



President's Letter

### Superfilers

Superfilers are people who do things much better than the ordinary. Really good filing rooms always pay attention to details and are always looking for ways to do things better.



**Cascade Hardwoods in Chehalis, WA**  
Here's that darn picture I promised you. Left to right: Juan Vasquez, day shift roundsaw benchman, Mike West, lead troublemaker, Wes Jensen, day shift bandsaw benchman, Juan Mora, dayshift filer/fitter, not pictured Randy Sundberg (saw the camera and disappeared) day shift filer / knives / guides. I promised them that Tom would use it for good and not evil. The names were changed to protect no one in particular. Have fun, Mike West

I didn't have my camera with me yesterday, it was in my daughter's car evidently. I brought it today but didn't have the whole crew here. Someday I'll get a picture of all eight of us. That self timer thing is weird; you never know when it's going to take the picture. I'd hit the button and run up and get in position and then find myself talking when the flash went off. I told Wes that I thought the camera added ten pounds and he said no, it was probably the beer. That's why we hate Wes.  
(See P. 6 Hardness Testing)

# Carbide Processors, Inc.

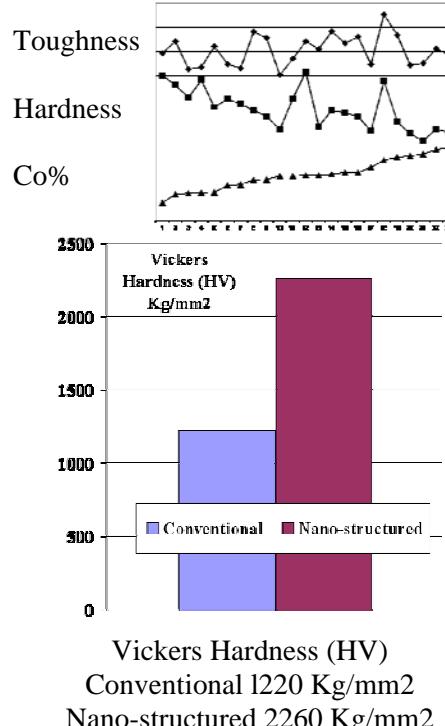
Northwest Research Institute, Inc.

Newsletter September, 2006

3847 S. Union Ave. Tacoma, WA 98409 (800) 346-8274  
sales@carbideprocessors.com [www.carbideprocessors.com](http://www.carbideprocessors.com)

## Making Our Cermet II Materials

### How you get much better wear and much better toughness



This graph shows the same basic carbide but in one case it was made in the traditional way and in the other it was made with extremely fine grains. Extremely fine grains give about double the hardness of ordinary carbide.

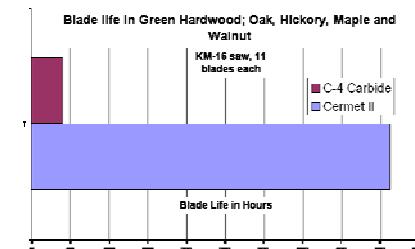
### Toughness, Hardness, Binder % & Grain Size Explained P. 3 & 4



### Plane Breaking The Sound Barrier

For years it was "impossible" for a plane fly this fast without coming apart. The same science that accomplished this also brings you better saw tips.

## Four Classes of Advanced Materials.



Ceramics – experimental - should work well in brazed applications as they do in mechanically held applications but they haven't worked yet.

Cermets – experimental grades of various chemistries that sometimes work and sometimes don't. Sometimes are much better than carbide and sometimes much worse.

Cermet II – proven cermet grades that always work. These are grades that have worked well in field tests for a year or more. They have never worked worse than carbide and about 95% of those who try them are now ordering them in thousands at a time. About twice the price of carbide and worth it as they can give results five to ten times as good.

Comet grades – (Comet X, Comet M, Super C, Metal cutting, Steel cutting, Secondary - especially man made materials, etc.) These are advanced grades of standard tungsten carbide tips that sell for a bit more than carbide but typically give two to three times the life. These are older grades than cermet II by a couple years and well proven. They are still much more advanced than standard C grades. (Continued P. 2)

### Newsletter by email

We will be happy to email this newsletter and you may pass it on as you wish.

Cermet II and Comet grades both braze like ordinary carbide in manual or induction systems. They grind as easily or easier than ordinary carbide because they are tougher. The will cut faster and easier than carbide which means they can be fed faster, up to several times faster in some cases. They stay sharper much longer which means you can run 12 hours instead of four hours and still have better quality cuts.

Cermet II and Comet grades are in inventory and may be available fro immediate shipment.

Cermets are a very special order and ceramics are not yet available.

You are wise to avoid cermets as they are experimental. However some are using them with extreme success but it is a long shot and will probably take a lot of development work. As we work with them more and more we find more grades that both very well and very reliably in different applications.

We do not have the small, hooked, beveled steel cutting tips in production yet. These are Korloy / Mitsubishi tips for Kanefusa. Part of the problem is the \$12,000 for the tooling. I have some now that were individually made and they will go out for testing shortly.

A suppose the simplest analogy is that the C1 – C4 grades are like various sizes of Crescent wrenches and that we are developing and have developed ratcheting socket wrenches.

## Filter Unit sale



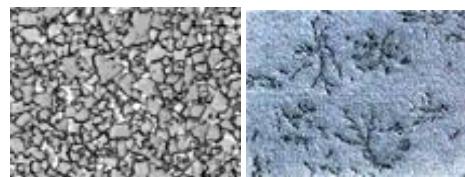
We have a sale on two filter units that were used as sale demo units. They are fully guaranteed and great for filtering water based coolants. Call Emily to wheel and deal . 800 346-8274

## Our Strategy

Several grades of advanced materials for saw tips. In addition we sell them based on proven success in specific applications instead of by general grade number

## Cermet II

### World's Best Saw Tips



Advanced grain structure is just one of the many, many reasons Cermet II tips work so very well.

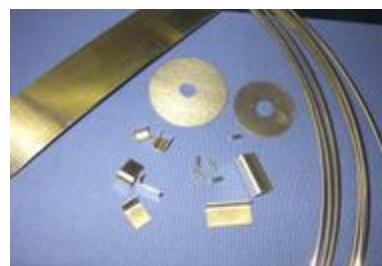
## Super "C" grades

Less money than Cermet II but still longer life.



**Super "C" Nail cutting**  
Sawmill Grade Super C is especially popular since is ah the strength of a C-1 and the wear of a C-4.

## Braze Alloy (Silver Solder)



All grades & shapes

## Odd & Strange Carbide



## Coolant Test Instruments



All you need for monthly coolant tests

Digital Brix Refractometer \$369.00 complete

Cobalt Test Strips \$75 per tube of 100 pH Test Strips \$25.90 per box of 100 Bacteria & Fungus Test Kit - Box of 10 - \$91.40

Graduated Cylinder \$19 Complete starter kit \$559.30 save \$21

## Our Pretinning Is Truly Beautiful



And it works better than it looks.

### Lowell Freeborn Obituary

Lowell freeborn has passed on after a long and successful life. He founded Systi Matic with Bob Budke and then moved on to found Freeborn Tool in Spokane. Lowell Freeborn was widely regarded as a genius in the industry. His understanding of materials, his brilliantly intuitive tool designs and his meticulous approach to manufacturing set standards extremely high for the time and still at the top end for quality. Freeborn Tool is still in the Freeborn Family and still producing absolutely top quality tools.

To best understand Lowell Freeborn's genius you need to read his carbide saw manual. It is free online at our web site [www.carbdeprocessors.com](http://www.carbdeprocessors.com) or we will email it to you. If you wish we can print, bind and mail it to you for \$12.00.

# Sand Blasting Using Other Media

Blast cleaning, generally, is a fast means to clean complex surfaces without the use of chemical stripping agents. With experience and finesse, sandblasting can handle most power abrasive tasks in a shop; however, substrates other than steel often don't tolerate aggressive surface preparation. Many times it's easy to blow holes right through the article being cleaned. Wet chemical strippers can remove coatings, but they generate hazardous wastes that take time to dispose of properly.

Plastic abrasives deliver a high stripping rate and consistent performance. Plastic media is considered too soft for most rust removal, but it is good for applications such as removing paint, mold cleaning, deflashing and deburring.

There are three types of plastic media commonly used:

- Acrylic is the longest lasting media presently on the market. Termed a multi-purpose media by users, acrylic is very gentle on substrates and engineered for stripping the most sensitive surfaces while providing an effective stripping rate.
- Melamine is engineered for stripping the most difficult surfaces while providing an effective stripping rate, and can be used as a replacement for glass beads and other harsh abrasives.
- Urea is the most widely used plastic media, particularly in automotive work, because of its low cost and because it can be recycled for use several times, as compared to chemical stripping. Typically used for less sensitive applications, urea is formulated to meet an increased level of stripping performance where stripping speed outweighs other considerations.

## Aluminum oxides

Aluminum oxide grit is harder than other commonly used blasting materials, aluminum oxide penetrates and cuts even the hardest metals and

sintered carbide, and can be recycled many times. The media can be expensive (though less so than plastic), particularly if there aren't means for recovery, but it can strip thick metal, such as a vehicle frame, in short time.

Virgin brown aluminum oxide provides optimal performance, when compared to reprocessed product. Virgin, brown aluminum oxide contains less than 1.5% free silica and is therefore safer to use than sand. The grit size, ranging from 12 to 220, is consistent and cuts much faster than sand, leaving a smoother surface.

White aluminum oxide is safer to use than sand because it contains less than 0.2% free silica. As a blasting media, white aluminum oxide is 99.5% ultra pure, with twice as many particles per pound as other metallic media. Fast cutting action minimizes damage to thin materials by eliminating surface stresses caused by heavier, slower-cutting media blasting grits. Grit size is consistent and cuts much faster than other sand blasting media, leaving a smoother surface.

## Crushed glass

The angular particles in crushed glass grit allow for aggressive surface profiling and removal of coatings such as epoxy, paint, alkyds, vinyl, polyurea, coal tar and elastomers. Crushed glass grit is produced from recycled bottle glass, with no free silica. It is non-toxic and inert, and contains no heavy metals.

With thin metals, blasting media that generate heat, such as sand or aluminum oxide, should be avoided. However, there are alternatives. Blasting media made from walnut shells is considered a "soft abrasive," yet is extremely durable, and sufficiently angular and multi-faceted to strip light to moderate rust. Common blast cleaning applications with walnut shell grit include stripping auto and truck panels and cleaning delicate molds.

Both sand and crushed glass grit are consumable media which means that they are good for one use, and then they must be discarded. Other types of media can be used in cabinets and booths

equipped with systems that recover all of the particulates and separate the grit from removed paints and coatings. Re-use of such media will lower materials costs in operations where stripping is frequently performed.

Schneider also notes that users often ask why the abrasive life seems to be unreasonably short. There are 3 reasons this may be happening:

1. The operator is blasting too close to the work surface. If operating too close to the surface, the abrasive bouncing off the surface is colliding with the abrasive from the gun. The blast gun should be a minimum of 6-in. from the surface, or, if using a direct pressure machine, the minimum is one foot.
2. A small parts such as a washer or other foreign object may have been sucked into the abrasive hose. Abrasive colliding with this obstruction will get pulverized. Check hose lines regularly.
3. The blast pressure may be too high. Most abrasives should not be blasted at pressures above 100 psi. Glass beads will deteriorate at pressures above 80 psi.

## Quotes from Brian Wallinger

Owners are entitled to 5 weeks vacation a year. This came from Brian Wallinger of West Coast Saws. He then added that he'd sure like to figure out how take some of it.

Brian is what is often described as a man of action. Even when he is sitting and chatting he always seems like he is ready to jump up and do something. He is also so much a man of action it is easy to overlook his intellectual, reflective side. I have had a quote from him on my office wall for years. It is as follows.

"Speed is liberating because those with quick minds and quick steps accept no limits. Don't waste precious time avoiding, deterring, fearing, hesitating or regretting. You have the power to decide how the future will play out for you. The new business world has a new motto; you let up, you lose."

# Making Cermet II

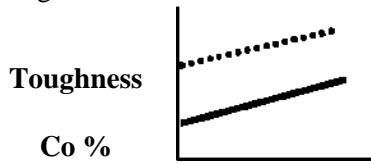
## Materials

What follows are some explanations of how to make advanced carbide. These are pretty short explanations but they will give an idea of all that is possible.

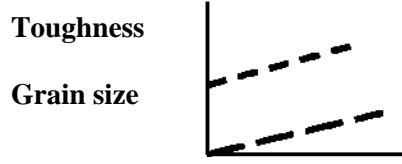
Obviously we use different techniques for different grades and applications.

### Grain Size & Cobalt % Compared to Hardness & Toughness

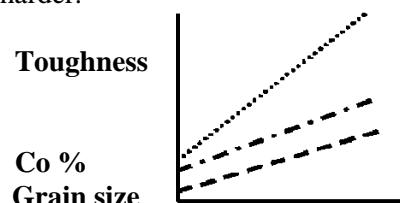
In the very early days of carbide you made carbide tougher or harder by changing the amount of Cobalt in the binder. Cobalt is metal and softer than carbide grains so more cobalt made it tougher and less made it harder.



Then people learned how to change the grain size. Bigger grains made carbide tougher and smaller grains made it harder.



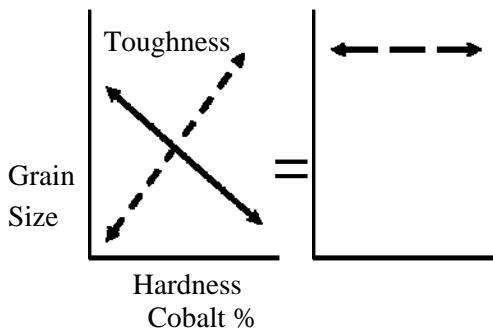
By varying grain size and cobalt % you can make carbide a lot tougher or a lot harder.



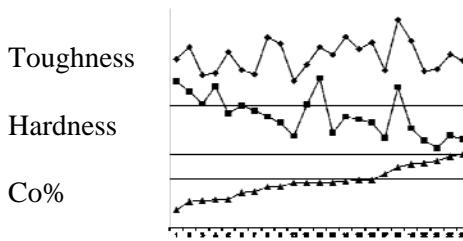
If you add more Cobalt to large grains then you get even more toughness. However there is a limit to how tough you can make carbide or want to make carbide. If you get it too "tough" then it is too soft. Remember we are using the term 'tough' here as the opposite of hard.

If the grains are too large and there is too much Cobalt then the carbide will move and deform under pressure.

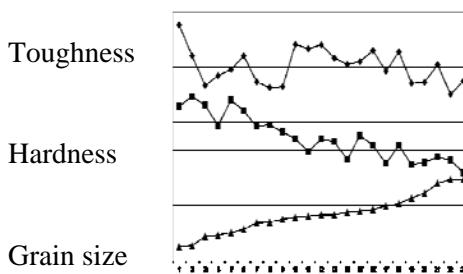
One of the major strengths of carbide is its ability to handle pressure or compressive force. If it is too soft it loses that ability.



What you can do is mix Cobalt % with grain sizes and get carbide that is both tough and hard so you get long wear without breakage.



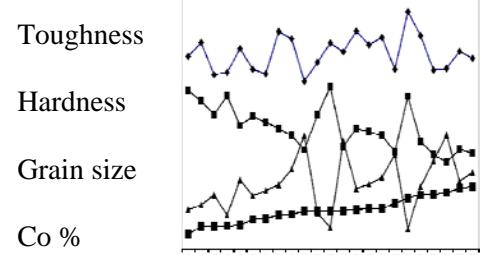
Above is a graph of 23 different grades of modern carbide. You can see by the Co% line on the bottom that as co% goes up hardness drops and toughness stays sort of the same. This is because grain size differs.



Here we increase grain size and hardness drops while toughness sort of drops.

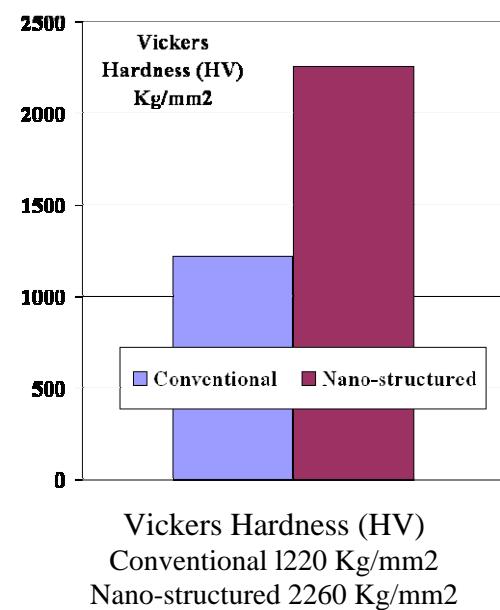
**These graphs are confusing and that is the point.**

**Neither Cobalt percentage or grain size alone determines how a grade will perform.**



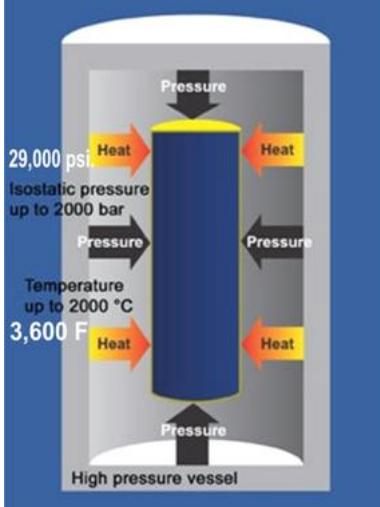
Here you can see 23 grades. I graphed it so that the Cobalt slowly increases. You can see where hardness seems to relate to grain size more than Co% especially in a couple places. You can also see a lot of places where hardness and toughness don't seem to relate to grain size and Co % much at all.

### Hardness of Conventional and Nano-Grain Tungsten Carbide

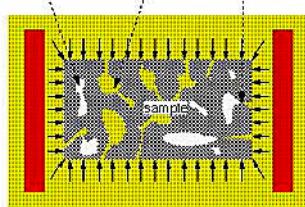


This graph shows the same basic carbide but in one case it was made in the traditional way and in the other it was made with extremely fine grains. Extremely fine grains give about double the hardness of ordinary carbide.

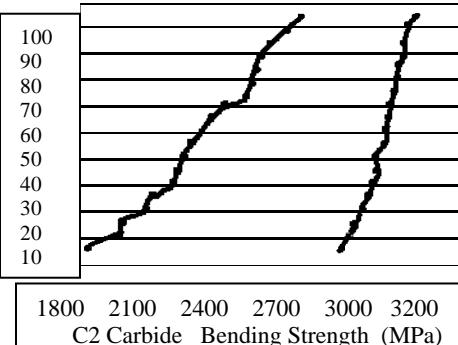
## Benefits of HIPing



closed pore open pore blocked pore mouth



Chance of failure	Before HIP	After HIP
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Hot Isostatic Pressing takes material to a temperature just below melting. While it is soft the HIP process uses tremendous pressure to squeeze the material evenly from all sides. This gives a very consistent material free of all voids and gaps.

Fracture % before HIP After HIP

10%	1980	2860
20%	2090	2880
30%	2150	2910
40%	2200	2920
50%	2250	2950
60%	2350	2970
70%	2490	3000
80%	2500	3020
90%	2600	3060

## Why Cobalt Is the Preferred Binder

There are several criteria which govern the performance of a binder for carbides:

- Cobalt has a high melting point 1493°C (2719F)
- Cobalt has excellent strength at high temperature
- It forms a liquid phase with WC at a suitable temperature of 1275°C. This pulls the sintered part together by surface tension and eliminates voids.
- Cobalt dissolves WC. Cobalt forms a eutectic with WC at 1275°C/1350°C and at that temperature dissolves 10% WC.
- On cooling, WC should reprecipitate in the Cobalt bond giving hardness combined with toughness.
- The binding agent should be capable of being ground very finely to mix with the hard carbide particles.

Cobalt can be produced as a very fine powder well under 1 micron.

Other binders such as Nickel and Chrome can add corrosion resistance and toughness. They are harder to use and thus more expensive but the increased performance can be well worth it.

## Special Carbide Additives

Straight tungsten carbide grades contain the highest resistance to abrasion (flank wear) of any carbide grades and have the greatest strength. The grain size and cobalt content affect the hardness, abrasion resistance and strength of the tool. Additions of other carbides reduce the strength and abrasion resistance.

High Tantalum (28%) has very high red hardness and high. It is excellent for removing flash from weld.

Tantalum Carbide (TaC) and Tantalum Niobium Carbide (TaNbC) are frequently used to maintain structure edge strength at high temperatures. In addition, TaC can be used as a grain growth inhibitor preventing the formation of large grains and increasing the hardness of the sintered part.

High Titanium carbides with nickel as the binder have high red hardness and good wear qualities. They machine steel in the very high speed ranges, providing good surface finishes and size control. They have low strength values and are recommended for light cuts only.

Titanium Carbide gives "lubricity" to the carbide so that the chip slides across the face of the cutter with less heat and friction. Titanium carbide additives permit the carbide to maintain high hardness at elevated temperatures. However, the more titanium carbide added, the weaker the tool is. Where the material being machined tends to crater, bind, seize, or gall the workpiece, titanium carbide bearing grades should be used.

Titanium Carbide and Tantalum (or Columbium) Carbide resists cratering, seizing, and galling. They resist deformation of the carbide under heavy load where very high temperatures are created. Although additions of tantalum carbide reduce the strength of the carbide, they do not reduce the strength as directly as titanium carbide additives do. Tantalum carbide maintains its hardness and strength at elevated temperatures better than titanium carbide or tungsten carbide.

Molybdenum carbide acts as very efficient catalysts for water gas shift and reforming applications

Vanadium carbide is chemically stable and has excellent high-temperature properties. It can be used as an additive to tungsten carbide to make finer carbide crystals and improve the property of the material.

# Mike West & Portable Hardness Testers

We have been discussing portable Rockwell testers here at the mill and I was wondering if any of you have one or are familiar with what is out there and how reliable they are. I have done some web searching and have found some units but most are quite expensive and I'd have a hard time selling the idea to my boss. Any suggestions or comments?

Mike West, Cascade Hardwood

Mike,

These are pretty much always lab instruments. The portable ones are not very robust. The diamond points are sold as consumables. So the original units are high and the cost of using it will be high as well.

I would do a search and maybe a post on the two following discussion groups.

<http://www.eng-tips.com/>  
<http://www.practicalmachinist.com/>

What you might look at as well is a tester from PTC that is a modern version of the Poldi hammer test.

<http://www.ptc1.com/steel316.html>

It's \$650 or so new and uses carbide balls which will be more robust than diamond tips.

Tom

## PTC®'s Model 316 Portable Steel Hardness Tester

measures the hardness of metals in the range of 20 to 65 HRC on the equivalent Rockwell C Scale. The instrument is fully portable and easy to use. It can easily be carried anywhere an accurate hardness test is required. It is exceptionally useful where the test piece is too large or heavy to test on a bench-type tester. This high quality, affordable, portable tester is a must for large work pieces, small machine shops, heat treaters, quality control personnel, and engineers PTC®'s Model 316



### Hardness Tester With Light Source With A Fiber Optic Light Pipe.

The unit consists of two major components, a calibrated indenter and a direct reading microscope.

The hand held automatic indenter is used to make a small indentation in the piece to be tested. The microscope is used to directly "read" the hardness from the size of the impression on its equivalent Rockwell C Scale.

PTC®'s Model 316 Steel hardness Tester comes complete with a calibrated impact indenter, illuminated microscope, calibrated test block, conversion chart, and carrying case.

The hand held indenter features a 1/16 inch diameter tungsten carbide ball tip. This makes a small spherical indentation in the material being tested.

The 60x microscope features a direct reading reticle. The illumination system features a Maglite ® flashlight. The fiber optic light pipe directs the light to the focus of the microscope.

The calibrated test block can be furnished with certification to ASTM E18 Specification.

## New Mill Profit Programs



In an effort to increase profits a northern mill is contracting out its filers as ice cutters in the winter.

## The Original Poldi Hammer Hardness Tester



The Poldi-hammer works with a hardened steel ball, just like a Brinell tester. The ball is held in a steel holder with a knurled grip.

How to operate this contraption? First slide a bar in the holder. Then take up the Poldi with your left hand and position the ball on a horizontal surface of your workpiece. The pin then points straight up. The steel ball is caught between the top of the workpiece and the underside of the calibrated bar. With a sturdy hammer in your right hand, hit the emerging pin smartly on the head.

Next you measure the diameters of the indents in the workpiece and the calibration bar with the graduated eyepiece shown on the left hand side of the box. In the booklet in the lid of the box you'll find, for a given hardness of calibration bar, at the ratio of the two diameters you've measured, a value for the hardness of the workpiece.

To work accurately, the diameters of the indents in workpiece and calibration bar may not differ too much. In other words, the hardnesses of workpiece and calibration bar may not drastically diverge. That is why you could buy bars calibrated to various standardised hardnesses.

The booklet contains tables for each of these standardised test bars. Between consecutive determinations, you must slide the test bar in the holder to a fresh surface, so that the indents will be at least 1.5 diameters apart from each other. The calibrated bar is square, so you may use its four surfaces. The manufacturer however advised against this practice.





### **Not only a pretty face but also great customer service**

Here is Emily, who is always perky and always happy to help customers. Emily's job is to help people find carbide, silver solder, filter systems and everything else we sell. If we can't supply you but we know who can we will refer you. No matter what you want we will work really hard to find it.

### **Sawfiler T shirts.**



US - <http://www.cafepress.com/usasawfiler>  
Canadian



### **We buy scrap carbide**

Price varies but figure \$200.00 per 2# coffee can for scrap or about \$4.90 / # depending on the market.



**This is good pretinning.** It is ours and it is what you should be buying.

Demand it (well, ask for it, anyway) wherever you buy carbide.

### **Sweatshirts, Mugs, etc.**



<http://www.cafepress.com/sawfilercanada>  
**or call 800 346-8274**

### **New, Carbide Grades**

We have our super "C" grade that has proven extremely popular because it works so well. Peerless has announced a new LT (for long lasting and tough) grade that is also getting very good results.

They both work much better than ordinary grades and both are multi grade carbides. They have the wear of a C3+ and the toughness of a C1+.

### **Try Both And Then Buy Ours.**

We have our own inventory of our super "C" and we have an inventory of Peerless LT grade here, ready to ship.

In all honesty you should try both of them. They are each clearly superior to ordinary carbide of any grade.

We think you should try both and then buy the one that works best for you.

We have a deal with Peerless to maintain a west coast inventory for them. We will be happy to sell you **Super "C"** or **LT** advanced grade carbide.

Of course we will be slightly happier if you buy ours but only slightly



**Carbide Processors, Inc.  
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