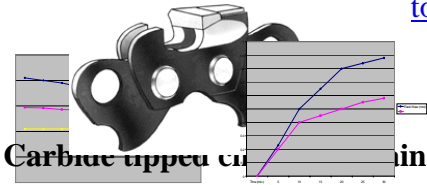


Northwest Research Institute, Inc.
Carbide Processors Inc.
Newsletter

3847 S. Union Ave. Tacoma, WA. 98409 800 346-8274

January 2001

tomwalz@email/msn.com www.carbideprocessors.com



Rapco Industries, Inc. in Vancouver, WA makes carbide tipped chain saw chains. They sell world wide directly and through distributors. They have a very impressive operation to ensure quality and make chains in a huge number of shapes and sizes for many different uses. They run many small batches with a lot of change over. . Ron Blehm started Rapco Industries, Inc. and his son, John, now works there. Their success is due to both father and son. They have different analytical styles and different approaches to situations. However both are very sharp and very quality oriented.

We mention this because 1. We get people asking us where they can buy carbide tipped chain and it is nice to have an answer. 2. John and Ron truly are good and we liked them. 3. People have tried to talk us into making carbide tipped chain and we never wanted to do. After seeing how the experts do it we really don't want to try and compete with them. Rapco Industries, Inc. (800) 959-6130 <http://www.rapcoinc.qpg.com/> rapco_carbide@prodigy.com

We can test coolants for bacteria, metals, pH and other values.

**February Special
10% off all cobalt
testing**

Cermets are tougher than carbide and stay sharper longer - New Data from Japan (see P.2)



"We put them on weeks ago and they are still sharp. I don't know when we are ever going to take them off." Customer comment on Ceramic (TiCN cermet) tipped saws.



own - guys are making them work Cermets are a little different than carbide but it is not a huge difference. Good shops figure out how to use them very rapidly and we can supply a lot of information. (see p2 & p.3)

Cermet saw magazine articles WIN, Fine Woodworking, Asian Timber, Woodworker's Gazette, Specialty Wood Journal And Woodworker's Journal

Exclusive report

Japanese plan to dominate US saw market (see P. 7)

Seven sets of cermet tipped saws on a shipping bench.

They cost 30% more to make than carbide, sell for twice the price of carbide and customers love them

Cermets need to be ground differently than carbide and they need to be run differently than carbide. Learning to use cermets is a lot easier than learning to use carbide was 40 years ago but it still takes some learning. If you grind them wrong they will break.

Cermets in short supply

Cermets are getting much more popular and the supply is getting short. It can take 5 or 6 months to get delivery. We do have some on hand but the supply is running low.

Stan Wynn at Northwest Hardwoods in Longview, WA.

Stan took a lot of time and trouble to educate me last fall. It is really nice when a filer goes out of his way to explain just what is really going on and what he really needs.

Franklin Goforth Welcut of Idaho in Naples, ID

Franklin uses Easy Off to clean parts but he also uses Calgon dishwasher soap. He did remind us that you need to use clean solution. Any cleaning solution gets old and dirty eventually.



Grinding Cermet Tipped Saws

Gary L. Miller

Diamond Productions Inc. 12/29/2000

The technology of cutting tools has dramatically changed over the last two centuries. In the early 1800's carbon tool steels were used, followed by high-speed tool steels in the early 1900's. Then in 1930 cemented carbide was first introduced succeeded by Stellite®, Polycrystalline Diamond (PCD) and Cermets.

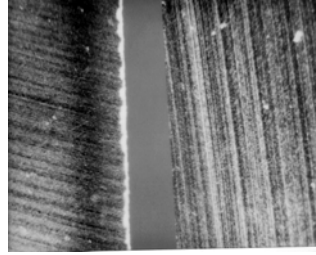
These materials were first used in metal working industries and were mechanically held. As the technology developed to braze the materials they were used in saws in woodworking and similar industries. The next big steps in woodworking and saws are the use of cermets and then ceramics.

Each time the material of the cutting tools changed so did the need to change the grinding procedures. In the case of Cermet tips this has never been truer.

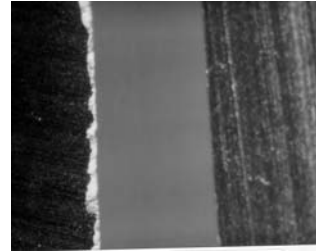
Cermet or Titanium Carbo Nitride (TCN54) though classified as ceramic it really is not. Cermet is comprised of non-metallic refractory compounds (carbides and nitrides) and metallic binders namely Cobalt and Nickel (metals) hence the name Cermet.

Compared to Tungsten Carbide, Cermet is much more abrasive resistant and oxidation resistant. At the same time is more brittle, rigid, fractures easier, more susceptible to shock and has poorer heat dissipating qualities as compared to tungsten carbide. Because of these differences Cermet is much more susceptible to grinding pressures and much more difficult to grind.

Cermets ground using the right wheel and the wrong wheel



40 magnification - good wheel rt.



100 magnification - The left one was ground with the wrong wheel. The right one was ground with a proper wheel. The broken edges on the left start crack propagation, which weakens the material. Then material gets forced into the crack and you get a wedge effect tearing the tip apart. The minor edge irregularity on the right will be removed with a very light honing.

TiCN cermet is about twice as hard as carbide and is harder than some diamond. Grinding cermet is like grinding CBN (cubic boron nitride) or boron carbide.

Typically grinding force ratios in Cermets are 4 to 5 times higher than that of tungsten carbide. In grinding cermet it has been found that when the grinding pressures go up the surface finish goes down due to heat and impact on both the grinding wheel and on the Cermet being ground. When the grinding pressures go up the surface finish goes down due to chipping and subsurface damage which is difficult to detect and can have an adverse effect on the performance of the tool and the tool life.

In order to reduce heat and impact on the cermet tip one must use a very soft free cutting diamond wheel. Research shows that coarse grit sizes and harder diamonds tend to cause more impact stress and diamond pull out. Where smaller more friable diamonds help reduce the grinding pressures and increase the g ratio (grinding ratio). Smaller diamonds give more grinding points on a given grinding plane and more friable diamond gives you more sharp points. It is recommended that one use a diamond grit size between 220 and 400 with 75-100 concentration and a soft free cutting bond. A good starting place would be MD220R75B. Also always use the smallest contact area to help reduce the heat at the point of contact.

Next use a heavy, stable and rigid machine such as Vollmer, Euromax, Wright, Akemat or Walter where you can control your speed and feeds. Your stock removal is considerably different when grinding Cermet as compared to tungsten carbide. You should remove no more than .001 to .004 at half your normal feed rate. Always use good clean and rich coolant either water soluble oil or synthetic and lots of it. Always remember heat is your enemy and anything you can do to reduce it will help you.

If you have any questions you can reach me at:

Gary Miller

Diamond Productions Inc.

Phone/ Fax (909) 883-1440

Cell (973) 454-0539

E-mail pengar@compuserve.com

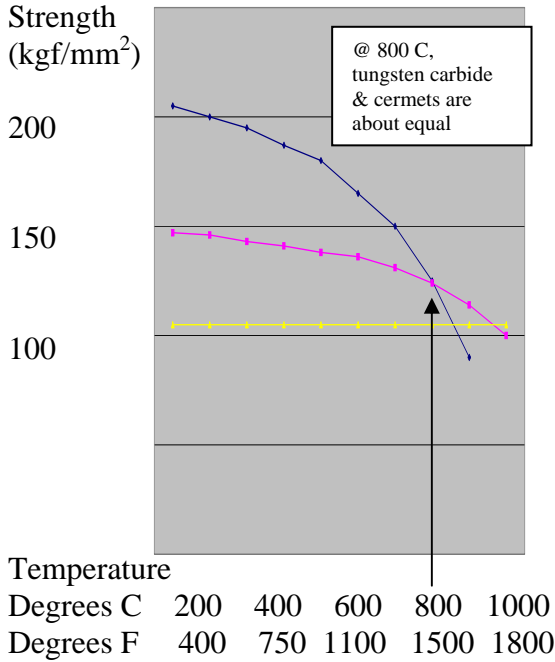
Write: 5743 Yosemite Dr

San Bernardino, Calif. 92407

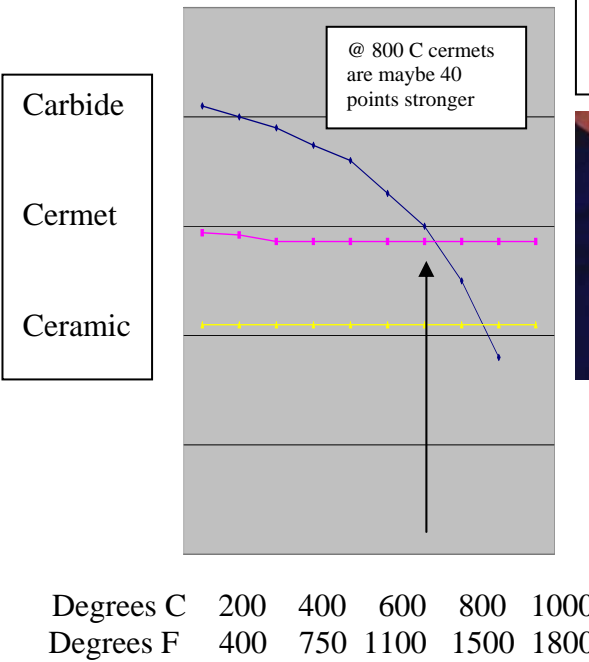
Cermets are Tougher than Carbide?

Carbide is tougher than cermets or ceramics at room temperature. The problem is that carbide gets very hot (1500F) as it cuts (see Sandy Stewart article). As carbide get hot is loses its rupture strength rapidly. Cermets also lose strength as they get hot but cermets do not lose strength as fast as carbide and cermets just do not get nearly as hot.

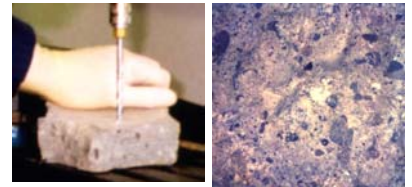
If cermets heated up



Cermets stay cool & strong



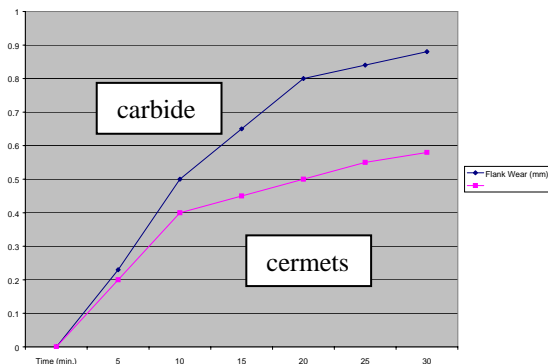
Drilling Concrete with a cermet tipped drill



Cermets are more wear resistant than carbide

Wear Resistance		
Cermet vs. Carbide		
Time (min.)	Flank Wear (mm)	
	Carbide	Cermet
5	0.23	0.2
10	0.5	0.4
15	0.65	0.45
20	0.8	0.5
25	0.84	0.55
30	0.88	0.58

Cerabit supplied this information (Ssangyong Cement Inc. Co., Ltd.)



A "True" Ceramic Tipped Saw
We can build saws with other materials than TiCN and will be happy to do so if someone wants to pay for them.

Papers we offer on grinding cermets

- Grinding Cermets with Diamond
Malcolm Bailey and Horst Juchem
- NTK Cermet information - Including Material Selection for Machining Hardened Steels (50 - 65 C)) NTK catalog
- Grinding of Cermet Tool Materials
K.V. Kumar GE Superabrasives
- Characteristics of Diamond and Their Effect on Grinding Behaviour
M.W. Bailey, R. Garrard, H.O. Juchem
- The Behaviour of Resin-bond Diamond Wheels in the Grinding of Advanced Ceramics
Bianchi, E. da Silva, C. da Silva, de Souza, Fortulan, Fernandes, Valarelli, Aquiar

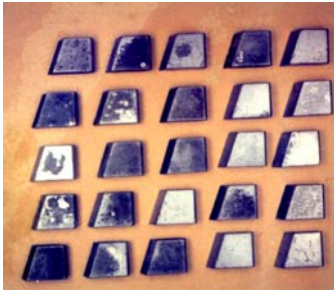
- Performance Study of Scepter™ Metal Bond Diamond Grinding Wheels
S.K. Denison and J.W. Picone
- Mechanical and Thermal Effects in Grinding of Advanced Ceramics
Tonshoff, Friemuth, Hessel, Lierse
- Cutting performance of Cermet, Ceramic, Cubic Boron Nitride and Sintered Diamond Tools III
Tanaka, Date, Nakao, Takahashi
- Which Diamond Grinding Wheel?
Jeff Bryant
- Ceramics and CBN
Johannes Schneider

- Materials Developments Increase Tooling Efficiency
Dr. Ryszard Szymani

From GE superabrasives

- Insert Manufacturer Finds "Real Value" in RVG 880 Diamond
- RVG WS60 Diamond Provides High performance, Long Life in Resin Bond Grinding
- Grinding of Cermet Materials in Tooling Applications
- RVG -890 Diamond Delivers High Performance in Resin Bond Grinding of Tough Materials

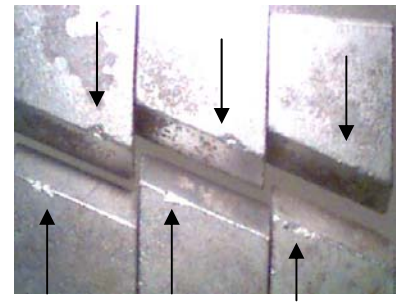
Bad Carbide



Irregular appearance



**Overcooked and burnt tips
Braze alloy on the face**



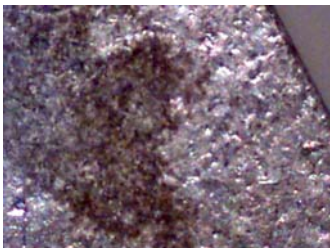
Chipped tips

Irregular appearance

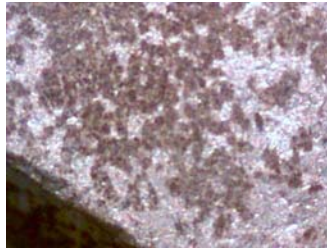
These tips all look different from each other. These tips were braze treated. These tips all look different because they have a really bad surface treatment. One of the things that a good braze treatment does is leave the surface consistent so that each tip works like every other tip. The surface treatment on these tips stuck to some more than others. If the surface treatment doesn't stick to the carbide then the tip will not stay on the saw.



This tip is just one example of a bad surface. It has a big patch missing from the middle of it. What this means is that the surface treatment did not stick to the tip. If the treatment did not stick then the braze alloy will probably not stick either.



The picture above is a close up of the edge of the bare patch.

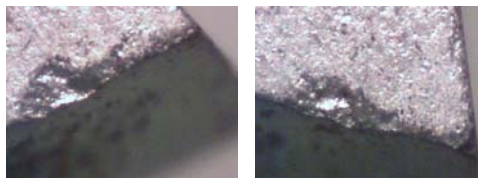


Here is a different tip with many small gaps in a speckled pattern.

Chipped tips



There is another problem. This is a 10-x magnification. Each tip has a notch in the edge, bigger in some than others. One theory is that this is acceptable since it will be ground off in sharpening. Most people don't like this because they don't know how deep the crack will run. What is really significant here is that the crack is in about the same place on all of them. It appears to be a manufacturing problem, which means the tips were chipped when they left the carbide plant.



If quality control and inspection had been good in the plant then chipped tips would not have been made and certainly would not have been shipped.

Overcooked and burnt tips Braze alloy on the face

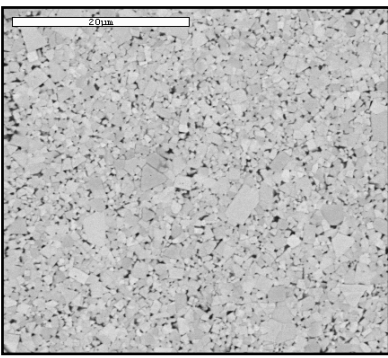


These four tips have braze alloy on the face. The two middle tips have the face completely covered. This means that the diamond wheel will clog. Clogged diamond wheels do not cut as well and they generate a lot more heat. They also need to be dressed more often. Grinding through braze alloy can cut diamond wheel life in half. The second tip from the left has also been burnt pretty badly. It was heated above 1600 F as shown by the boiling of the zinc. This means it will have to be heated higher than 1600 when it is brazed on the saw. High heat makes saw steel brittle and can cause shoulder ripping or snapping.

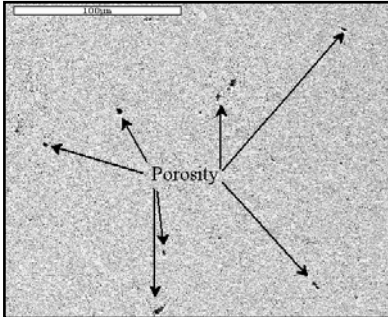
Process control is very important

If tips are bad on the outside it is easy to see. If tips are bad on the inside it is a lot harder to see. If the outside indicates sloppy work then the inside may be bad too.

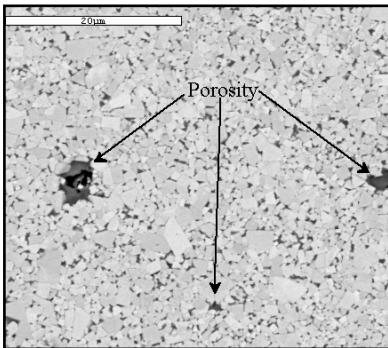
**If you don't like the way tips look
you are probably right about
them.**



Above - Inside of a good tip
Small regular grains, nice tight structure no big voids



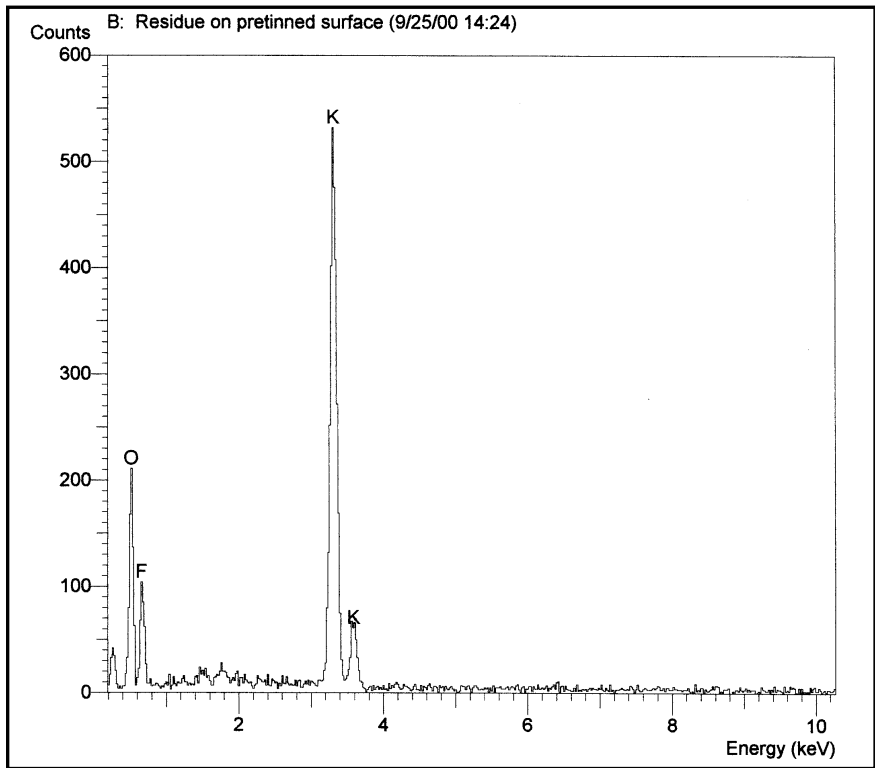
Inside of a bad tip
Lots of porosity -these holes mean a much weaker tip



In a close up photo of the bad tip we see that the grain size is very irregular which means a weaker tip and poor wear as well

Cheap tips can be very expensive

A carbide manufacturer did the photos and graphs on this page. One of their customers had gotten a deal on carbide from another source. When it didn't work he came back to the original supplier asking for help. By that time he had lost a couple customers and a lot of money in the replacement of bad saws



Identifying the source of bad tips

This is an elemental spectrum analysis using an energy dispersive X-ray technique. This identifies the chemicals that are in the material or on the surface. This was an analysis of flux on the surface of a bad tip. There is not nearly enough Boron. This means they used the wrong flux and didn't get enough temperature protection. It also shows that it wasn't our work.

Standards for Carbide in Automatic Systems

If the carbide surface meets these standards then there will be zero defects in a brazing operation where all other factors are within specifications.

1. 100% performance in a brazing process accurate to $\pm 2^\circ \text{F}$ and ± 0.1 seconds
2. The brazing temperature will be no more than 50°F above the liquidus of the braze alloy.
3. Tested for "set and forget" process. The brazing machine is able to operate successfully in a preset cycle. E.G. Every batch will operate identically with every other batch of the same size, shape and grade.
4. No calibration is needed from batch to batch
5. There is no minimum size test batch however the standard proof-for-manufacture test batch is one million parts in assorted sizes; shapes and grades based purely on the end users demands. That is: the sample size should be accurate enough that the user will achieve one million parts with zero failure in production.
6. The bond strength standard is that the carbide or the steel tool body will rip before the braze joint fails. The entire carbide will rip instead of part ripping and the rest coming off.



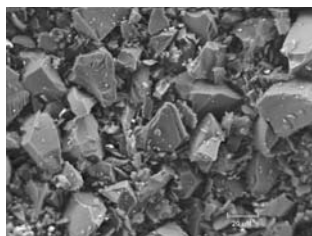
Here is a CP 2002 (left) and a CP 2020 in a saw shop. They nestle under or behind the grinders so they have a very small footprint.

Increase Machine Life

Save \$2,000 to \$8,000 per year

Filtering grinding coolant is just like filtering the oil in your car. Dirty oil and dirty coolants wear out equipment.

Particles per cubic centimeter:		
Unused	Dirty	Filtered
11,885	76,299,682	40,000



This is a photomicrograph showing the chunks of diamond wheel and carbide in dirty coolant.

96% to 99.9% particle removal

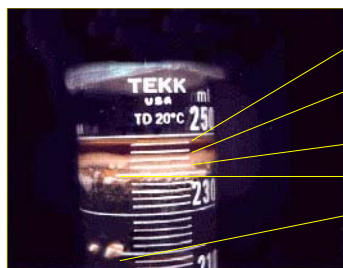


Dirty Coolant Filtered Coolant

There are American flag postage stamps under these. The dirty coolant is thick and dark. You cannot see through it. The filtered coolant is clear and clean. You can see the stamps through it.

Reduce Diamond Wheel Costs - save \$3,000 to \$10,000 per year

Coolant Filtering Works



- Light to medium oil
- Emulsified oil/air
- Heavy oil
- Light grease
- Suspended grease
- Heavy grease on bottom

A good grinding operation will still dump oil and grease into the sump. This oil and grease clogs the wheel. Clogged wheels mean slower grinds, worse quality and shorter wheel life. Clean coolant increases diamond wheel life by at least 30% overall and as much as 50% depending on the wheel and the application.

Filter Units for Any Use or Price



CP 1000 \$999



CP 2002 \$1699



CP 1000 \$399



CP 2020 \$1999



5 years motor life with no problems

Please clean your impellers once a year. The only real problem we have is that the oil, grease and grinding swarf can clog up the impeller and shut down the motor. The motors have thermal overload protection so there is no damage. All it takes is flushing once a year.

We have distributors covering all of the US and Canada who will be happy to help you. They can help you decide which units you need and help you figure out just how fast the payback will be. Cleaner shops, better quality and reduced costs are just a few of the benefits.

Customers Love The Results

“The air in the office doesn’t seem to have that oily smell anymore”
Kathie Rundstrom
co-owner of Paso Robles Carbide in California

“The grinds are smoother, our wheels stay cleaner, and the oil and grease on our machinery is less than it was.”
Alistair Moore
Shop Foreman at Cal Saw Canada in B.C.

“ I don’t have to clean my glasses as often as I did before.” Greg Sprague
Head Sawfiler for Potter Lumber in New York State

Why Tools Get Dull

Adapted from an article by Harold "Sandy" Stewart in December 2000 **Modern Woodworking** magazine

Cutting dry wood and wood products creates a lot of high pressure and high temperature at the edge of the cutting tool. The edge of the tool can be 1500° F (800° C) or hotter. For comparison, at 1500° F mild steel is a good orange color and it softens and warps easily.

When a saw tip cuts wood it gets hot enough to soften the material so that it loses a lot of strength. 1. The saw tip and the wood grab each other, which pulls molecules out of the saw tip (Adhesion). 2. The wood is abrasive and simply wears away the saw tip (Abrasion). 3. The constant flexing of the tip as it enters and leaves the wood causes fatigue and weakens the tip (Fatigue). 4. At these temperatures wood and wood related materials are very active electrochemical baths. They dissolve and eat away the tip by electro-etching. (Diffusion)

In addition these are all worse in thin sections and at edges, which pretty well defines the edge of a cutting tool.

Cutting wood products such as MDF may be a lot more severe on the tool than cutting metal. Wood does not conduct heat nearly as well as metal so the heat stays in the cut and goes into the tool. A prime consideration in selecting tools for working wood materials is heat resistance.

This is a brief overview. For more information contact Sandy at:

Harold A. "Sandy" Stewart
Forest Products Laboratory
Mississippi State University
(662) 325-8329
sstewart@cfr.msstate.edu

Japanese Strategy to Dominate US Saw and Tool Market

The Japanese strategy to dominate the US saw and tool markets is under way and it is working. Kanefusa seems to be the first. Their TA line of cold steel cutting saws is very successful. They are exploiting and protecting this technology very well. The saws are only being sold as disposable saws and they will not sell just the tips.

Their strategy is clear and simple. For at least the last five years they have been funding major R&D. They have developed superior products and they are driving down their cost of production.

Kanefusa has 23 patents or patent applications for saw related technology in the last 5 years. In addition they are working with Sumitomo so they are well funded and very, very good.

They are putting a lot of money into research and are developing new, superior technologies. They use the results of the research to make better products that dominate the market at much higher profit margins.

If you make a product five times as good then you can charge twice as much for it and you will sell a bunch. If you are the only one you can set your prices according to what the saw is worth to the consumer without having to worry about your competition.

Cermet tipped saws cost about 30% more to make. They sell for about twice the price of carbide. They cut twice as much in half the time and stay sharp 5 to 10 times as long.

If you are not spending at least 3% of gross sales on R&D you are in trouble. 7% is average and 10% works really well.

Cermet Testing Comments

Bob Cook called in December. He loves the newsletter, but takes issue with the way we test cermet saws. He feels some points we miss are; whether the saws cut material that is hand or power fed, and how the carbide saw previously used was sharpened and by whom. He also questioned the wisdom of selling saws that last a long time.

Bob Cook - Cook's Sharpening Service - San Marcos, TX 78666

Why Sell Saws That Last Longer

It is "Change or Go Broke"

Some saw shops don't want to sell cermet tipped saws because they last longer. This means the customer buys fewer saws and buys fewer sharpenings.

Bob Budke used to say that part of the reason for his success building Systi Matic was being one of the first to make carbide tipped saws that worked. He did extremely well with the new carbide technology, which made saws that lasted longer. Changing from carbide to cermets is like changing from steel to carbide was 40 years ago. Companies that didn't get into carbide disappeared. The same will happen with cermets and ceramics.

Fortunately we are way ahead of the Japanese on brazing technology for saws. We have some very inclusive applications moving nicely through the patent process that will provide US and International protection. We still have a chance to get ahead and stay ahead.

Cermets any way you want them

We sell saws, we will sell you the cermets and tell you how to use them or we will license the technology to you so you can do them yourself.



Please Call

**We're glad you like our newsletter
We sure would like your business**

We do this newsletter, a huge amount of research and free consulting. We do this because we believe that the best way to succeed is to help our customers succeed. We pay for all this with our pretinning and filter system and tipping alloy sales as well as the consulting, licensing and research income. If you like the newsletter, please call and see if we can help you in other ways.

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Woodtech 2001

Portland, OR March 14 -16

Come visit us.

We will have booth 235 again this year and will have the latest information on our filter systems, ceramic tipped saws, etc.

Free Tickets

I will be speaking Thursday afternoon on Simple Tests to Help You Spend Less and Get More covering new trends in purchasing and how they affect you if you are the buyer or the seller.

Everybody

(Well, almost everybody) pays their bills on time.

Occasionally someone is late paying. Mostly this is an honest mistake. Sometimes it is someone playing games or in trouble.

It may look like a good idea on paper but most of the industry, including customers and suppliers, finds out about it rapidly.

I have been told how it makes sense to pay bills late. I also know that it makes you look untrustworthy or just like a bad manager. It also makes people much less anxious to do business with you.



Free "T" Shirts

I Do The Impossible
Ceramic tipped saws
Carbide Processors, Inc.

Buy a saw, get a T-shirt

Cermet tipped saws can work really well. There are still experts who tell us it is impossible. If you are good enough to do the impossible then buy a saw and get a T-shirt.

Bad Grinding Will Ruin Good Carbide

It will probably show up first in your largest parts. Cheap wheels, dirty coolant, clogged wheels, lack of dressing and taking too much off in a pass all generate excess heat that causes thermal stress and breakage. If big parts crack and the others don't it could be grinding.

Iselli tipper 4 sale - used

\$22,000 new - fair condition - make offer - Clarence Taylor -
Southeastern Saw Service
(912) 427-8011

Northwest Research Institute, Inc.

Carbide Processors Inc.

Newsletter

3847 S. Union Ave.

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