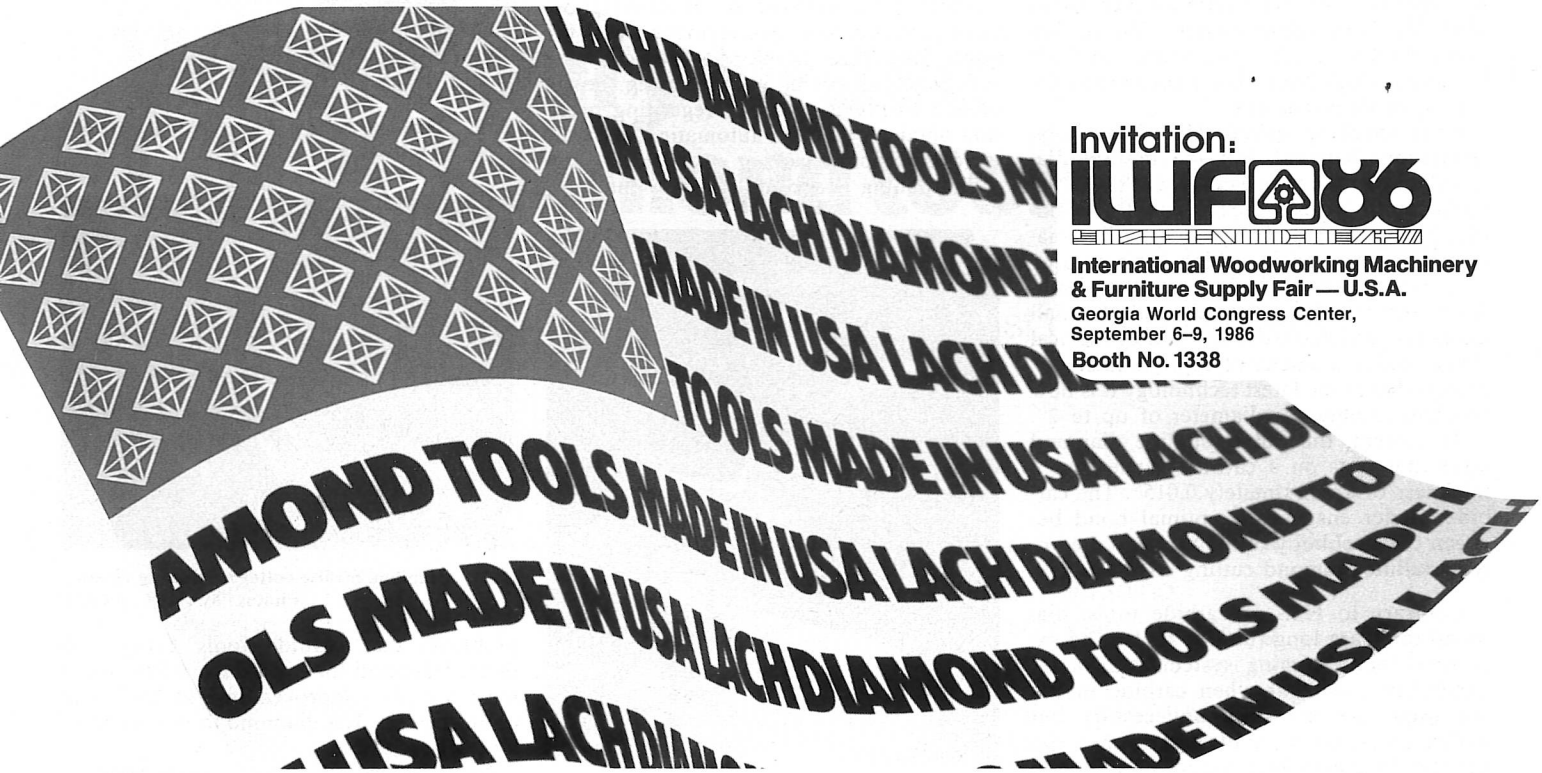


Reprint from

Woodworking Machinery

made in Europe

Published by Holz-Zentralblatt · HK international Stuttgart 1986

Diamond Tools for Woodworking

By Horst Lach, Hanau (Germany)

First of all, let us take a look at the diamond cutting edge material. It is made of synthetic polycrystalline diamonds, manufactured in the USA. The diamond is still the hardest material we know. According to the hardness scale of Knoop, diamonds stand at the top at a Knoop value of 7,000, followed by boron nitride at 4,700, boron carbide at 2,750, silicon carbide at 2,480, and carbide at 1,800 to 2,000. Expressed in a different way, diamonds are 125 times more abrasion-resistant than carbide. Small wonder then, that we obtain an increase in tool life from approximately 250 to 300 times. I refer here to documented tool life increases which have been published in the leading trade magazines.

I am speaking specifically of the polycrystalline diamond, not the natural diamond since the latter cannot withstand the high impact loads which occur, for example, during routing. The polycrystalline diamond is produced in a high temperature/high pressure process. Under these conditions, and aided by a metal catalyst, small diamond particles are fused into cylindrical shapes with a diameter of approximately ½″ though due to the latest technology it is now possible to obtain a diameter of up to 2″.

At present, the polycrystalline diamond layer that rests on a carbide carrier has a thickness of approximately 0.015″. The carbide carrier ensures an optimal bond between the steel body of the tool and the polycrystalline diamond cutting edge.

Contrary to HSS or carbide tools, diamond tools are long-running tools. The expensive tool changing systems which are needed in particular when carbide inserts are used, are not only unnecessary but would constitute a paradox since they run counter to the savings aspect of diamond tools. Diamond tools on double-end-tenoners and shapers, for example, will last an average of 4 and a half months in a single-shift operation, whereas – under similar conditions – carbide tools last an average of 3 hours. This corresponds to a ratio of 300:1 in favour of diamond tools.

Let us assume that, using a tool-changing system – which, of course, is unnecessary for diamond tools – one insert would protrude by just 0.0003″ during the cutting process, then this one protruding diamond edge would appear time and again as an interference factor in the form of a ridge in the wood or wood product that is being machined, such as particle board, MDF, or redwood. And this would go on for roughly 4 and a half months! The protruding edge would not even itself align with the other cutting edges, during the life span of the tool because, this is diamond, as opposed to carbide, in particular.

Therefore a diamond tool must be an optimal precision tool. In conjunction with the tools, Lach has developed methods and even machines which help realising the approach to precision tools, regarding precision obtained through automation, with the aid of microprocessors.

Sharpening is accomplished by the same method. Sharpening is a vital process not only for economy's sake, but for ongoing precision, and the life span of the diamond tool. Each diamond tool – and they can see up to 4 years of service provided that they have been sharpened 8 to 12 times – needs an identity. From the very beginning we provide this identity, with the help of a computer which stores all the necessary data for servicing the tool. The computerized data system enables manufacturers, even after months or years, to joint the most diverse parts, on a mass production basis without problems. I was happy to hear this because in Europe we don't experience such long runs of just one profile. Long production runs give the opportunity to obtain maximum savings from a diamond tool. The latest developments in woodworking machines will help, too.

What use is a CNC-router in a situation where a production run has to be interrupted after having produced just a few pieces? How would you feel if a workpiece that was produced on a CNC-machine with maximum feed would subsequently have to be handsanded because the edges were not clean cut? Not even counting the fact that your production will be interrupted and thus burdened with unnecessary costs, in some instances you might possibly have to supply a customer with merchandise of various quality standards. Less servicing problems.

The Diamond tool solves the servicing problems that carbide tools bring with them. Diamond tools will also allow you to have a vastly improved insight into your tooling needs. The diamond tool is the ideal tool for long runs.

Manufacturers can now concentrate on increasing production and better utilization of their machines. They will have more time now, time which formerly had to be spent on changing the carbide tool. Due to the sharper and cleaner cutting edge of the diamond tools, it is possible to increase feeds and speeds. The diamond tool is the tool for large scale production.

There reminds the question: "Can I make use of a diamond tool, and can it be utilized on the machines I have in my plant?" As long as the machine in use is in reasonably good shape, meaning that the bearings are in good condition, and that there seem to be no obvious mechanical defects, then it is possible to use diamond tools. Such a machine is suitable for diamond tools because the tool manufacturer will design a tool to fit the existing machine. It is not necessary that you change your usual procedures regarding feeds and speeds as the diamond tool is engineered completely for the needs of your operation.

On the newer, and perhaps computer-controlled machines, diamond tools have a definite place. Only through the use of diamond tools will you be able to obtain your machine's full potential. The diamond tool allows you production increases, running shift after shift without a tool change.

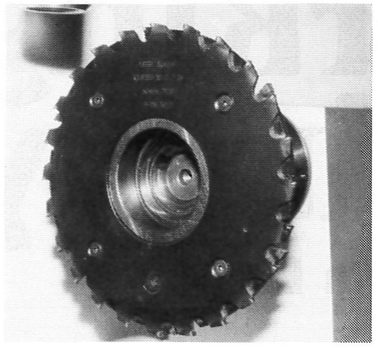
Diamond tools can be used on double-end-tenoners, routers, shapers, saws, edge-banders, jointers, dovetailing machines, molders and special machines. The variety of shapes made with that magic crystal diamond is truly astonishing: It ranges from a single-groove profile to the most complicated profile as, for instance, cabinet doors, tongue-and-groove patterns for hardwood flooring, V-grooving, architectural moldings, furniture parts, straight edges, rounded corners, frames, etc. For each profile or shape a specific tool is designed. All pertinent data pertaining to each individual tool, including its shape, are stored magnetically and can be recalled when the tool needs resharpening: this ensures an exact duplication of the profile.

Today, there are many new materials on the market. Some of them are very hard to cut, with some it is even impossible to do so with conventional carbide tools. The advent of diamond tools opened up a new era for many of these materials, such as the high-density fiber board, carbon epoxies, synthetic marble. Hardwood, tropical wood, MDF, particleboard, laminated materials – where the edge quality is highly important – plywood, gypsum boards, hardboard and composites, to name just a few.

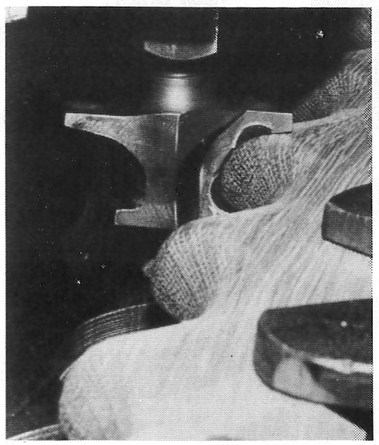
Diamond will cut these materials economically. The keener cutting edge of the diamond tool will give you a cleaner cut which translates directly into profit increase, and avoidance of the extra step of sanding that would otherwise be required for many of these materials.

The diamond tool really shines when it comes to the use on materials which formerly shortened the life of tools considerably, made frequent tool changes necessary resulting in excessive down-time, and gave poor quality.

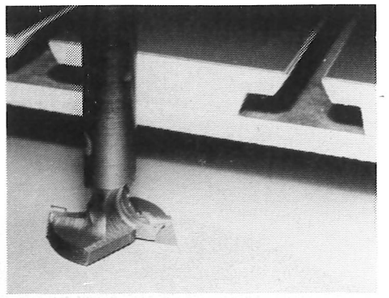
The author is head of the Lach company



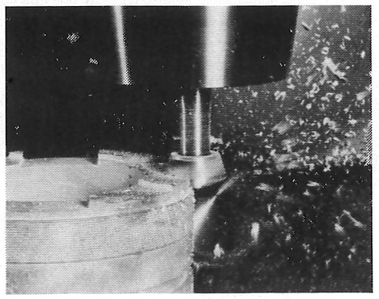
Ill. 1 Diamond hogging head in action running up to 3 to 4 months without any tool change



Ill. 2 Diamond profile routing with CNC; one of the best applications with diamond tooling in woodworking



Ill. 3 Diamond tool for T-slot-cutting, only one single operation



Ill. 4 Diamond profile cutter machining plastics (Photos: by courtesy Lach)

Where can you use LACH-Diamond tools?

Practically in all applications where you have used carbide tools, Diamond tools can be applied for substantial cost cutting effects.

APPLICATIONS

- Routing
- Shaping
- Cutting
- Edge trimming
- Grooving
- Milling
- Rebating
- Sizing
- Jointing
- Straight cutting
- Profile machining
- Hogging with prescoring
- Hogging without prescoring
- Folding, V-Grooving
- T-Slotting

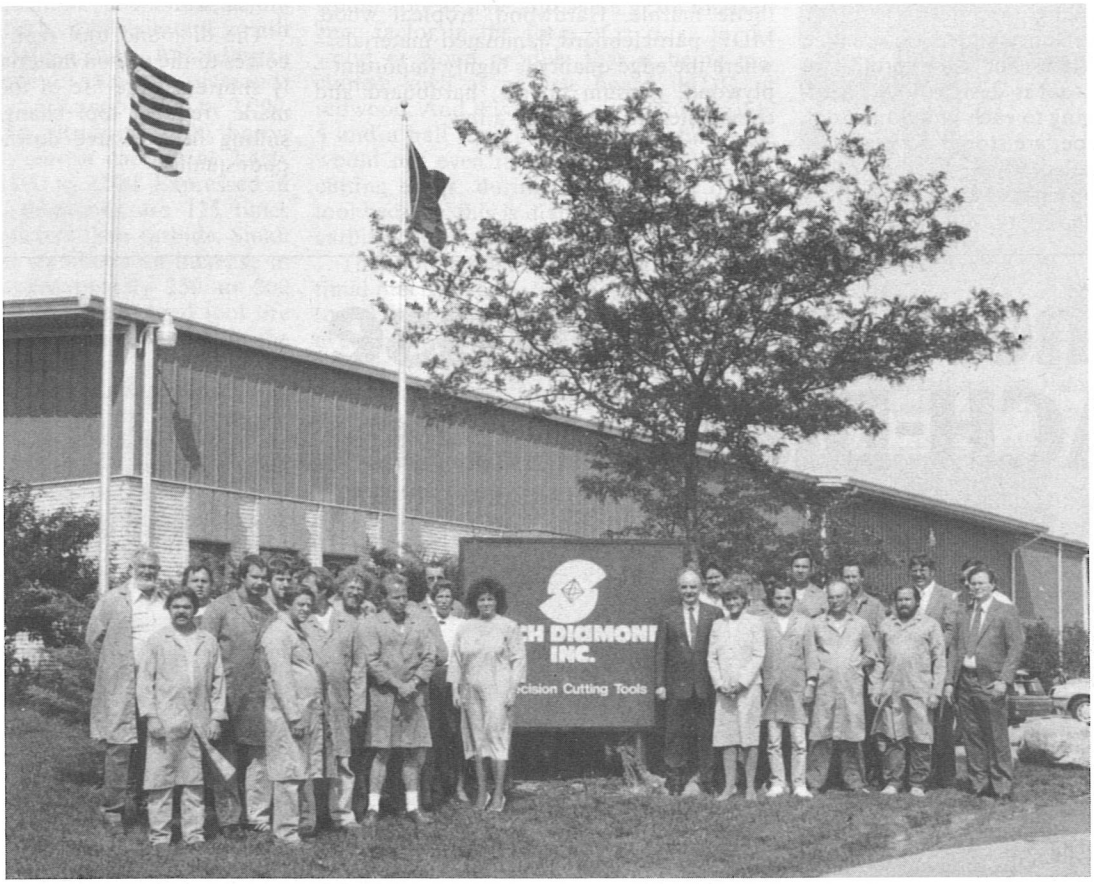
MACHINES

- Routers
- Shapers
- Moulders
- Jointers
- Carvers
- Planers
- Double end tenoners
- Saws

MATERIALS

that can be cut with Diamond

- Hardwood
- Tropical Wood
- Plastics
- Duro-plastics
- Fiberglass reinforced materials
- Parquet woods
- Chipboard
- Particleboard
- Laminates
- Composites
- Laminated Boards
- Softwood
- Medium Density Fibreboard
- Hardboards, tempered and untempered
- Plywood
- Graphite, Gypsum
- Cemented particleboard
- Fire resistant particleboard



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