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How Super-Abrasives Conquered the World

Horst Lach recalls the beginnings in the run-up to GrindTec 2016.

Does LACH DIAMANT present 108 years of expertise and know-how at GrindTec? Actually, the company was founded only 94 years ago, but as the founder’s son, Horst Lach, recalls, “the acquirement of knowledge began already in 1908 when Jakob Lach started his apprenticeship as a diamond cutter.”

When wage grinding became unprofitable after World War II, Jakob Lach focused on his second company, which he had founded in the 1930s for the sale and distribution of industrial diamonds. “Jakob Lach – Industrial Diamonds” [Deutscher Industriediamanten-Vertrieb Jakob Lach] was very successful in the Magdeburg – Leipzig – Chemnitz area and well known among automobile manufacturing companies such as Opel in Rüsselsheim.

With this, a new era had begun for Jakob Lach company – the name LACH DIAMANT® was born. Dressing and profiling of grinding wheels with industrial diamonds (both set and rough self-imported diamonds) became the primary business of LACH DIAMANT in the 1950s.

Photo #1: The first company outing of the diamond grindery Jakob Lach in 1924. In the front, to the far right, sits the founder of the company.

Photo #2: Horst Lach, born in 1940, manages LACH DIAMANT together with his son Dipl.-Ing. Robert Lach. The company was founded by Jakob Lach in 1922.

Abrasives of a new age

After Horst Lach joined LACH DIAMANT on October 1st, 1960, the company started manufacturing diamond grinding wheels in metal and resin bond for the grinding of hard metals and ceramics. “The development of metal-coated diamond grits by DeBeers (for example grit type RDA-MC) was instrumental not only for the success of diamond grinding wheels in resin bond for carbide processing (e. g. LACH DIAMANT’s grinding wheel K-MC) but also for the development of carbide tools in general, “ Horst Lach recollects. “At the same time this paved the way for the commercial success of tool manufacturers such as Leitz, Leuco, Sandvik, Widia and grinding machine manufacturers like Vollmer - Dornhan or Biberach, Walter, Stehle, and other companies like them”.

General Electric (GE), a manufacturer of super-abrasives set another milestone with their introduction of Borazon™ (boron nitride – CBN), a modern day abrasive. “Finally, it was possible for tool grinders to accomplish precise circular grinding of HSS milling tools on a Deckel grinder in a one-step process – without having to continuously find new measuring points on a traditional corundum grinding wheel,” Lach comments.

Photo #3: 1969 – Worldwide, the very first BORAZON CBN presentation.

The higher temperature resistance of the new abrasive Borazon-CBN (up to 1500°C) compared to diamond (up to 720°C) makes this possible despite a low degree of hardness. This new material

revolutionized the industry, and its potential for future processes and applications has still not been fully realized. It is a new material with a great deal of potential for future developments, processing, and applications for the grinding industry as the presentations at GrindTec demonstrate. LACH DIAMANT introduced the new “super-grind-power” grinding wheel and »drebojet®-plus«.

At the beginning of the 1970s, everything in the world of tool manufacturers appeared to be “just fine”, as Horst Lach remembers, until two new product innovations by GE shook the industry. These were PCD, a polycrystalline cutting material first introduced in 1973, and in 1974 CBN and PCBn, other polycrystalline cutting materials.

Photo #4: 1973 – The starting point of the first success story due to PCD – more efficient copper collector machining.

Historically interesting is the fact that GE researchers came across cubic crystalline boron nitride (CBN) early on, during their search for diamond synthesis. However, at the time they did not know what to do with this material since it had such a low hardness compared with diamonds.

Horst Lach remembers that Carboloy in Frankfurt, a GE company, already had CBN blanks in storage during the early 1960s. Later these blanks were marketed as BZN blanks.

LACH DIAMANT has been a pioneer from the very beginning – as a matter of fact since the first development, production, and commercialization of Borazon CBN grinding wheels. “We demonstrated turning of aluminium with interrupted cuts with a new cutting material PCD – dreborid® - at the Hanover Trade Show in 1973. GE offered polycrystalline synthetic

diamond segments with 600 and 900 angles for the first time in 1973. At the time it was very difficult to cut them out of blanks with only ø 3,4 mm, and cutting lengths were equally limited”.

Graphic #1: 1973 – For the very first time, GE offers polycrystalline diamonds for tool manufacturing.

Beastly materials

Grinding these polycrystalline materials was also problematic; diamond cutters, used to grinding natural diamonds, called them “beastly materials” without any structure and they rejected them. LACH DIAMANT was able to produce the very first PCD lateral turning tool on an existing Simon tool grinding machine with a diamond cup wheel in resin bond (K-MC, 125x12.5) – just in time for the Hanover Trade Show in the spring of 1973.

“We had a Weiler turning machine with a clamped-on aluminium round part for the following demonstrations. It was covered with bores in order to simulate interrupted cutting. Without knowing an exact tool life, we had ordered one replacement tool per show day (10 days at the time!) from our manufacturing facility in Hanau.

After three days we called off the special driver who transported the tools to Hanover; the PCD cutting edge worked and worked and worked, and at the time we believed we could never wear it down. We only accomplished that on the very last day of the show, when we boisterously placed a small bottle of sparkling wine into the machine... That was the starting point of PCD and the legendary dreborid® at LACH DIAMANT”, describes Horst Lach with a smirk.

LACH DIAMANT had decades of experience in manufacturing and servicing natural diamonds for the manufacturing companies of copper collectors for the electrical industry, and therefore the company focused at first on those customers, such as Bosch, Siemens, AEG, and this strategy proved to be very successful.

“Until then, a natural diamond tool for collectors could turn between 100 and 120,000 collectors at the most. PCD dreborid® turning tool made much more economically sound numbers possible. Today, depending on collector size and cut, one tool can produce up to 220,000 collectors. Truly electrifying results were achieved when PCD dreborid® was tried out at Kautt & Bux, a manufacturer of rough collectors. Until then rough collectors had to be ground in a time-consuming process. Now this procedure could be done in a few seconds by turning instead of grinding the collectors for several minutes. This meant for LACH DIAMANT that they had won a key account customer right from the get-go. Both, PCD manufacturing and service could be built on this initial success.

Alternatives on the market for grinding machines

Even diamond cutters of natural diamonds had surrendered to the “beastly” polycrystalline cutting material PCD. New procedures had to be developed and at least some alternative solutions were needed on the market for grinding machines.

Photo #5: 1974 – LACH DIAMOND demonstrates for the first time the milling of plastics and aluminium with PCD at the Hanover spring trade show (image shows machining of GRP)

Photo #6: 1977 – At productronica, Munich, the worldwide first presentation of PCD milling cutters, saws and scoring saws for machining abrasive plastics.

“Quick decisions were of the essence, since from the very beginning, there were a lot of potential users of PCD, including machining companies who processed aluminium, hard and soft plastics, wooden materials, green ceramics and other materials; the optimal grinding system should not only accomplish straight edges but should also be able to grind angle and radius. The final choice was a rather “delicate”, yet extremely precise, tool grinding machine, the Kelch SZ34”. LACH DIAMANT and the manufacturer from Southern Germany worked closely together in order to adapt the machine specifically to PCD grinding. After the production license was transferred, LACH DIAMANT continued to build this machine under the new names »pcd-100« (equipped with swivel part) and »pcd-300« (equipped with optional adjustable spherical head). Requests to produce PCD-tipped rotating tools such as milling cutters, scoring saws and saws were fulfilled at productronica in Munich in 1977. LACH DIAMANT had chosen GRP (glass fibre enforced plastic), an extremely hard-to-machine material for this “trial run of PCD-tipped rotating tools”. GRP is used as base material (PCB) in the production of circuit boards. 35 hours of grinding time for twelve teeth was accepted in the false hope that “we would eventually find something better. Not at all. With the grinding technology of the time, there was no reduction possible. The initial enthusiasm of the exhibition visitors quickly gave way to accusations of withholding these cost-cutting miracle tools. Potential customers held this grudge for years.

Photo #7: 1978 –Horst Lach’s discovery of spark erosion made everything possible. Example: Production of multiple diamond saws on LACH DIAMANT’s universal sharpening machine »Dia-2200-mini«.

Machining of composite materials.

In 1978, one and a half years after this rocky start, a memory triggered another brilliant idea. Horst Lach remembered the words of his father that “electricity has a major part in grinding diamonds (he was talking about natural diamonds)”. Horst Lach was reading an advertisement for Fanuc erosion machines of the former company Matra.

“The reader should know that at the time GE and supplier DeBeers still used electro-plated diamond cutting wheels for cutting PCD blanks: The back of the hard metal surface of up to 6.4 mm round PCD blanks was first scored, then broken. At the time spark erosion had not yet been discovered”. His interest was piqued.

A visit to Matra should change the world of machining. After a first successful attempt to machine and form the electro-conductive PCD via spark erosion, this new process opened up the same possibilities for PCD which hard metals had finally established over HSS and ceramics. LACH DIAMANT entered the market of machining wood and composite materials by founding LACH-SPEZIAL-WERKZEUGE GmbH which in turn established LACH DIAMOND INC. for the American and Canadian markets.

Photo #8: 2016 – GrindTec Augsburg: Introduction of »drebojet®-plus« as another example of non-stop innovations. Contour-controlled dressing of conventional grinding wheels at LACH DIAMANT’s stand 1052 in hall 1.

A very bright future.

PCD diamond tools proved to be 250-300 times as efficient as hard metal-tipped woodworking tools. NC manufacturing technology was soon developed into CNC technology with multi-axis machines. “Today we know that this technology did not stop at metal machining. All the advancements of today’s automobile, aircraft, energy (especially wind energy with CFRP wings), sports and medical industries – to name only a few - would not have been possible without diamond, without polycrystalline synthetic cutting materials, including so-called mono diamonds and CVD (chemical vapour deposition).” After the development of spark erosion, or electrical discharge machining, Horst Lach obtained one of the first European patents. He withdrew the patent voluntarily after a Swedish tool manufacturer lodged an appeal. This discovery opened up a vision of a very bright future. Continuous innovations have proven this up to this day. LACH DIAMANT’s exhibition programme at this year’s GrindTec 2016 in Augsburg further demonstrates this as well. LACH DIAMANT’s entrepreneurial success with erosion technology is particularly evident in its technologically mature, well-engineered erosion grinder, »Dia-2200-mini«, which machines diamond tools for the wood and plastics industry. The GrindTec 2016 exhibition demonstrated that, today and in the future, LACH DIAMANT stands at the cutting edge of machining and grinding technology.

Photos: LACH DIAMANT

More information at www.lach-diamant.de - GrindTec: Hall 1, Stand 1052.

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