offer automated tool change and all other features of modern tool spindles like tool clamp status monitoring, but for the first time ever with an aerostatic and patented bearing system and ultra-precision properties.

For ultra-precision machines this means an opportunity to use automated tool change in future machine designs and to offer a more autonomous and safe machine operation to customers.

For the conventional CNC machine market on the other hand this means higher spindle speeds, better thermal stability and optical surface finish without sacrificing the current machine automation level.

Which industries primarily benefit from using Levicron's products?

Within the automotive industry, dies from hardened steel can now be manufactured with optical surface quality. Also spray holes of fuel injectors can be drilled and milled without tool breakage because of unique spindle dynamics and run-out properties.

Furthermore, this industry has started to replace hydrostatic spindles by our air bearing spindle solutions to save energy costs and expenses for peripherals. The Swiss watch industry benefits from speed and rotation quality of our spindle solutions to precisely machine small parts for watches and to get mirror surface finish what again makes polishing redundant.

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The optics industry benefits from the low spindle error-motion level to grind glass lenses with low sub-surface damage and to mill optical components from non-ferrous materials with high material removal rates and repeatability.

For coining dies high spindle speeds and thermal stability is important because of long machining times and the requirement to machine small features. The mint industry thus found our tool spindles to be an ideal solution.

For coordinate grinding often tools are used that can't be dressed and that rely on a low spindle run-out and automated tool change. The run-out properties and tool change repeatability of our ASD-H25 and our ultra-precision HSK tool holder series UTS-x was recognized as a step change in coordinate grinding.

How do you see the ongoing fusion between high-precision CNC and ultra-precision machining progressing in the next five years?

Although our ultra-precision tool spindles represent a very important piece of the puzzle, I

still see a small gap between high precision and ultra-precision machining because of the reason that each market has to adopt several things from the other market.

This includes metrology, safety features, programming and, last but not least, the customer that could slow down or speed up this process.

How do you see Levicron being part of this change?

As we partly initiated this change, we will always be part of it. Current spindle developments are targeting on exact this intermediate market because it has enormous potential for the future and supports both ultra-precision and high precision CNC machines.

Where can our readers find out more information about Levicron and the ASD-H25/Cx aerostatic ultra-precision tool spindles?

Please contact Mike Tanniru, Business Director of AMETEK Precitech, to get more information if you are from the Americas or Asia.

For any other country contact me by e-mail or phone, I will send you technical or commercial information about our products.

To get more information about your ultra-precision machining solution with Levicron spindles please refer to www.precitech.com

To get more information about our products please visit our website www.levicron.com

About Ralf Dupont

For more than a decade, Ralf has been driven by non-contact bearing systems like air bearings as well as precision engineering and machining.

Coming from a high-speed drilling spindles and centrifugal compressors background, Ralf founded Levicron back in 2010 and yielded to his temptation of precision machining and high-speed spindle systems.

Ralf holds a degree in industrial engineering from TU Kaiserslautern. Ralf previously worked for Air Bearings Ltd, MAN Turbo AG, Fischer-Precise AG and the University of

Kaiserslautern.

Written by

Alexander Chilton

Alexander has a BSc in Physics from the University of Sheffield. After graduating, he spent two years working in Sheffield for a large UK-based law firm, before relocating back to the North West and joining the editorial team at AZoNetwork. Alexander is particularly interested in the history and philosophy of science, as well as science communication. Outside of work, Alexander can often be found at gigs, record shopping or watching Crewe Alexandra trying to avoid relegation to League Two.