INTERVIEW...

... with Horst Lach, Lach Diamant

"The current trend is toward monoblock"

Diamond cutting materials are state-of-the-art for the machining of aluminum, non-ferrous metals and fiber-reinforced composites. Chief editor for the German magazine "fertigung", Richard Pergler, talked with PCD pioneer Horst Lach about historical details as well as the latest trends and developments for PCD tools.

Mr. Lach, on October 13th, 40 years will have gone by since you registered a patent for the electro-erosive machining of diamond materials. What is the story behind this?

Horst Lach: To be more precise, it was a European patent we registered in 1978 for "machining synthetic polycrystalline diamond and use of the diamonds machined according to this procedure". It was all about PCD – a cutting material which had been introduced to the industry five years previously. The material was considered exotic at the time, and machining it was very difficult.

When did the first tools appear?

Horst Lach: Already in 1974, we had presented the first PCD tools with soldered cutting inserts for machining aluminum. For turning, we manufactured turning tools with a soldered PCD segment which were carefully and tediously cut from a round plate with a diameter of just 3.4 mm. Milling with PCD was at the time limited to carbide inserts with soldered PCD cutting edges and clamped onto cutter heads.

What was back then the status of machining this material?

Horst Lach: The only way of machining hard materials was grinding. In 1977 for example, we tried to produce rotating PCD tools for machining circuit boards for productronica in Munich. There was a demand for tools like this, and we already anticipated a lot of business. Disillusionment followed soon after: 12 teeth of our sample tool, a scoring saw for circuit boards, took as much as 35 hours – by far much more time than was economically affordable. That was the end of machining PCD on a large scale because even experienced diamond cutters did not enjoy working with this, apparently very tricky material. However, we continuously tried to find other ways to machine PCD efficiently.

How did you, of all things, end up with erosion?

Horst Lach: Thanks to good business partners: MATRA was at the time a manufacturer of surface grinding machines which we also used for our Borazon CBN grinding wheels. In 1978, they advertised a "spark erosion machine" – something we wanted to see. On the appointed day, we were standing at machines commonly known today as vertical eroding machines. We inserted our material, and what happened was – nothing. Not even during the next few minutes. We were disappointed and were about to leave when we came across another machine – a Fanuc wire eroding machine. And since we were already on site, we wanted to give it another try. However, the machine was already programmed with a customer's profile, something that could not be changed that easily at the time. But it was a position of principle for us, and so we tried it. The dielectric immediately started to react, and shortly afterwards we had our PCD profile cleanly cut. This was far beyond all our expectations – we had found a way to cut PCD, and furthermore a way to produce profiling tools made from this material. That is what our patent from October 13, 1978 was all about.

And where was this finally implemented?

Horst Lach: It did not take very long – we did the first steps in machining wood: A well-known kitchen manufacturer approached us with the challenge to produce a profile milling cutter with a diameter of 125 mm for machining kitchen worktops. Up to this point, those were machined with a carbide milling cutter. And since we did not have an appropriate machine for milling round bodies of such dimensions, we ended up with an existing carbide tool, from which we had removed the cutting edges and then soldered on the PCD profile edge. No sooner was it said than done. The world's first PCD cutters, thanks to the soldered edges, were actually monoblock cutters and first set into use on a double-end-tenoner. Three to four hours, basically a single shift, was the tool life of one carbide tool.

And the diamond?

Horst Lach: Now, at first we heard nothing. Only after we came knocking a week later did we learn that the tool was still working. Triple shifts. In short: the tools lasted between three and five months – in contrast to a couple of hours with carbide. An enormous progress, a foreman would no longer need to be present at every shift to swap cutting tools. This allowed the machines to be used much better and more economically.

So, the beginning with wood and plastic went quickly. How was it with metal?

Horst Lach: More difficult. The not quite fully realized development of numerically controlled (NC/CNC) machines for mass production in the automobile and accessories industry at the end of the 70s was a stumbling block. The new cutting material became widespread more quickly with fiber resin materials than in the metal industry. And today almost nothing is done with carbon and glass fiber materials without PCD, especially when clean, flat cuts without much finishing work are needed. But it was started by wooden tools, benefiting – among others – the aerospace industry through tool know-how that we originally developed for entirely different materials.

Were cutter heads the ideal solution?

Horst Lach: No. These tools naturally have a certain imprecision and must be exactly configured for machining. That demands know-how, time and skilled operators. Monoblock tools, defined ex works, are the better solution. In addition, users demanded improved performance – more and more cutting edges and less space for chip removal set limits to cutter heads. Today, you will find only monoblock tools within the wood manufacturing industry, no one wants to be forced to configure a tool anymore. This is true especially in times when skilled workers are more and more difficult to find. The same path is also laid out for the metal machining industry.

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Horst Lach, CEO of Jakob Lach GmbH & Co. KG and LACH DIAMOND INC., Grand Rapids/MI.

When should one rely on monoblock tools?

Horst Lach: The more performance is demanded of a tool, the clearer the recommendation for a compact monoblock tool. Even when trying to integrate multiple functions into one tool, the trend goes toward monoblock. While cartridges in a cartridge tool need a lot of space and, for that reason alone, limit design options, monoblock tools can be freely and precisely adjusted to the needs of a specific application. When deciding on a tool, it is advantageous to look at the complete process. And when breaking down the cost per work piece, a compact tool will in many cases be much better in comparison.

But is it not a waste to have to dispose of the entire tool when using monoblock?

Horst Lach: Not at all! For 40 years now, we re-grind monoblock diamond tools quickly and with repeatably accurate results. What was true for milling cutters for all wooden materials, we were able to successfully apply to metal machining as well – so the use of monoblock is efficient and environmentally very attractive. By the way, the tool base can be reused. Tools with replaceable heads have an exactly defined interface and guarantee maximum precision, even after the change. A measurement of each cutting edge, as with cutter heads, is not necessary for monoblock diamond cutters.

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