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Oberflächen wie geschliffen –  
mit polykristallinem Bornitrid

**dreborid<sup>®</sup>-G**

unentbehrlich für  
Werkzeugbau und  
Produktion

**HSS-Guß-  
hochlegierte  
gehärtete Stähle**  
ab 55 HRc



**LACH  
DIAMANT**



This cover picture is a reproduction of a leaflet of 1975

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

3rd part

How grinding times of hours became turning times of minutes ...



# "Poly, poly or what?"

How grinding times of several hours became turning times of a few minutes

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

Here, in the third part, he reflects on the beginnings of hard turning, focusing on the period between autumn 1974 and the Hanover Trade Show in the spring of 1975.

Dealing with this new cutting material: "Polycrystalline diamonds" (PCD) was fascinating for all of us. After the presentation at the first Hanover Trade Show in 1973, each day brought new insights for production and for different applications. The diamond cutters, familiar with the production of natural turning diamonds and polished turning diamonds for the jewellery industry and for the turning of copper commutators, were especially amazed by the superior cutting abilities of this new material in comparison with natural diamonds.



Development, production and application of the first PCD tools was successful in the end. It was a team effort and based on the professional know-how of diamond cutters.

Polycrystalline diamond materials resisted even the most artistic skills of natural diamond cutters on traditional cast grinding wheels. Poly means "much" and does not have any growth to guide the trained eye of a diamond cutter. A grinding test on a resin-bond grinding wheel, manufactured by LACH DIAMANT, proved to be so successful that we started to look for a stable and precise tool grinding machine. We found a machine manufactured by Kelch, which we co-developed especially for PCD grinding. After a license transfer, we continue to build the »pcd-100/300« precision tool grinding machine for single-tipped PCD and carbide tools.



This brings to mind another great innovation, Borazon® CBN grinding wheels. These are well known among tool grinders in the tool manufacturing industry, as tool and inside grinding wheels with increasing production and as peripheral grinding wheel for surface and circular grinding. I had expected a polycrystalline CBN cutting material back in the beginning of 1973, a sort of "compact Borazon cutting edge".

As luck would have it, we received an inquiry from Hempel Company, Düsseldorf and they asked if we would be interested in a new cutting material named "Elbor", manufactured in the USSR, a compact CBN material, compressed through high-pressure synthesis.

At that time, we visited the Tomilinsky factory near Moscow, founded in 1959 and one of the leading manufacturers of diamond tools in the former Soviet Union and from the 60's onwards, also a

manufacturer of diamond and CBN grains. Here we would be introduced to "Elbor", a new cutting material that, until then, was unknown in the Western world and designed to make machining tools for hard machining.

By that time, we were very familiar with Borazon CBN grinding wheels, made from high-alloy hardened steel from 58/62 HRC. Compared to grinding, it should be easy to use this CBN composite mixture, unlike diamonds stable up to 1.500° C), for the superior turning of these steels.

However, the CBN composite material Elbor, consisted of a unit with an 8 mm radius and a thickness of approximately 6 mm. There was no carrier, or carbide layer, which would have provided for a solid soldered joint. We found comfort in the thought that we would, as usual, find a solution in order to achieve a stable connection between Elbor and holder. A license contract for the raw material was signed.

Back in Hanau, we began preparations for the Hanover Trade Show in 1975. We received unexpected help via Borazon: A customer thought that grinding times with the CBN grinding wheel were too long. Elbor provided the solution.

However, as expected, soldering without a carbide holder, as with PCD, was unsuccessful. At that time, we did not have the option to solder within a vacuum and so we had to sinter the Elbor cutting edge. The first attempt of making a turning tool in this way was already successful.





At the Hanover tradeshow in the spring, the new product was successfully presented as "dreborid G-AS" for machining of metal powder coated turning parts. For the first time, hours of grinding times were reduced to minutes of turning times and the surfaces were just as polished.



The first step towards better performance and more efficiency was done. We achieved up to 90 percent reductions in turning instead of grinding.

During the initial phase, Metco and Castolin provided all their technicians with LACH DIAMANT developed repair kits, containing one dreborid-G-AS turning steel and a special development, a dreborid G-diamond grinding wheel. Due to the low hardness of CBN, compared to PCD, even inexperienced tool grinders were now able to re-grind the cutting edge.

Encouraged by this and during our search for other possible applications, we were inspired by the positive experiences during the use of Borazon CBN grinding wheels.

We realised that from now on, there would be a "gap" between grinding with CBN and machining with polycrystalline CBN cutting materials results, despite the continued efforts of machining tool manufacturers to counteract this tendency with newly developed types of carbides and ceramics.

A solid carbide basis, however, for soldering was missing from the 8 mm  $\varnothing$  CBN compact unit. More and more often, we ran into the problem that the delicate Elbor cutting edge would break out of its matrix after 30 to 35 percent usage.

There was no other alternative manufacturer of polycrystalline CBN cutting edges. Until the end of 1975, when our PCD supplier GE surprisingly informed us that we could order polycrystalline "BZN-compact" boron nitride cutting edges from GE – with a carbide basis for soldering. Without any hesitation, we switched to BZN-compact.

Apparently, this polycrystalline material had already been developed in the mid 60's, in order to offer it to GE subsidiary Carboly. They were not interested at the time, but when we presented CBN tools at the Hanover Trade Show in 1975, Carboly in Frankfurt had already BZN inserts in its safe for some time.

Once again, the first step to the introduction of a new technology had been taken, let's simply call it the "hour of birth of hard turning."

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