Carbide Processors, Inc.

Northwest Research Institute, Inc.
Newsletter March, 2006
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President's Letter

Superfilers
Al Bouchard, Weyerhaeuser
Randy De Heer, Pella
Randy Seaman, Sierra Pacific

These filers differ in experience but they share many similar qualities. Randy De Heer emailed us a few months ago to ask how we could help him. Since then he has gotten his engineer, Dave Anderson, involved and we have had a bunch of discussions and traded analyses back and forth. Al Bouchard took a day to drive up here from Oregon to help us improve the quality of the products we provide for him. Randy Seaman dropped me an email about some really promising new technology.

These folks differ in age, experience, location and a great many other areas. However they are all curious and are all trying new things to improve their operation. They are all polite, they don't make up their minds ahead of time and they realize the necessity for "tweaking" to achieve success.

When Al Bouchard visited my staff and I learned a great deal about what minor adjustments in equipment setting can do to the quality of the finished product.

I'm Not Perfect

How's that for a shock? The reason I mention this is that sometimes people quote me as though what I have written is absolutely correct. What I write is what I believe to be correct and I work hard at it. However no two situations are ever identical.

When I give test results they are the results of the tests I ran. Every situation is different. Don't take my data as gospel but just as a starting point.

US Census Bureau Saw Blade Sales

1997 - $3,301,937,000
2002 - $2,617,856,000

20% loss in 5 years

Why Coolant Doesn't Last Forever

Any type of coolant could last indefinitely if not for the changes continually occurring while the coolant is in use. These changes include contamination ingress, microbiological activity, water evaporation and nonuniform depletion of coolant constituents.

Often the first components to be depleted are those that impart corrosion protection and lubricity.

Sources of contamination are: hydrocarbon-based lubricants and process oils (tramp oil);
• metal fines and chips;
• dissolved water constituents;
• biological agents;
• fluids carried in by metal surfaces from previous processing;
dissolved gases from the air that become entrained; and
other foreign matter mistakenly introduced into the coolant.

Some contaminants that have an effect on the coolant's life and its continuing effectiveness can be controlled or modified with additives and separation equipment. Others cannot.

Tramp oil may appear in coolants as free floating, mechanically dispersed or emulsified. Primary sources of tramp oil are lubricating oils, grease or oil residues on parts coming into the machining operation. Excessive oil can contribute to misting, residue buildup, odors, grinding burn, nonuniform lubricating action and bacterial growth.

Solid particles, such as metal chips and fines, cast iron dust, rust (iron oxides), plastics, loose fungus, coagulated or clumped grease or sludge, and foreign material, should routinely be removed by filtering, centrifuge, settling, coalescers, dredging, vacuum/pressure, magnetic systems or other mechanical means. These materials can selectively pull out loose, emulsified particles.

Bacterial or fungal growth can be reduced with biocides, fungicides, ozone generators, aeration, ultraviolet light, chemically treated beads, and pasteurization. Fungus can create special mechanical problems because of its biomass. Fungus often competes for the same food sources as bacteria. Usually, a coolant is not plagued by both bacteria and fungus at the same time.

Fungus becomes evident when it grows on the walls of sumps near the fluid's surface or in coolant feed lines, and sometimes produces a "sweaty sock" odor. A biomass can turn an oil layer into a mucus-like substance, which can prevent oil from being picked up by a mechanical skimmer. Both mechanical and chemical cleaning is normally required to rid a system of fungal growth.

Extraordinary cleaning agents and methods often need to be employed to effectively and totally remove fungus. Fungus often goes dormant when it encounters harsh cleaners. When conditions become more favorable, fungus reemerges and recontaminates the coolant.

If You Change Coolant More Than Once A Year You Really Need To Talk To Us

Testing Saw Plate for Cleanliness

Clean saw plate is essential for welding or brazed tips. New saw plate comes with a protective coating. Used saw plate has its own set of contaminants from use.

You must remove this to get the best braze or weld.

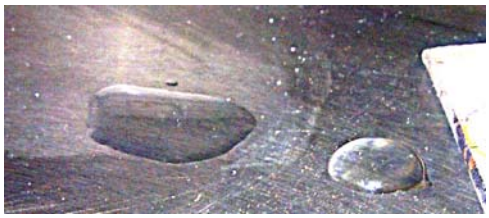
Below is a test run on saw plate that was sent to me for analysis. They had tip loss and wanted to know what to do about it.

I took an eye dropper and put three drops of water on the saw plate and it formed a nice, round bubble.

For comparison I took a piece of steel and ground it with a very rough wheel. You can see the bar on the right of the picture and how the water spread out more.

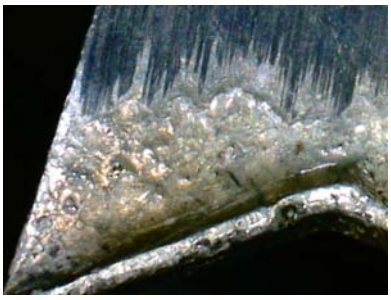
Close up of the two surfaces

The next step was to take cleaner and clean the saw plate. Then I put three drops of water in the clean area.



You can see how the 3 drops of water on the left, in the clean area, spread out much more than the three drops of water on the right. You can also see how the clean area around the big spread has a different reflectivity than the uncleaned area.

Here is what it looks like when it is braze alloy on a saw plate. You can see the distinct, steep ridge along the edge of the braze alloy.

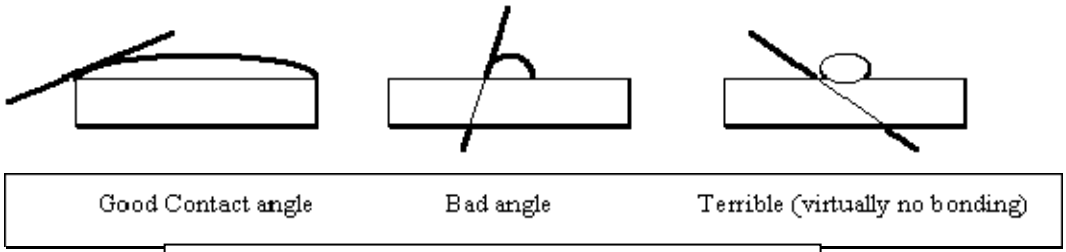


Another sign is the feathering out from the braze alloy ridge. When the braze alloy doesn't flow well the constituents tend to separate out and you get some bleed out from the main mass of alloy.

Wetting of braze alloy – clean area left and uncleaned right. I measured the areas of the flow as rough rectangles. Clean was .63" x .41" for .25 sq. in. Uncleaned was .52" x .31" for .16 sq. in. The clean area wet 60% better.

The real difference is that there is an edge on the uncleaned area where it didn't wet at all. Uncleaned plate wets poorly and parts of it may not wet at all.

Above is the high tech test instrument which is just an ordinary eye dropper.



The technical term is "contact angle" see above

Reasons For Pretinning

Lower cost
In 1982 Weyerhaeuser figured it cost about $0.50 each top have a union employee pretin a tip. This covers all the overhead, the direct wages and material. This is based on the total number of tips done in a week compared to the total hours charged for it.

Now a pretinned tip from Carbide Processors, Inc is about 1/2 to 1/3 the cost of doing it in-house.

<u>Material</u> - Average $0.10 per tip
The proper silver solders are about 50% (49% to 56%) silver. This makes them about $15.00 an ounce. Figure about 116" in an ounce of silver solder so that it costs $0.129 per inch. A half inch long tip should take a piece of silver solder about .375" long depending on the kerf. This comes to about $0.05 in braze alloy. (You can lower this to about $0.035 if you buy $100,000 a year on a scheduled basis.)

We pretin by cutting the braze alloy (silver solder) wire to length within 1%. In many mill operations they use a torch. As soon as the tips are hot they hit them with a fluxed wire. The hot carbide sucks the alloy down. Typically this will be two to three times the amount of alloy needed. So the alloy cost can be $0.10 to $0.15.

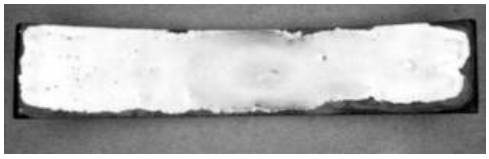
Labor - Average $0.06 each
We have specialized pretinning operation with operators at $8.00 to $12.00 an hour who do nothing but pretin all day on automatic equipment.

In most operations where pretinning is not the main business an operator will do 300 tips an hour. If he makes $12 an hour with a 50% burden for taxes, vacation etc. then they do 300 tips for $18.00. This is $0.06 each. This usually does not include set up, clean up, equipment maintenance etc. In reality the production is closer to 300 tips per hour for a cost of $0.06 each.

Diamond Wheels
Soft silver solder is very hard on diamond wheels. We use a digital wire cutter that cuts within 1% of the calculated volume. (See Average Alloy Depth below) This means there is enough silver to make a properly thick braze joint without excess run over. It is the excess runover that the diamond wheels have to grind through.

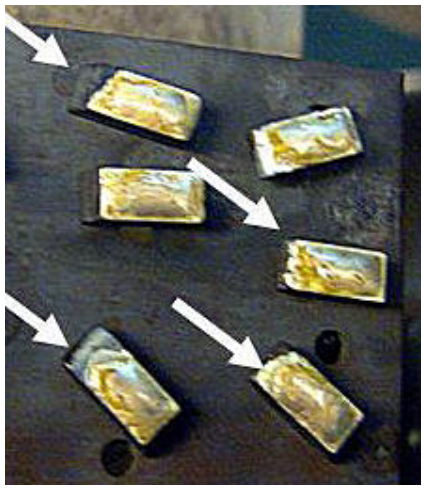
Quality
<u>Not all tips work well every time.</u> We have several different treatments we developed and a couple we patented)US patents 5,624,626 and 6,322,871) to make sure every tip works.

Untreated – patchy silver solder adhesion



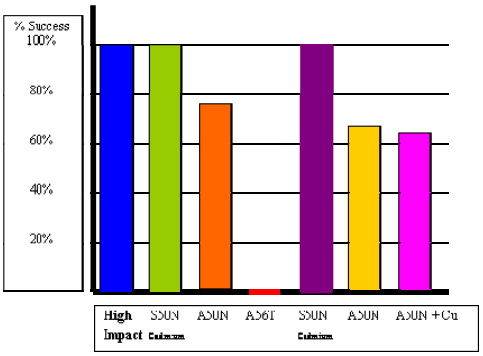
Treated – full strong, silver solder adhesion

Flow Problems
All tips are supposed to flow well. This doesn't always happen. If the silver solder doesn't stick to the tips then the tips don't stick to the saw blade well.

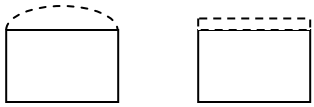


There is a huge difference in braze alloys
A good pretinner will make sure you have the correct braze alloy.

Braze Alloy Impact & Bond Strength Tests	
High Impact	100%
35SN - 50% Silver with Cadmium	100%
A50N - 50% Silver - Cadmium free	75%
A56T - 56% Silver with Tin	0%
35SN - 50% Silver with Cadmium	100%
A50N - 50% Silver - Cadmium free	64%
A50N with copper spheres added	67%



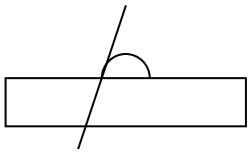
Average Alloy Depth
We prefer to specify alloy depth by a term called "Average Alloy Depth." This treats the part as though the alloy would form a flat topped, straight sided layer. This makes it very easy to calculate from either volume of weight.



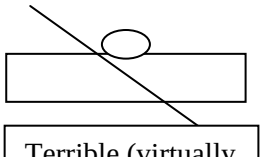
The Important thing about average silvery depth is that it gives us a number so we can give you an exact amount and the same amount every time, order after order.

You measure wetting by the contact angle

Good Contact angle



Bad angle



Terrible (virtually no bonding)

CP 2002 Sales Fact Sheet

Price $2038

Payback period - 3 to 6 months

Annual filter - cost $100 to $400 in average use

Savings
Tests run at West Coast Saws in Tacoma WA. All figures are for five grinders run constantly for two shifts a day. Tests run Dec. 97 through April 98

- Coolant savings of $5,500 per year - **$1,100 per grinder per year**
- Sump changes went from once a month to once every six months
- Diamond wheel life increased by 30 to 50% - **save $3,000 to $10,000 per year**
- Less wear on expensive machines - **save $2,000 to $8,000 per year**
- Does Not Harm Coolant - generally no additives needed for bacteria, fungus or odor

Filter change
Filter change is recommended once a month. Filters can last up to three months. Requires two filters. Usual cost about $12 each. $24 per change. Using the right filters is very important. The right filters will last a month. Wrong ones may last a few hours.

Maintenance
If you get a lot of sludge and grease you may want to take the pump faceplate off once a year and clean the impeller. They have run three years and more with no cleaning.

Installation
Take the unit out of the box. Plug it into a 110v 15 amp grounded socket. Put both hoses in the sump. Turn it on. Self-primes to ten feet.

Warranty
One year on pump and motor from the manufacturer. No one has ever needed it.

Problems - following are the only two problems we have seen
1. The pump will pass parts 1/8 inch in diameter. The pump is powerful so if you take the filter off the end of the hose you can suck up chunks big enough to block the pump.

2. The pump housing works best with water in it. If you run the pump dry you may get an air lock and need to prime. That is why we have the special valve on it.

Other We can build units with European power motors
We will retrofit the CP 2000 into a CP 2002 for $595
We can generally build custom modifications for special features

CP 2002 coolant filtering system
only $1699 complete

CP 2002 makes you money

Grind 3,623 saws before a filter change
(Thirty tooth saws with half inch tips)

The CP 2002 has the same high quality as the CP 2000. It has a tremendously larger dirt holding capacity. The CP 2000 needs a filter change between one and three days. The CP2002 should only need a filter change between one and three months.

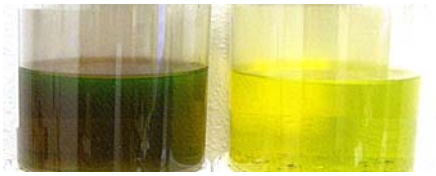
- **Can save you 75% in coolant maintenance and disposal costs**
- **Make a better product while you work less**
- **Cut diamond wheel costs by 25 % to 30%**
- **Can pay for itself within the first year**
- **Installs easily**
- **Make more money**

Clean and dirty filters

The dirty filter has a ring about 3/4 to one inch thick. These filters ran three months in an actual shop. Filter life varies. Excess oil and grease may shorten filter life

Our New Refractometer And How To Tell If You Really Need It

Two samples from the same shop. The right one was thick enough that it didn't filter well. The left one was so thick that it didn't filter at all.



These are two samples from the same mill. You can see that the left one is considerably darker and thicker than the right one. These were all supposed to be the same and thus they were supposed to be the same color.

Digital Brix Refractometer
0-53% $369.00

Easy to use with Safety goggles and gloves. This is a new unit. It is very easy and simple to use and very accurate.

Our Thanks to:

Todd Jackson
Plum Creek Columbia Falls, MT
Bill Haas, B & G Sharpening
Sebring, FL

The newsletter is a lot of work to write and sometimes I wonder if it worth it. Both of the above gentlemen took the time to call and say they appreciated it. Some days, just having someone say "thank you" means a lot.

Sawfiler logo

Saw Filer Discussion Group
Tim cook set this up so sharpeners could freely exchange opinions. Its focus is saw blades and knives. Currently there are really good discussions going on about how much to charge for retipping saw blades and what kind of grinder to buy.

I am really impressed by how knowledgeable and how outspoken some of these guys are.

It's free and anyone is welcome to join. However remember to be polite. IndustrialToolSharpening@yahoogroups.com

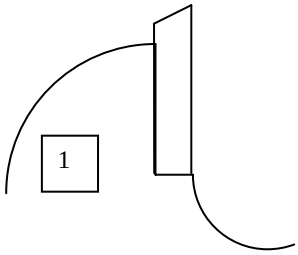
On the right are some drawings from this group used to discuss tip breakage. Not everyone has access to digital camera for photos so these might come in handy describing a problem.

Free 411 Phone Information
"Cell phone companies are charging us $1.00 or more for 411 / information calls when they don't have to. When you need to use the 411 / information option, simply dial 1-800-FREE-411 or 1 800 373 3411 without incurring a charge. You'll still incur airtime charges, when using your cell phone though. This works on home phones as well. "

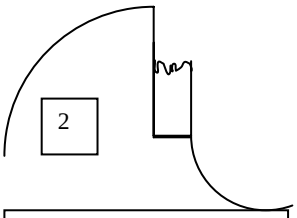
Verified on Snopes.com. For more information, read the article at: http://www.snopes.com/inboxer/nothing/free411.asp

Pins & Fines
Newsletter of the Southern Sawfilers Association
Mike Pate
870-543-9917

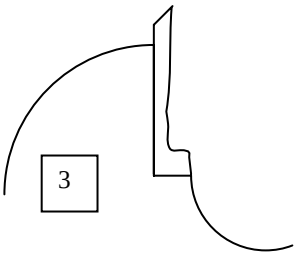
Tip Breakage Drawings



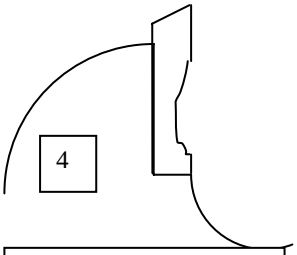
Good Tip



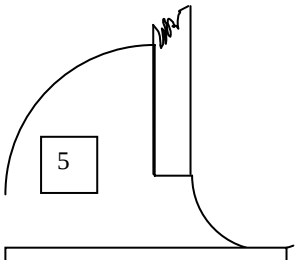
Impact breakage – If there is no carbide stuck to the steel above the break then brazing is an issue and maybe a cause.



Most commonly heat stress – probably wrong braze alloy



Also heat stress – wrong braze alloy



Weak carbide – maybe improper grinding

Super "C" Carbide Grade
Tougher than C1
Better wear than C3

Super C	Hardness (HRA)	T.R.S. (psi)
	92.3	**537,000**

Typical C2 values

	Hardness (HRA)	T.R.S. (psi)
C2	92.1	334,000
C2	91.8	334,000
C2	91.5	377,000
C2	90.4	435,000

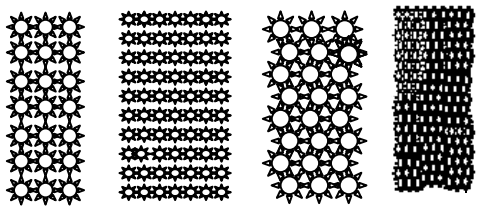
Typical C Values

	Hardness	T.R.S. (psi)
C1	89 - 92.4	350,000 - 360,000
C2	91.2 - 92.9	250,000 - 400,000
C3	91.4 - 93.6	270,000 - 350,000
C4	89.6 - 93	260,000 - 450,000

What Makes Super C Tips Truly Superior

1. Superior Abrasion Resistance

Abrasion or straight wear is countered by smaller, more consistent grain size.



1. 2. 3. 4.

1. Ordinary Carbide
2. Smaller Grains
3. Tight Packed Grains
4. Micro grains – tight packed

What is called abrasion is often thought of a straight wear. However a big part of it is actually pulling carbide grains out of the metal matrix. Smaller grains have less surface area for wear and less surface area exposed so are also less likely to be pulled out. Grains can also be more tightly packed. Both methods reduce grain exposure and loss

2 & 3. Superior Adhesion and Diffusion Resistance (corrosion and chemical attack)

The materials used in tungsten carbide have an affinity to the materials being cut. This functions two ways. One way is adhesion where the material being cut actually sticks to the tungsten carbide in a sort of welding process. The picture to the right we call "surfing dinosaur." It is a 60 x picture of an aluminum chip welded to piece of tungsten carbide. We found this in an aerospace machine shop milling aluminum.

The second way is where the material being cut dissolves one or more of the materials in the tungsten carbide. Usually it is the cobalt binder, in the tungsten carbide. This is very readily seen cutting high acid woods.

Super C grade of carbide has an extremely fine structure so there is very little binder presented to the material being cut. This, combined with the special metallurgical formulation the Super C binder (hint - it's not just plain Cobalt) creates an extremely wear and corrosion material for use in wood, plastic or non-ferrous metals.

4. Superior Fatigue Resistance

This is standard metal fatigue. On a large scale you see it by bending piece of metal repeatedly until it snaps or tears. The binder in tungsten carbide work hardens and fails much like any other metal. Its susceptibility to metal fatigue can be changed by minor changes in chemistry and by processing. Cobalt is used as a binder because it works well. Cobalt is much softer than the tungsten carbide grains and increased /cobalt binder adds greatly to toughness. However cobalt is a hard, brittle metal and alloying it with other metals gives an incredible high toughness.

And People Really Like Them - Call Today To Try Them – Most Sizes Readily Available

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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.

$1.50 a pound for Stellite® scrap. We had a customer who wanted to sell his scrap and got a quote of less than a dollar. Emily went to work and got him better than twice as much.

The Brazing Book from Handy & Harman This is a really good reference on brazing available as a book, CD or online and it is free- http://www.brazingbook.com/

www.therightcarbide.com

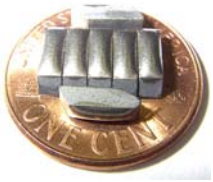
www.carbideprocessors.com

Braze alloy – top quality at very good prices

www.brazealloy.com

Please Specify Us For Pretinning

Ask for us where you buy carbide or call us directly



We are really, really good at pretinning small parts

Customer Letter

Emily,
Thanks for the great service. Your company has never ran so efficient as when you started working there with your dad.

I placed an order this week, and as soon as I hung up the phone someone brought me a box of candy you had sent us. You shouldn't have done it! (not really).

Anyway I want you to know how much I appreciate doing business with you. You make buying carbide a pleasure, and I'm not use to that.

If you have an identical twin I'd like to employ her immediately, so have her contact me.

Carbide Is Getting More Expensive

What You Can Do About It

Carbide – We offer several grades that just last a lot longer; 2x, 3x up to 11 times as long. You get a lot more for your money.
Silver Solder – We buy a lot of it and we are willing to resell at a very small mark up.

Filter Systems

Filter Systems Available Through Top Quality Distributors such as Peerless Saw Co., Smith Sawmill Supply, Burton/Fitt Saw & Supply, Equipment Ltd., Jack Sigrist, Moon's and wherever you buy saw supplies

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