

UKAM Industrial Superhard Tools Division of LEL Diamond Tools International, Inc.
25345 Avenue Stanford, Unit 211 Valencia, CA 91355 USA
Phone: (661) 257-2288 Fax: (661) 257-3833 www.ukam.com

SMART CUT™ technology

Advanced Diamond Machining

SOLUTIONS

*Diamond Tools Play a major role
in our everyday life.*

for the complex material world



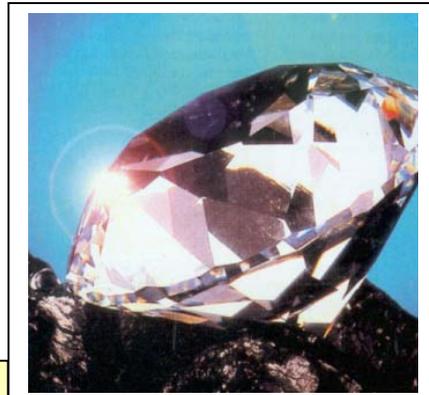
Our life as we know today would not be made possible without the use of diamonds to machine the materials around us. Diamond Tools are used to machine the concrete roads we walk and drive on, granites in our kitchen countertops, electronic chips found in our cellular phones and other electronic devices. Many Industries and Products we take for granted today, could not feasibly exist without the use of diamond tools.



In 1996 over 5 billion dollars worth of diamond tools were consumed worldwide. Since the inception of the first industrial diamond, the material industry and diamond tools employed have evolved over the last 50 years from infancy to steady maturity. Despite the tremendous improvements which Synthetic Diamond and CBN (cubic boron nitride) have provided for precision cutting, drilling, and grinding tools, which are used to shape and fabricate the world around us. There are still many problems and disadvantages in both manufacturing and using these tools. Which when resolved, would greatly improve performance of these tools and reduce their costs.

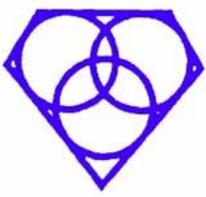


One of the main problems faced by diamond tool manufacturers worldwide involves properly orienting and positioning diamonds inside bond matrix. Over the decades there have been numerous attempts to solve the diamond and CBN distribution problem. Unfortunately, none of the attempts have been proven effective.



Today 99.8% diamond tool manufacturers still have no way or technology to evenly control and distribute Diamond or CBN particles inside bond matrix, nor properly position them to maximize their machining efficiency.





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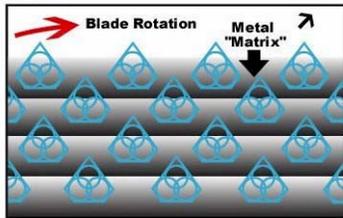
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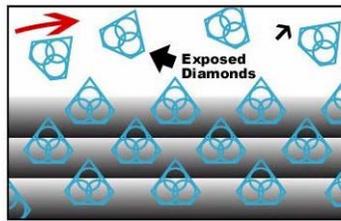
Current technologies are also inadequate to provide effective control of diamond mesh size (grit size) and concentration of variations on different parts of the same tool. Current technologies also do not allow diamond distribution to be factored in when manufacture a wheel specifically designed for individual material property and structure.

The sharpest and finest quality DeBeers diamonds that go into a Smart Cut Diamond Bond, immediately penetrate into the material, grinding and polishing as they cut.

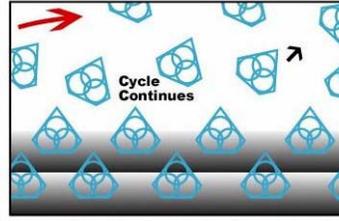
How SMART CUT Works?



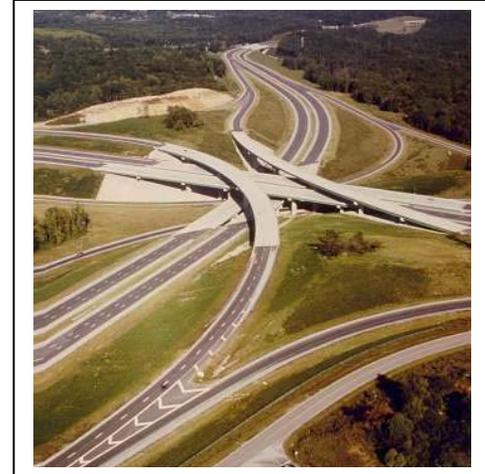
Diamonds are activated only at the exposed layer. As diamonds layer begin to wear out, diamonds in a new diamond layer are immediately activated, substituting the already used up diamond layer. The Smart Cut Diamond Bond makes sure every diamond is in the right place and at the right time, working where you need it most.



The newly exposed diamonds don't effect diamonds already working on the material. Unlike many other diamond bonds, diamonds in a Smart Cut remain sharp and grow sharper with each cut. Prolonging product life and consistent performance.



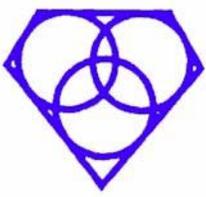
This advanced formulated open diamond bond design insures minimal chipping, fast cut, constant speed of cut, minimal cutting noise, and most important of all minimal loss of precious material.



SMART CUT™ technology is Developed

In 1998 UKAM Industrial Superhard Tools, Division of LEL Diamond Tools International, Inc. Developed a solution to this problem. A new breakthrough called “**SMART CUT technology**” in manufacturing precision diamond tools. **SMART CUT** will greatly improve your diamond tool cutting, drilling, grinding, and lapping efficiency **SMART CUT™** is an **ADVANCED** technology that redefines the standard in manufacturing diamond tools. Utilizing this technology a diamond tool manufacturer is capable of orienting diamonds inside matrix so that every diamond is better able to participate in cutting or drilling action. **SMART CUT™** open bond design makes sure every diamond is in the right place and at the right time, working where you need it most. You get maximum use of diamond and bond.

This technology makes diamond concentration almost irrelevant. What most diamond tool manufacturers used to do, and still do today is place diamonds inside the metal matrix, with no control over diamond distribution. The problem with this approach is inconsistent diamond tool performance. Only about 40% of these diamonds are able to participate in diamond machining action. The rest fall out, become dull, or disintegrate before they have a chance of being used. This factor causes the following problems:



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Problems with Conventional Diamond Tools

The distance between each Diamond or CBN particles determines the work load each diamond will perform. Improper spacing of diamond or CBN particles typically leads to premature failure of abrasive surfaces or structure. If diamond or CBN particles are too close to one another, some of these particles are redundant and provide little or no assistance in cutting, drilling, grinding, or lapping. Excess diamonds particles increase the cost of manufacturing diamond tools, due to high cost diamond and CBN powder.

Yet have no effect in increasing performance. In fact excess and non performing diamond or CBN particles reduce the diamond tools overall performance and efficiency by blocking up the passage of debris from material being machined. In many cases these excessive diamond particles play a major rule in decreasing the useful life of your diamond tool. Conventional diamond tools have been suffering from these type of problems and inefficiencies for over 50 years.

Diamond Inefficiency / Ineffective Tool Performance

The performance of a diamond tool depends on how diamonds are distributed and adhered in matrix. Diamond distribution can be random or regular, and its adherence strong or weak. Conventional diamond tools contain randomly distributed diamond particles, and their adherence is intrinsically weak. Random diamond distribution combined with weak diamond bonding in conventional diamond tools design may slow down the cutting, drilling, grinding, and machining speed and shorten the tool life.

Diamond particles in conventional diamond tools are separated too far (the impact exerted by each diamond particle on material becomes excessive). The sparsely distributed diamond or CBN particles may be crushed or even dislodged from the matrix into which they are disposed. The damaged or missing diamond particles are unable to fully assist in the work load. Hence the workload is transferred on to the remaining diamond particles.

SLICING



DICING

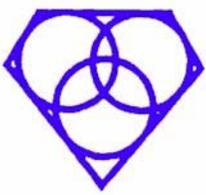


DRILLING



GRINDING



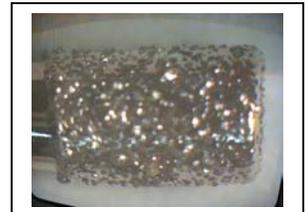
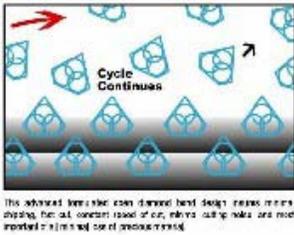


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The failure of each diamond particle causes a chain reaction, which soon results in tool ineffective performance or complete failure of the diamond tool.

Inconsistent Machining Speed & Excessive Tool Dressing

After a few dozen uses a conventional diamond tool, and its speed gradually begins to slow down. You will notice excessively longer machining speeds, and equipment motor bug downs. And since only a few diamonds participate in the machining action, you may find your self applying an increasing amount pressure just to machine the same amount of material. Without properly orienting the diamonds, conventional diamond tools quickly become dull, out of round. With further machining requiring constant blade dressing, in order to expose new diamonds.

Excessive Heat Generation & Loss of straight cutting capability

Constant diamond tool dressing and pressure put forth on material, causes the tool to overheat and loose its tension. The user may find themselves using excessive force and pressure just to machine a small amount of material.

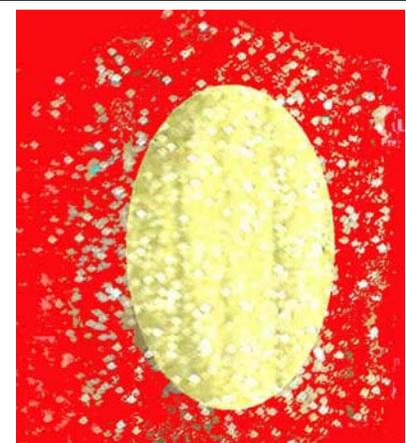
SMART CUT™ technology

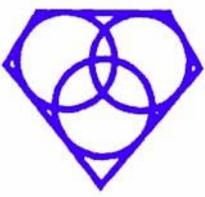


SMART CUT™ technology allows the diamond tool manufacturer to control diamond spacing. Hence improving ever diamond particles performance. Reducing the need for high diamond concentration used in diamond tools. Every Diamond in a **SMART CUT™ diamond bond** works like a small horse. Unlike many other bond designs, the **SMART CUT™** begins to work from the first cut, and remains to work at the same level of consistent performance until you take your last cut. This unique open bond design insures you get the maximum usage of diamond and bond every time you use a **SMART CUT™** product.

INDUSTRIES USED IN:

- *Advanced Ceramics*
- *Composites*
- *Glass*
- *Medical Industry*
- *Metallography*
- *Material Science*
- *Natural Stone*
- *Precision Optics*
- *Precious Stone*
- *Semiconductor*





Maximum Diamond Exposure / Diamonds Working for you

SMART CUT™ open bond is designed to keep diamonds working at their maximum potential. **SMART CUT** diamond bond undergoes regular renewal, making sure all diamonds are constantly under maximum exposure to materials being worked on.

Some of the advantages include:

- More Consistent & Uniform Overall Performance
- Minimal Chipping
- Faster Machining Action
- Minimal Machining Noise
- Minimal Loss of Material
- Minimal Tool Dressing / Diamond Rerposure
- Easier to Use

HOW SMART CUT WORKS?

Figure # 1

The sharpest and finest quality Synthetic DeBeers diamonds that go into a **SMART CUT™** Diamond Bond. Immediately penetrate into the material, grinding and polishing as they cut.

Figure # 2

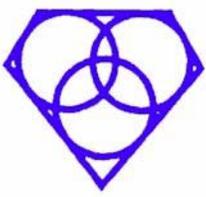
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Figure # 3

The newly exposed diamonds don't effect diamonds working already inside the material. Unlike many other diamond bonds, diamond in a **SMART CUT™** remain sharp and grow sharper with each cut. Prolonging product life and consistent performance.

Figure # 4

This advanced formulated open bond design insures minimal chipping, fast cut, constant speed of cut, minimal cutting noise, and most important of all minimum loss of precious material.



What is the difference between conventional diamond tools, and a diamond tools with SMART CUT™ technology?

Advanced Coolant System

Precision diamond tools manufactured utilizing **SMART CUT™** technology, are built with a special open bond design that promotes a better coolant system. Air and water flows freely through the diamond bond, providing extra coolant, greater conductor of heat and thus increased product longevity. Instead of heat generated in a few places, it is evenly distributed and hence minimized.

Easy to Use

We made a science out of making your work easier. **SMART CUT™** technology are easier to use than most conventional diamond products. Thousands of sharp and high quality diamond particles metallurgically bonded to alloy steel allow diamond tools with **SMART CUT™** technology to complete a job by applying little or no pressure. Freeing the user from constantly having to dress and renew the diamond layer. **SMART CUT™** technology makes any sophisticated job a simple one.

no glazing

Diamond Tools with **SMART CUT™** technology require minimal dressing, the bond renews itself.

faster machining action

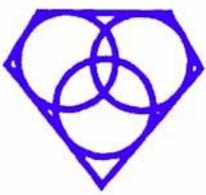
Diamond Tools manufactured utilizing this technology are much more aggressive than your conventional blades. They machine material faster, still leaving behind a smooth finish.

longer lasting

In most cases diamond tools manufactured utilizing **SMART CUT™** technology, will outlast other conventional metal (sintered), resin, and nickel bonded diamond tools. **SMART CUT™** diamond tools are more sturdy than tools manufactured with conventional technologies. Unlike many other resin or metal bonded diamond tools, these will not dull and maintain its firm shape and bond configuration all the way through the diamond tools life.

Controlled Diamond Concentration at different parts of diamond tool

Many times a metal bond diamond tool requires different sizes of diamonds and different diamond concentrations to be disposed at different parts on the same tool. Most diamond tools wear faster on the edge or in front than the middle.



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Higher diamond concentrations are preferred in these locations to prevent uneven wear and thus premature tools failure.

By making the distribution of Diamond or CBN particles uniform and in a predetermined pattern, tailored to individual customer application. The work load can be evenly distributed to each diamond particle. As a result a diamond tool with **SMART CUT** technology will machine material faster and its working life will be extended a considerable amount of time.

SMART CUT technology promotes not only even diamond distribution. But strong diamond retention as well. Allowing the diamond tool manufacturer to use of smaller diamond particles. Small diamond particles will improve surface finish, and optimized performance of each diamond particle.

There are other advantages of utilizing diamond tools manufactured with the **SMART CUT™** technology. The company feels, you will find it a significant breakthrough in your industry.

When you see the **SMART CUT™** symbol on a product, you know there is more to the diamond tool than it looks. Because what you don't see is what makes all the difference. Whatever your goal requires you will find an advanced, high quality, and cost effective **SMART CUT™** solution, specially designed for your needs. Just how superior is a **SMART CUT™** product?

That's for you to decide. Because you can't really see the difference or get a sense of it from words. You must feel it, and you will from the first time you pick up a **SMART CUT™** diamond product to the time you first use it, and all the way to the tools life.



SMART CUT™ Difference

That's the difference you get out of every SMART CUT™ product. The difference you can't see, but you will feel and highly appreciate

IT'S TIME YOU EXPECT MORE FROM YOUR TOOLS.