Northwest Research Institute, Inc.

Carbide Processors Inc.

Newsletter

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April 2000

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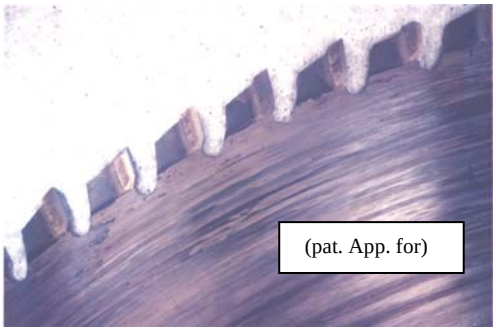
Ceramic Tipped Saw Huge Success

At Portland Wood Tech show



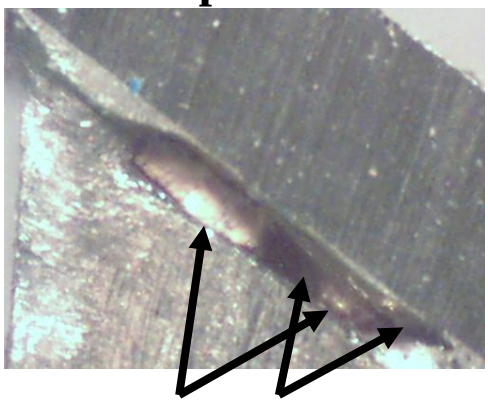
Mike West, Head Filer at Cascade Hardwoods in Chehalis, WA ran this 5 weeks on a planer / trimmer. He ordinarily runs carbide 4 weeks. This saw was much sharper after 5 weeks than carbide is after 4 weeks. After five weeks this saw was still cutting very well. He took this saw off after only five weeks because we needed it for the show. It was still good for weeks more. Mike was extremely happy with the performance. The planer ran 4 hours a shift, 24 hours a day and 7 days a week. This saw was a cutoff saw cutting reject dry maple and alder for a chipper. The saw was so sharp after 5 weeks that we had to use a caution sign. “Careful - Sharp Saw This saw was run 5 weeks but tips are still sharp enough to injure”

Saw built by Universal Saw & Tool - Tacoma, WA
Toll free 877 438-7427

Grinding information and wheels

Gary Miller - Diamond productions
800 346-5676

How to Spot Bad Saws



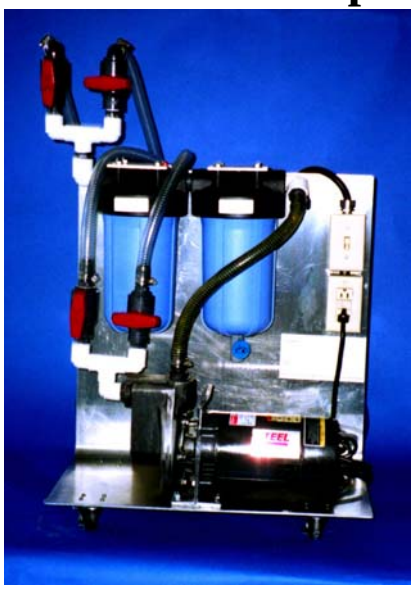
The left arrows point to solder balls. The alloy did not stick to the tip or the plate. The right arrows point to gaps between the tip and the steel.

Really Bad Pretinning & Brazing
Ken Chavez of Tewa Molding called because he really had doubts about the saws he bought. He did not think he was getting his money's worth. He was absolutely right. This was pretinning from our competitor and the saw tip was from a supplier who doesn't use us because we are too fussy.

We use several thousand dollars of computer, scanner, electronic microscope and software to do these analyses. We charge $500 for the first tool and $300 for additional tools. You can do a lot of this yourself with a good magnifying glass or a good simple microscope.

Disclaimer – A lot of what we do is research. We always try to be as honest and accurate as we can but we are not perfect. Our insurance company requires that we tell you we do not warranty anything we say and we do not have any liability no matter what you do with any information. We can send an official 3-page version of this.

Filter Two sumps



CP 2002 –2 $2045 3 way
Turn 2 valves and filter 2 sumps

We built this unit for Paul Duclos of Peerless Saw Co. Paul had a customer who wanted to switch between two sumps without moving hoses so we added the valves. It still only filters one sump at a time (see below) but it is easier and less messy.

Scott Whiting’s good Idea

When you filter two sumps at the same time one sump fills up a little faster than the other. Eventually one sump overflows while the other drains. Scott solved this problem with a siphon hose which automatically equalizes the height of the liquid in each sump. Make sure the siphon hose is in and working at all times.

Change filters every three months, please?

Also Clean the intake screen and run clean water through the unit. The unit will work better.

A Saw Filer Talks About Health and Safety

Dear Tom,

Hello from Bermuda ! Hope all is well and that you're keeping out of trouble. I see you've been getting lots of exposure on Sharpnet, which is good for us sharpeners. As we learn more from you and how your company can help us, the better service we can provide for our customers and prolong our lives in the meantime. Got your news letter the other day. Thanks and keep it coming ! The day it arrived, I'd been having problems with my knife grinder and was really tearing out my hair (of which I have lots of, Sat down for lunch and started reading your news letter. The bells started going off in my head as I read along, and right after lunch I took the grinder apart. Holy smoke Batman ! Robin's been a bad sidekick and not cleaned out his sump on a regular basis. Wondered why my 46 grit oxide wheel kept clogging up and burning the knives, why my hand seemed dry and really irritated, and the list went on. After I cleaned the grinder from top to bottom (including a bacterial cleaner called Spray 9), put fresh coolant in and re-dressed my grinding wheel, WOW !!! Better than new. Calgon may soothe away stress in the T.V. commercials, but your news letter that day took my stress away ! Thanks for saving my mind that week. (Bermuda cont.)

I thought that because I was only grinding HSS knives and not carbide, that I wouldn't experience all the problems associated with carbide grinding. Boy was I wrong. I must have cleaned out almost a gallon of gunk from the sump and machine. The grease was clogging up my grinding wheel and causing me to dress it for every set of knives. The bacteria must have aggravated my hands because one night they were really burning no matter what I put on them. After I had ground one set of knives, I checked the sump and the clean coolant. I could see sediment settling in already. I couldn't believe it ! This was a very valuable lesson, and one I won't forget too soon.

As you have said, the initial cost of your filter systems is the only drawback, especially for a small co as mine. However, this experience has only firmed my resolve to get a filter system for my equipment before the year is up. I can only imagine what my lungs are taking in and I will be taking steps to investigate cleaning the air in the workshop somehow. I'm only 35yrs and I would like to live to a ripe old age without serious health complications to enjoy the fruits of my labor.

Thanks again and please keep those news letters coming. There's no telling what disaster it'll save me from next !

Victor Da Silva, Razor's Edge Sharpening Service, Bermuda

Cobalt Concentration in Coolant

Dave Karren of AA Carbide, Inc. in Utah speaks with a soft, gentle voice and a polite manner. He is one of those guys we describe as talking sort of slow and thinking real fast.

He called with some real tough questions. Dave knew that cobalt reacted chemically with coolant as well as being dissolved in it and it was also in coolant as pieces of saw tip. Dave wanted to know what filtering did to remove the dissolved and chelated cobalt.

This is a very complex issue and testing is difficult to do. We had tests done on recoverable cobalt as well as on coolant conductivity.

Lab test comparing unfiltered coolant, coolant after filtering and new (unused) coolant

	Dirty	Filtered	Unused
Cobalt mg/L	3,210	299	0.138
Cadmium	0.06	0.038	<.003
Chromium	<.07	0.024	<.007
Silver	<.07	<.014	<.007

	Dirty	Filtered	Unused
pH	8.08	8.04	8.02
Turbidity	45,000	15	7.02
Conductivity	2,210	1,508	1,683
Viscosity	0.73	0.67	0.76

Laser count of total particles in one cubic centimeter of coolant

Dirty coolant	76,301,683
After filtering	84,581
Unused coolant	11,884
% of particles removed	99.89%

What this means

Filtering does not completely clean coolant but it goes a long way towards keeping it clean. Even brand new coolant has particles and some metal in it.

The top figure shows that recoverable cobalt (chunks and dissolved) dropped from 3,210 to 299. The chelated cobalt changes the conductivity of the coolant and the conductivity dropped from 2200 to 1500. The real answer is that we have been selling these units for 4 years and we are repeatedly told that the coolant lasts longer and does not get as red as fast. Cobalt in coolant adds red to the color so cobalt coolant turns coolant pink or purple.

At the Portland Wood Technology show we had one of the most famous saw filers come up and tell us that he had state officials, company people and health experts from the state university in his shop. He was hoping they could make things better. Instead they couldn't find anything to improve. He constantly filters every machine.

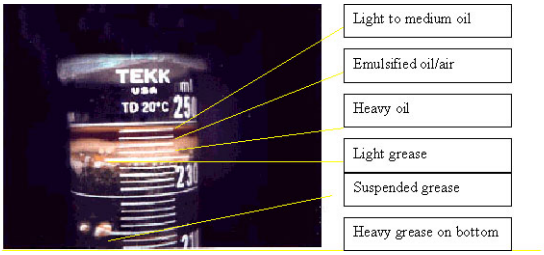
Test Instruments to Analyze Coolants

Double or triple diamond wheel life

Graduated cylinder $45.32
Detect bearing and seal failure

Test for oils and grease
13"h x 3.5" base x 1.8" cylinder

1. Fill it to the top
2. Let it settle
3. Read the lines

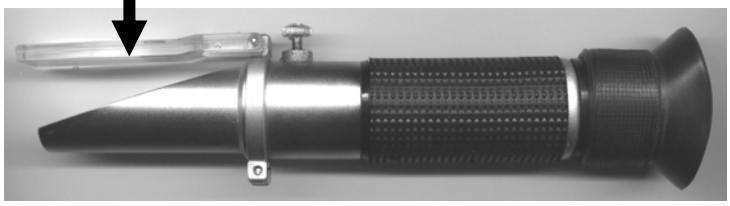


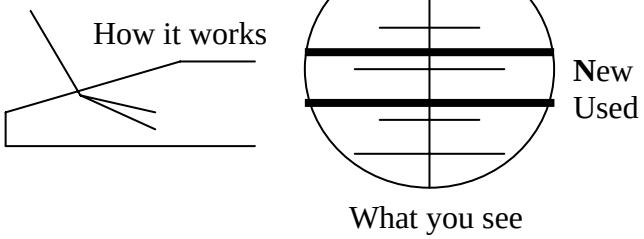
Clean coolant with no oil or grease on the left
Above is the top of the cylinder. You can see the oils and grease. These can clog wheels and dramatically cut wheel life. You can see the different oils and help identify leaks.

Keep your coolant at the proper concentration.

Refractometer 0 - 32% $170 Thick coolant gets gummy and clogs diamond wheels and machines. Thin coolant allows rust to form and bacteria to grow

Put a little coolant here and close the flap





As water evaporates the coolant gets thicker. Light bends as it goes through liquid. Thicker liquid bends light differently than thinner liquid. You see how this works in the middle drawing. The right drawing shows what you see when you look in the eyepiece. There is a grid shown by the thin lines. You will see a thicker line which tells you how thick or thin the coolant is.

Detect cobalt and other metal concentrations in your coolant.

Conductivity or dissolved solids tester $89.90
Cobalt leaches out of carbide. Stellite®, carbide, steel and wheels drop fine particles in the coolant. These dissolved metals and the very fine particles can seriously affect machine life and perhaps affect health.

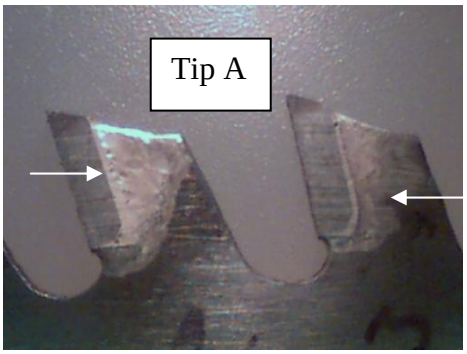
1. **Stick this end in the coolant**
2. **Press the button**
3. **Read the number**
4. **Lower is better.**

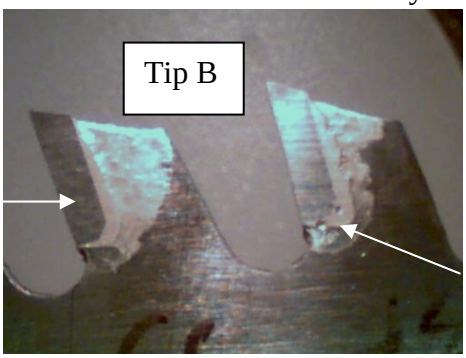
Prevent skin rash, dermatitis and bacteria growth.

pH tester - auto calibration $104.00 or pH papers $45.32
pH tells you whether your coolant is acid or caustic. Either one can promote bacteria growth and affect skin. You need to keep your coolant at the proper pH with water and additives. You use the gauge by putting the end in the coolant and reading the numbers. You dip the paper in the coolant and match the color with the supplied chart.

Analyzing Braze Joints

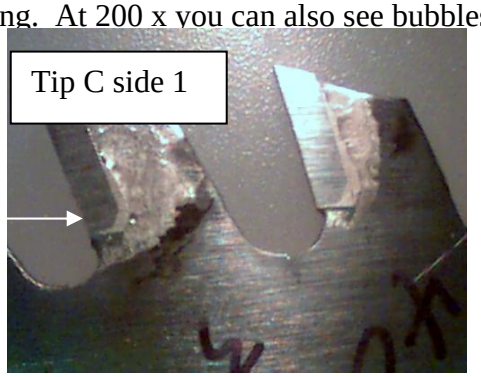
These were done at 10x but all these defects could be seen with the naked eye.

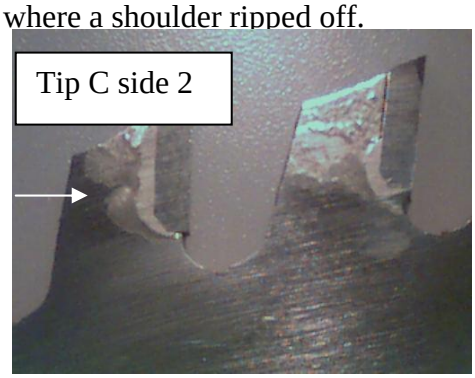




Bubbles in braze alloy - overheating

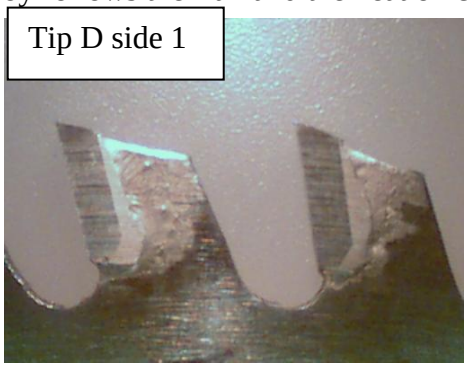
Braze alloy reaches its full flow by 1350 F. Zinc boils at 1664 F and a torch can run 4,000 F or hotter. It takes skill and concentration hit the flow point without getting the braze alloy too hot. Overheating can be as bad or worse with induction heating. At 200 x you can also see bubbles in the steel where a shoulder ripped off.

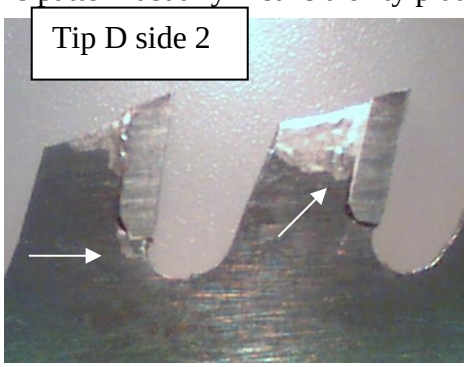




Uneven flow onto the plate - dirty plate, and / or not enough flux.

Too much heat causes bubbles in the braze alloy. The right photo shows an area on the plate where the alloy did not flow. Braze alloy follows the flux and the heat on clean areas. This pattern usually means a dirty plate.





Tips look pretty good on this side

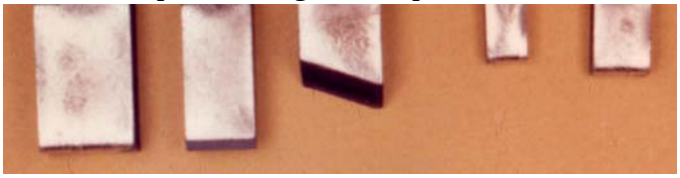
2nd side shows big gaps between tips and plate

Bumps on the left tip in the left picture may be copper crystallization from overheating or manganese nodulization from underheating depending on the alloy and the process controls used.

The gaps between the plate and the tips are caused by bad tips, good tips with bad surface preparation, bad pretinning and / or all three.

Tuffco © gives better brazes at lower temperatures

Our new surface-treatment process works extremely well. Tips always look and work like tips in the left picture and never like tips in the right hand picture below.

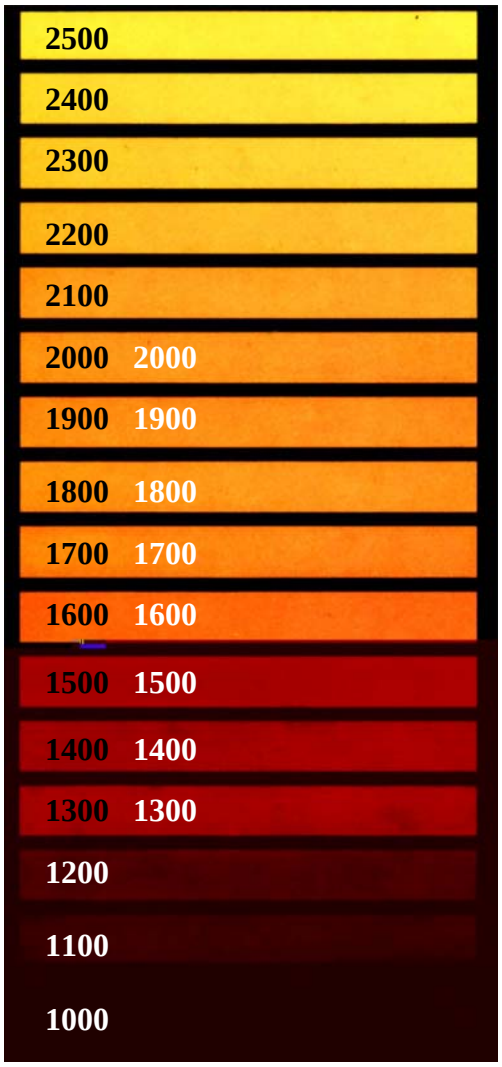


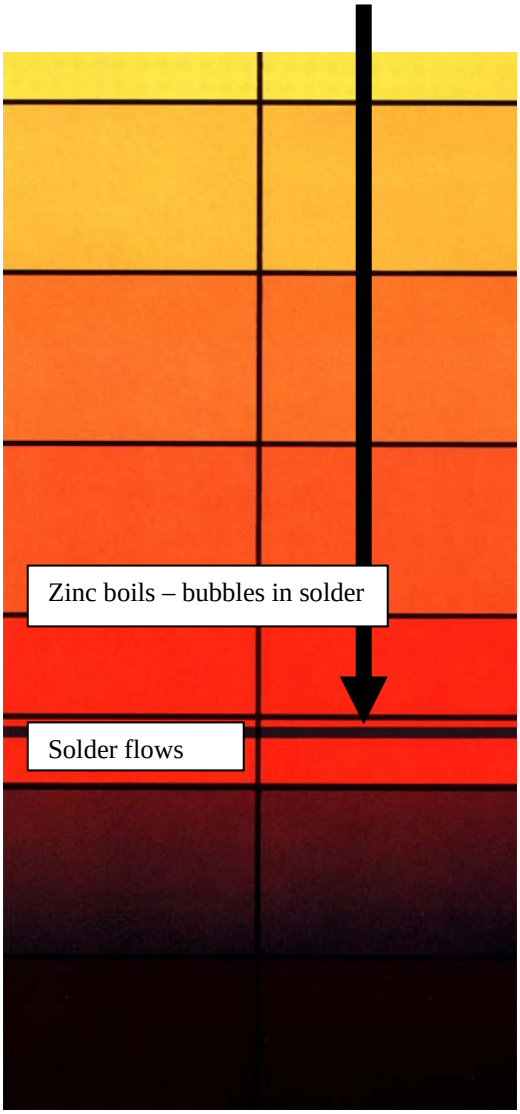
How to tell temperature by color

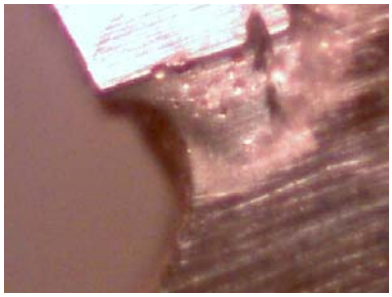
These are very rough charts. They are offered as a training aid because of requests and they are better than nothing. I recently saw automatic brazers that were getting the steel to a good orange color. They were optical sensors with computer read out and. I asked when was the last time the sensors were calibrated. No one knew. It had apparently been several years.

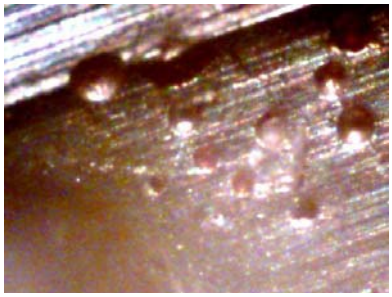
This arrow points to a thick line which is about as hot as you need to go to braze tungsten carbide but the carbide and the steel holder both have to be this color all the way though. Any hotter than this starts to affect the steel.

This arrow points to the thick line 1350 F









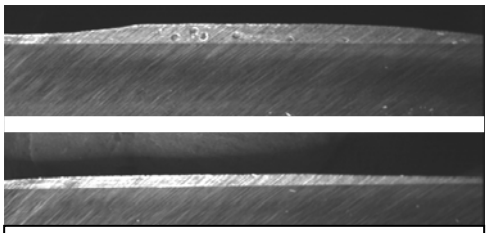
At 1664 F the zinc boils and forms bubbles in the braze alloy. This overheating weakens the braze alloy and the steel shoulder.

Why Overheating Makes Bad Tips Look Good

Typically tips with a bad surface are made to look good by using "a little more heat". The solder flows for two reasons. 1. As metal gets hotter it tends to flow better. 2. The zinc starts to boil and the alloy moves more just as boiling water moves more. This boiling sometimes leaves bubbles you can see on the outside and it also leaves bubbles inside. Sometimes you cannot see the outside bubbles. But the inside bubbles are still there.

Recognizing overheated tips
Tips in the top row wet and flowed well. These tips were not over heated. These tips have an even, consistent flow. There may be a slight dimple in the middle from cooling. The bottom row is overheated tips. These tips have a rougher pitted appearance. The alloy has separated due to boiling. There is bleed to give color in the corners but this is not good alloy

Uneven flow, extra alloy to hide surface conditions. Gas bubbles from boiling zinc. Competition



Our work - Smooth, even flow, undamaged alloy. No pits or voids. Greater intermetallic zone for better strength. Lower braze temperature.

Tip loss and ripped shoulders

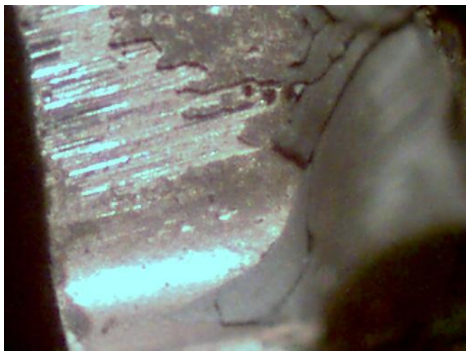
In this case the customer was having tip loss and ripped shoulders. The first part of the problem was that the salespeople said it was very serious and that they were losing sales. Manufacturing said that it wasn't all that bad. The first thing they needed was a count of just how bad the problem was. The second thing they needed was a testing method. In this case the test was to take a pair of vice grips and pull sideways on a tip until it came off. If it took some pulling then it was considered a good braze. By comparison we have another customer who pulls sideways on the tip and is not satisfied unless he can pull the tip over and bend the steel. He does not consider it a successful braze if the tip comes loose at all much less coming loose before the steel bends.

Ripped tip and steel – gold color on both which looks good

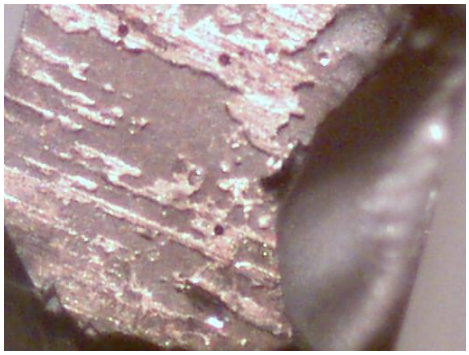
When you rip a tip off it looks like you are ripping the carbide and ripping the braze alloy in half. There is a gold color on both the tip and the steel body.

The problem is that neither surface has much actual alloy on it. The surfaces were pressed together with so much force that the alloy could not flow into the space. The alloy separated and there was a color bleed. This is sort of like dye coming out of cloth. The pictures above are the tip and the steel. You can see two layers. One layer is braze alloy and the other layer is the underlying steel or carbide which has been colored. The lines running across are where the braze alloy flowed in the notches left by the grinding wheel.

The ripped off tip and the matching steel shoulder



This is the carbide tip with a piece missing in the lower right 60 x

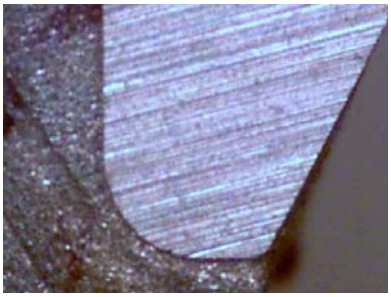


This is the steel shoulder with the matching piece of carbide brazed to it in the lower right. 60 x

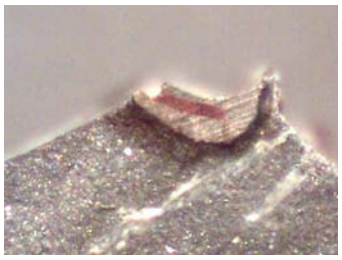
The Factory Saw Fallacy

Lately we have heard people talk about factory saw brazing and how good it looks. There is no braze alloy on the saw at all. No yellow color. This is sold as a sign of good brazing. In this case it is a sign of no braze alloy.

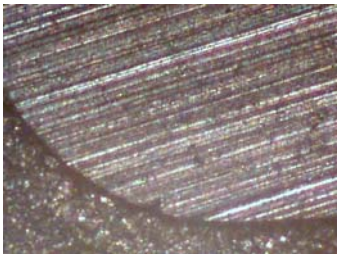
This is the tip on a "factory saw" magnified 10x.



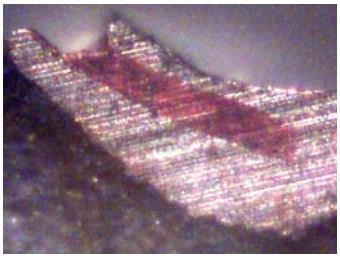
The same tip at 60 x. If there were 0.001" between the steel and the carbide it would look like a line that was 0.060" (1/16 inch) thick and would be easy to see.



This is a photo of another saw used here for comparison also at 60 x. The yellow with the red stripe is a tri-metal shim 0.010" thick. The red stripe is the copper center that is 0.005" thick and very easy to see.



The same tip 200 x and still no braze alloy visible. If there was the proper amount of braze alloy (0.003" to 0.005") there would be a layer that would show up as 0.6" to one full inch wide at this magnification.



This is the comparison tip at 200 x

This newsletter, free ads and other literature

We do a newsletter on sharpening. Our focus is carbide and ceramic saw tips but we do address other issues. In any case it is free. One thing we do is run announcements for readers if you were looking for something. We also have readers with equipment to sell. We have also put smaller shops in touch with larger shops to their mutual advantage.

In addition we have other training literature including copies of some of these pages that are larger and useful for training. Most of this is free. We do this because we figure the smarter you are the more likely you are to use us.

Video inspection systems

We have been asked a couple times if we want to build these. No, we don't. They are a lot harder to build than they look. California Cedar Products Company sells an excellent unit at a very fair price.

We can't help you if you bought wrong

Our competition has been sending people to us for help with problems. Quite often they have bought lower priced goods. They bought cheap and it just doesn't work very well. Quite often there is just no good solution.

Why I like this business

It is the people in it. Dave Marshal called to tell me that we had under billed him by $180. He asked what I wanted to do about it. I told him that our prices were so low that it was hardly worth charging him at all. We laughed and he told me to invoice him. We did but we gave him a 50% credit for honesty. I like this business because of the high percentage of great people in it.

Farm Implement

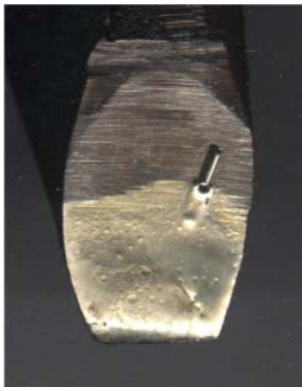
Surface treatment to solve braze failure

Chrome steel holder, ribbon alloy & carbide

This is a part off a complex plow. It tills the field, drills the holes, plants the seed and covers the seed all in one pass. The chrome fingers work well in the US but wear too fast in Germany so they wanted to braze carbide on. They were getting about a 90% failure rate.

We did some simple testing and identified flow problems with the carbide. It was good carbide but just didn't wet at all well.

Testing: I fluxed the parts heavily and put wire bits of braze alloy on them. I applied the heat into the part and not into the braze alloy.



Chrome holder with melted alloy Where the holder got hot enough it worked very well even uphill

The chrome holder wets beautifully after just being wiped off with a clean towel. You can see where the heat got to it by how much of it flowed. It wet beautifully from side to side. You can see the puddle of alloy at the bottom lip of the part. The part was brazed so that the braze area is on a slant. I set the bottom flat on a table. The braze alloy does wet well and does hold onto the upper parts of the slanted surface so it will braze well in this (or other slanted) position(s).

The parts fail because the carbide does not wet at all well. The left part has 2 little specks of alloy that stuck to it. They are very small. Smaller than pinheads. Think pin points. The rest of the alloy formed a little ball that fell off in washing. The second part has a blob. I used the same amount of braze alloy on all three areas. There was more than enough alloy to cover the

We can prepare the surface of the carbide so that it wets and bonds beautifully. Some carbide suppliers will say that this is not necessary because they make good carbide. In this case the carbide supplier was correct. This was very good carbide but it just did not wet well. We are probably the best in the world at wetting carbide.

Simple Carbide Quality Test

We have a simple procedure to test saw tips or any carbide for wettability. If you want a free copy please call.

Ceramic tipped saws work


Customers love the way they feed



Tough enough to cut metal

Customer love them and pay more for them

I jammed about 200' of wood (walnut, yellow pine, sassafras, poplar, red oak, cherry) into both blades and the ceramic blade outperformed my beloved Forrest blade hands down (on the bottom at left). The cuts were smoother, less binding, and MUCH more effortless with the cermet blade. I even cut a casehardened piece of walnut (firewood) that required wedging with both blades and the cermet blade hardly took a deep breath. Conclusion? I have used the Forrest blades exclusively for about 20 years. The only time the new ceramic blade will not be on my table saw is when it will be sent away for sharpening.

Sorry Multi –Metals

Shawn Teague called to compliment us on our newsletter. He also mentioned that we were writing about Dianite when it is spelled Dyanite.

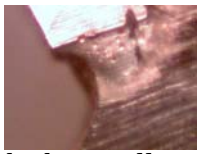
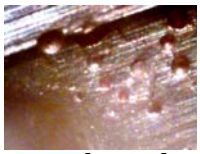
We need help with a research project

We are working with several people on the problem of ripped shoulders.

We need to know where and why shoulders rip. If you get a ripped shoulder we would like you to trace the ripped one and an unripped one and send them to us. We are testing a theory that shoulders rip at the bottom of the notch. Send us whatever you think is important and we will send you an Eisenhower silver dollar to say thanks.

Inspecting Saws

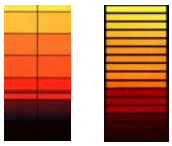
Our customer was told that this was a very good saw and cheaper too.

The braze alloy was overheated enough to boil the zinc and cause bubbles in the braze alloy. This can cause tip loss and ripped shoulders.


This is a bad tip with bad pretinning and bad brazing. They used extra heat to disguise it and caused a ripped shoulder. (more inside)

How to tell braze temperature by color



Whether you use a torch, induction or an automatic brazer you can use these to get a quick reference. From what I have seen lately automatic brazers are more likely to severely overheat than a good brazer with a torch. (more inside)

Tuffco © gives better brazes at lower temperatures


Our new surface-treatment process works extremely well. Tips always look and work like tips in the left picture and never like tips in the right hand picture above.

A filer talks about filtering

and says things our attorney says we can't say. (See front page)

Carbide Processors, Inc.

Northwest Research Institute, Inc.

Newsletter

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