

EMO 2017: LACH DIAMANT Looks Back on 95 Years.

Poly – poly – or what? How the story continued.

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. The occasion: LACH DIAMANT's 95th anniversary in the run up to EMO.

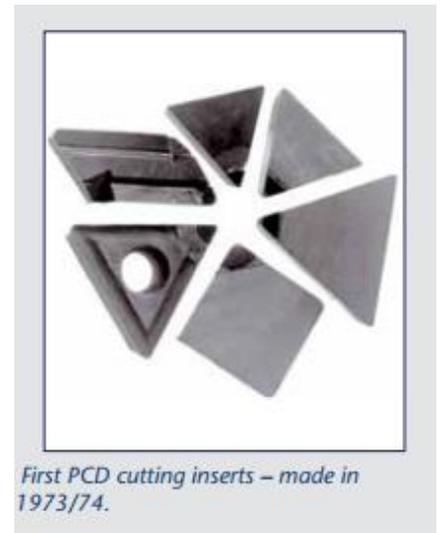
Horst Lach is known as a true industry veteran, and we are excited to have this pioneer of technology share some insights from over 57 years of professional experience in the diamond tool business.

In the fourth part of this (almost) historical review, Horst Lach looks back to the first twelve months after introducing the first polycrystalline machining tools.

Where do we come from – what is our destination? This was the question after the first introduction of this new cutting material "polycrystalline diamonds" (PCD) at the Hanover Trade Show in 1973 (see dihw 03 | 2017).

Despite the word "poly", the basis here is "diamond" (Greek: Adamas), naturally created from carbon in the depths of the earth under heat and pressure over millions of years. Diamond in its monocrystalline form is still the hardest of all things. Even before people discovered its beauty – "diamonds are a girl's best friend" – they made use of the hardness of this "indomitable" material in the earliest archaeological sites in India, e.g. for the turning and levelling of mill stones.

The industrial revolution, starting in England around 1770, and its powerful continuation in Germany in the mid 19th century would not have been possible without diamonds. They were instrumental especially for the production of steam engines and locomotives. More precise grinding machines, studded with wheels for steel grinding, had to be developed, and without diamond dressing tools, only geometrically distorted surfaces would have resulted. The demand for natural diamonds from Brazil and Africa skyrocketed during the following 100 years – and gained strategic importance due to both world wars. There was an increased need and desire to grow diamonds or to produce synthetic diamonds in order to



First PCD cutting inserts – made in 1973/74.

become less dependent on the commodity markets in London and Antwerp.

The Engineer Who Implemented Ideas

So it is no wonder that in 1954 engineer Tracy Hall was the first who succeeded in growing synthetic "man-made" diamonds in the United States, using a specially developed high-pressure press. When General Electric first marketed these synthetic granulated diamonds, with sizes of approximately 170 microns, under the brand name "Man Made Diamond" in 1957, it was one more step towards another technical revolution which, to this day, is affirmed through new innovations.

Once again, it was Tracy Hall who - in 1967/68 - implemented the idea to bake very fine diamond grains with carbide as a carrier material during synthesis. He was successful: The first step towards a so-called polycrystalline synthetic diamond cutting material had been accomplished. EDG (Electrical Discharge Grinding for dividing the round plates which at first had a diameter of approximately 3.2 mm) had not yet been discovered. Therefore, the carbide had to be scored with electro-plated diamond cutting



Crude composite cutting inserts. Source: "Bericht Schnelleres Drehen, Bohren und Fräsen..." Horst Lach MM Issue 11/1973.

**Translated from German to English by Gudrun Cruz, GLS – German Language Service.*

discs in order to be able to break off either 90 or 60 degree segments afterwards.

A New Cutting Material & The First Users

What to do with this new innovation? General Electric's management must have been faced with the same question at that time. After all, in 1966/67 the key "monopoly players" General Electric and DeBeers had introduced metal-coated diamond granulation and achieved super adhesive strength in resin-bond grinding wheels, which in turn made the use of carbide tools efficient for the industry for the first time. It was said that General Electric had good reason to protect its own carbide business within the corporate group – referring to its subsidiary "Carbology".

Nevertheless, the up-and-coming managers under the leadership of Louis Kapernaros must have prevailed within the big GE family. It was decided to provide samples of the new

cutting material to three or four selected diamond companies, including LACH DIAMANT. Apparently, GE was curious to see whether the company - known as "Borazon Pioneer" since the introduction of the CBN grinding wheel in 1969 - would once again come up with a lot of new ideas.

It was in the spring of 1974, shortly before the Hanover Trade Show, the second year after the first PCD presentation. Since the introduction of PCD for manufacturing copper commutators, we had practiced PCD turning instead of grinding and had tried to win new customers among aluminium processing companies such as Westinghouse, Voith, Solex and Oechsle, an enthusiastic PCD customer – which is still surprising to me today.

The company worked with polyamide synthetic materials, and produced small gears with imprinted numbers for the production of vehicle odometers.

Looking back, many new and unusual applications were added within a short period of time, e.g. the Dutch manufacturer for meerscham pipes who could now produce the mouthpiece faster and more precisely. As a thank you, he brought his latest pipe selection to each trade show for several years – which was a special delight to our sales



Internal turning with PCD tools – current development status in 1973/74.

manager, engineer Günter Hobohm, a passionate pipe smoker.

The automobile industry, later the main user of this new technology, was not one of the first users. An attempt of a North German diamond tool manufacturer to replace natural diamonds in the turning process of motor pistons could not be successful at this time. The poly cutting edge was considered to be too rough due to its poly saw character. This only changed many years later when it was discovered that its "roughness" would be perfectly complimentary to an elastic film of lubricant; broken down cars with seized pistons would be seen as a distant memory. This new business segment which had been growing rapidly within only a few months, also influenced the strategic planning at LACH DIAMANT. A newly finished industrial building, initially meant for the similarly booming branch of diamond and Borazon CBN grinding wheels, was turned into the first production facility for PCD tools. From now on, LACH DIAMANT PCD tools were marketed under the registered name dreborid®.

At that time, the grinding wheel production moved into a neighbour building, a large facility which happened to become vacant, and stayed there until 1984 when we moved to Donaustrasse in Hanau.



LACH DIAMANT dreborid® tool selection at stand at Hanover Trade Show in 1974 – Turning – Milling – Drilling – Cutting.

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PCD Milling as New Technology

Rapid growth – combined with the demand for shorter delivery times – forced us to find better conditions for grinding this “beastly material” (as our former Master diamond grinder Konrad Wagner dubbed it at that time).

After a search for a suitable machine, we finally found it at the Kelch company. In the following years, this machine was further adjusted to the particularities of PCD grinding. After taking over the license and construction, LACH DIAMANT is still building this machine, referred to as »pcd-100/300«.

Thereby, we were perfectly prepared for the manufacturing of so-called “single-tipped” tools for the trade show in 1974.

What kind of innovations did LACH DIAMANT deliver for the future use of PCD tools? One example was PCD-tipped carbide according to ISO. After discovering the fact that PCD cutting edges could be re-ground multiple times, customers wanted to continue to use carbide clamping devices for cutting inserts – for turning and milling! Milling? Another application. PCD milling was born.

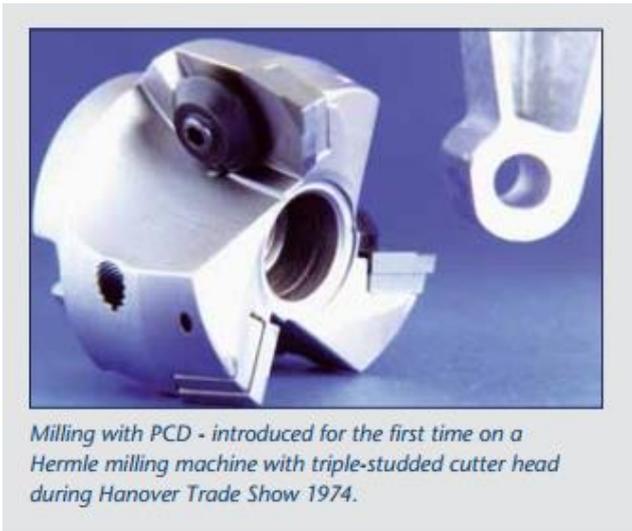
The Patent Issue

The highlight at our trade show stand in 1974 was therefore PCD inserts for turning and milling. PCD milling was demonstrated as a new technology on a Hermle milling machine with 5.000 rpm – equipped with a triple-studded cutting head. Aluminium and

At that time, interest could be called “enormous” – it was simply a success. At least until the alarmed junior manager of a North German company (back then considered an industry leader) appeared at our stand and asked reproachfully why LACH DIAMANT dared to show PCD tools for milling. His company had applied for the patent for this technology. At least two licensees had already been won in the Württemberg area. Well, in the end, the discussions at the trade show resulted in a free license for LACH DIAMANT. And as the reader might have already guessed, the patent came to nothing.

It is only mentioned in passing that another technologically sound idea was born during those days – reaming with PCD, an application we then discussed with a young man from Swabia for a potential cooperation.

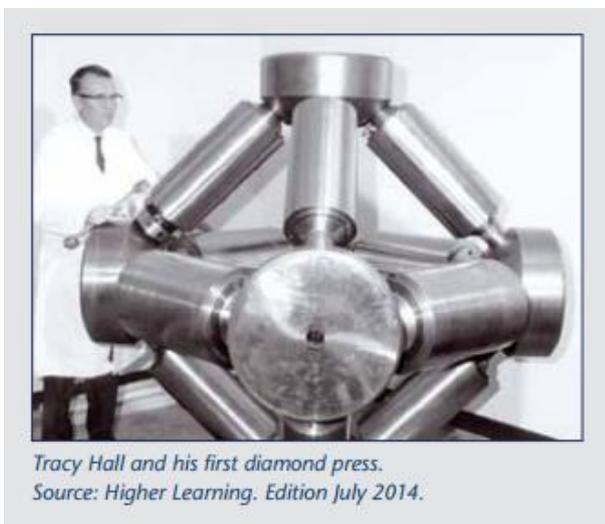
Horst Lach



Milling with PCD - introduced for the first time on a Hermle milling machine with triple-studded cutter head during Hanover Trade Show 1974.



Presentation of PCD-tipped end mills and cartridge milling cutters at Hanover Trade Show in 1974.



Tracy Hall and his first diamond press. Source: Higher Learning. Edition July 2014.

Duroplast parts as well as composite materials were milled.