

# CUTTING TOOL ENGINEERING®



## ***"Poly - poly - or what?"***

5th part

**Diamond show profile**

**A historical contemplation from Horst Lach**

# “Poly – Poly - or what?”

## 5<sup>th</sup> Part: Diamonds show Profile.

Horst Lach, managing director and CEO of LACH DIAMANT agreed to write an ongoing series of articles about the development of diamond and CBN tools and grinding wheels in modern industries.

Horst Lach is known as a true industry veteran, and we are excited to have this pioneer of technology share some insights from over 57 years of professional experience in the diamond tool business.

In the seventh part of this (almost) historical review, Horst Lach looks back to time when diamonds first showed profile.

It is 1978 – in October. On October 13<sup>th</sup>, my discovery, at the former Matra company in Frankfurt, that polycrystalline diamond (PCD) can be eroded by means of electric



sparks was registered at the patents office (see dihw 2/2018).

In October of 2018, we therefore will be

looking back at 40 years of experience in the application and use of spark erosion for manufacturing and versatile applications with polycrystalline blades of PCD/PCBN-tipped tools.



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LIGNA 1979 - A complete diamond tool programme for all wooden and plastic materials is presented - using the example of a diamond profile milling cutter.

But back to October of the year 1978. Only a few days had passed since registering the patent. “Forced” to maintain silence, the team around R&D staff members Dipl. Ing. Günter Hobohm, Gerhard Mai and Konrad Wagner (†) had not yet been able to think a lot about applying this technology. Fortuity became our “accomplice” – with a telephone call. A Mr. Denker of the company Resopal Werk H. Römmler GmbH in Großumstadt (today known as Resopal GmbH) answered. “Mr. Lach, I read that you presented milling tools at a trade show (he was referring to productronica 1977 in Munich – see dihw 4/2017).” I confirmed this.

Mr. Denker continued: “We are having a problem – can you build a profile milling cutter for us?” Immediately I was wide awake. Only 14 days ago, I would have answered with “No, sorry”, but now? Most likely I answered with a drawn-out “Yes!” and requested more details. And so, Mr. Denker continued: “We call it an American milling cutter with a profile for a postforming work plate with a cutting width of 45 mm and cutter diameter of 160 mm.”



LACH DIAMANT dreboform® profile milling cutter for coated decorative plates.

(All checked, and today still shown in old documents at LACH DIAMANT). When the cutter dimensions were mentioned, my reply was “BUT – unfortunately our production is not yet ready for this size”. Denker: “It doesn’t matter, we are sending you two Leuco milling cutters with carbide blades, and you simply take those off and solder on your diamonds.”

The conversation went that easy – however, it was so pivotal for the future of this cutting material which was still in an early development phase, and for us as tool manufacturer and user, as well as for manufacturers of super abrasives, such as, at that time, General Electric with its products “compax” and “BZN” and another manufacturer DeBeers, which appeared on the market at the end of 68/69, with its product “Syndite”.

On the following morning, Günter Hobohm picked up the two carbide milling cutters. Now the carbide cutting edges were removed, cleaned, diamonds attached, cutting width 45 mm – oh gosh – there was a problem. The largest insert blanks at the time, offered by the manufacturer General Electric, only had a diameter of 13.2 mm. We decided on a semi-circle cut (GE-Art.-No. 1625), so that a blade length of max. 13.2 mm was available.

We had to add pieces. The inserts were only 13.2 mm long and had to be soldered on in an overlapping way, tooth by tooth, to avoid scoring marks during the following milling process. Manufactured in this way, the worldwide first PCD cutting tool for machining wood materials (postforming – coated as kitchen cabinet plate) was manufactured as Z = 4, but due to the necessary overlapping this diamond milling cutter really was a Z-2 tool.

Now, regarding the profile. As I remember, a classic postforming profile for decorative kitchen plates, only differing from the “German standard” – for plate sizes of 45 mm – probably also called “American milling cutter” for that reason.

### ... and Now, only Profiling – Done!

Being an attentive reader, possibly an expert, you are right. At the time, this was not as easy. “Soldering” for example. Already the first diamond tool for milling on a double-end-tenoner was a monoblock tool – resulting from the carbide tool bodies given to us – thus no cassette tool. Again, another coincidence, or let’s rather call it a stroke of luck, since the PCD cutting edge, starting with the very first milling cutter, were already prepared for the long tool life of the future, compared to all other materials.

Ultimately, profiling prepared PCD cutting edges was “child’s play” (for us) – because

the company Matra did that on a Fanuc wire machine. For this reason, we are still very grateful to Mr. Schreiber and Mr. Becker (compare dihw 2/2018). After LACH DIAMANT agreed to manufacture diamond profile milling cutters for the first “wood customer”, we had to answer questions, dozens of times, on the part of Resopal during the development or manufacturing time between October of 1978 and January of 1979. “Yes, when can we start – customers demanding – or can you actually do this?” Finally, on January 5, 1979, we could report success. Günter Hobohm and I took the opportunity and personally delivered the two firstlings to then watch the first use. I don’t necessarily want to say that we were shocked when we saw the big “monster” of a postforming system – a double-end-tenoner (image 3). But we both were astonished. After mounting the cutter, the system started with a loud roar, and a few thoughts were going through our minds. “What happens now – do the cutting edges hold up – does the soldering hold up? – But all went well.

Before we went back home to Hanau, we asked “What do you think, how long will they be running?” We could have expected the answer. “You are the specialists – a



Example of a postforming facility.

carbide milling cutter holds approximately three to four hours, then it has to be resharpener. We work three shifts. Therefore, diamonds must hold up a bit longer – at least a week ...“ We only nodded to that, and said our



“Diamonds show profile” - An example of an EDGplus spark-eroded PCD blade.

goodbyes, promising to get back in touch within a week.

### Top Secret

The discovery that polycrystalline diamonds could be formed by spark erosion due to their electric conductivity was still treated as “top secret” at LACH DIAMANT company – this was kept even from the PCD supplier General Electric; you never know ...!

Not to be misunderstood, the cooperation with GE (more and more with the headquarters in Worthington, Ohio) was increasingly positive, so that LACH DIAMANT could even influence the development of GE’s so-called compax™ during that time. For example, regarding the size development of the blanks which had maximal widths of 3.8 mm in the beginning, from manufacturing sizes of 6.4 mm/8.1 mm leading up to available blanks with 13.2 mm at the end of 1978. As from 1975 onward, PCDs were still scored with circular diamond saws at the carbide bottom by diamond manufacturers, depending on the segment/form that was being produced.

A week had passed by now, and we had not heard anything about our diamond milling cutter. In eager anticipation, we called Resopal, where a Mr. Essow had joined in as contact person in the meantime, besides Mr. Denker. “No worries, all is well. Your diamonds are still running – there is still no end of the lifetime in sight ...“

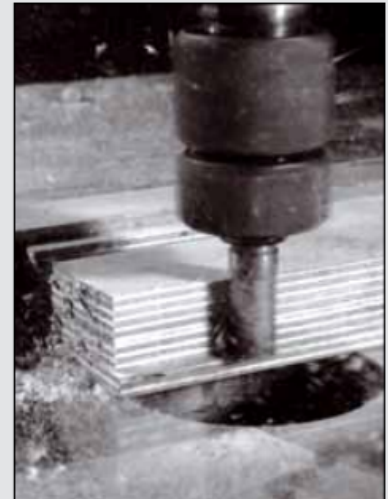
So, it is still running. This answer was repeated week after week. A certain nervousness began to set in – “they would not have taken this milling cutter and ...“. It is not known whether anyone at Resopal noticed our emerging suspicions – however, almost as a reaction, we were told in our next call “we would like another two diamond milling cutters with profile“. The firstlings were still on the machine – for now over four weeks.

### Conversation between Father and Son

This was also the time when I asked my father (Jakob Lach and CEO like me) how we should further deal with this. I will never forget his answer. “I am now 85 years old, if you want to do this, you are welcome to go ahead and do it...“ This really was the starting shot for the foundation of the diamond company “LACH-SPEZIAL-WERKZEUGE” as limited company on February 13, 1979 in the notary’s office of my friend Gerhard Grossmann in Frankfurt. Even in hindsight, it was a good recommendation of my father to split the LACH DIAMANT company, which was more oriented towards the metalworking industry, from the newly found “LACH SPEZIAL”, with the aim of winning customers in the wood and plastics industry. Luck was a factor as well, since exactly at that time, the committee of industrial research associations (AIF =



Diamond profile end milling cutter on a CNC-controlled router.



Diamond end milling cutter on CNC-controlled surface during the machining of Multiplex plates.

Arbeitsgemeinschaft Industrieller Forschungsvereinigungen) initiated company specific supportive measures for helping start-ups of small and medium-sized businesses. The project “Diamonds machining wood and plastics”, started with the founding of LACH SPEZIAL, could move ahead ...

Employees were hired, first machines – including a Wire EDM wire machine – were ordered, R&D work could begin – and ... of course acquisition of customers. Who needs LACH-SPEZIAL tools for all wood materials?

As is well known, today such a search falls under “marketing”; in short and simplified, today one could say “Look on the Internet” – but in 1979? At least, even back then, we had supplier catalogues such as “Wer liefert was” and company listings such as “ABC der Deutschen Wirtschaft” and we already had trade shows featuring this material “wood” – “LIGNA” for example – a world trade show for wood machining and the craft trade fair “Holz-Handwerk”. In the meantime, approximately in March of 1979, we knew that the diamond profile cutters, used for chipboards, coated on both sides, were still running at Resopal, much to the delight of LACH SPEZIAL’s first customer, and no end of their lifetime was yet in sight at that time.

Since January, the company Röhm in Darmstadt, had become another first-time customer – we had provided a milling cutter with two polycrystalline diamond edges as “pre-cutter” and one natural diamond blade as “after-cutter” for polishing acrylic glass

– with success. For the Rowenta plant in Offenbach we constructed a diamond profile milling cutter Z 4 under the new trademark “dreboform®” for machining an abrasive plastic component. Only to show a few of the machining solutions.

### “The Cat was out of the Bag”

Apparently, a successful product, but where to go with it ...? The small team of “LACH SPECIALS” – my humble self of course included – was now already very euphoric. The key word was “wood” – the crafts trade show, so I thought as “wood layman”, would be the place to find potential customers and inspirations.

I stood in front of a very impressive, compact and heavy machine, which gave me hope. It was one of the first numerically controlled routers – during the profile milling of a decorative plate made of MDF (Medium Density Fibreboard) – a router of the company MAKA. I was able to enthuse the owner of this company, Mr. Lobedank, by listing possible lifetimes and surface quality during milling with diamond. We quickly agreed that he would show this “novelty” in action on his new router as a highlight at the upcoming LIGNA.

And so, it happened. A dreboform® PCD end mill, type FZ24/20, shaft 12 mm  $\phi$ x20 mm, with plunge cut, was used – Machining: Veneered chipboard. CNC Router, made by MAKA. RPM = 17.900 Revs/min. Performance tested in practice: 30.000 milling operations; a maximum of 100 (one hundred) milling operations were achieved with a comparable carbide tool. Also, a 300 times higher lifetime compared to carbide. Yes, I can already predict that lifetimes of diamond tools for machining wood and plastic materials will play out at 250–300 times higher, compared with the average possible performance of a carbide tool. Many plus factors for this new technology – and for the start-up company LACH-SPEZIAL – as it should finally be seen at the worldwide first presentation of diamond tools for machining wood materials and plastics at LIGNA 1979. LACH-SPEZIAL-WERKZEUGE GmbH surprised the industry experts with a tool programme, complete with all until then known tools for the wood and plastic industry – as alternative to carbide tools.

“The cat was out of the bag” – the secret about the activities of LACH-SPEZIAL (almost) revealed. But this was only the

beginning for the wood and plastic processing industry, furniture and parquet manufacturing industry, automobile and supplier industry, aircraft and wind power plant manufacturing, machine and tool industry in general, and in particular for the companies LACH-SPEZIAL and LACH DIAMANT. “Diamonds show profile” and this already in 1980/81, future-oriented for wood and plastic machining, as documented in two videos of the first start (created by LACH-SPEZIAL-WERKZEUGE GMBH and available at [vimeo.com/206233393](https://vimeo.com/206233393) and [vimeo.com/2062319829](https://vimeo.com/2062319829)) “Poly – poly – or what?” – an inexhaustible subject ... to be continued ...

### Horst Lach

P.S. By the way, the dreboform® diamond profile milling cutters delivered to Resopal Werk H. Römmler GmbH on January 5, 1979, came back for regrinding for the first time on June 1, 1979 – after five months.



LIGNA 1979 - with melodious play - the worldwide first presentation of diamond tools for all wooden and plastic materials.