Lake Charles Woodworkers Club, Inc. October 2003

George Kuffel was our host this month at his fine shop. The shop is large (by my standards) climate controlled and full of tools.

This was a meeting where lots of Show and Tell were brought as well as lots of advise and conversation about techniques and tips.

Lee Frazier started off by telling about Cincinnati Dowel and Wood. They are suppliers of wood dowels and more. Contact them at 513-831-8887 or email them at cincinnatidowels@fuse.net or write them at Cincinnati Dowel, P.O. Box 865, Milford, OH 45150. You can also visit their web site at www.cincinnatidowel.com and order online. The prices for hardwood dowels and many other wood products are outstanding. Birch dowels, for instance are only about 7.5 cents each but, you have to purchase a minimum of 100. Still, at $7.50 plus shipping, they are a great deal. Lee brought a neat show and tell in the form of what I call a Whirlaway. This neat hanging wind powered twirler is easy to build. Barry built one of them more than 10 years ago and its still twirling away on the patio.

Bob Patin brought his Airmate personal protective air filtration system. His consists of a hard hat with a face shield. The system connects to a battery pack with a fan motor and HEPA filter to provide clean air to your face while protecting you from airborne dust. The battery runs the unit for about four hours. Contact Airmate at www.airwareamerica.com or call 800-328-1792 for more information or write them at Airmate, P.O. Box 975, Elbow Lake, MN 56531. The unit may also be used with a lighter face shield rig.

Chuck Middleton is about to build a new home. He described a piece of software he recently purchased, called Punch Pro. The software, available at SAM's. Chuck and Charlene were struggling with the placement of the home on their lot as the lot is an odd shape, so he built a model using templates produced by the software after entering the home's and lot deminsions.

Chuck also talked about safety glasses. He brought a pair he got from Valen Safety Supply for about $10 (Valen Safety at Hwy 90 and Columbia Southern Rd. near the old Chateau Charles motel). The items can be fitted with bi-focals in various diopters.

Eltee Thibodeaux brought some of his great scroll work including a picture of a couple of kittens. Eltee also does engraved bowling trophies for his bowling pals. See both on the LCWW web site in the Gallery.

Gary Rock (our host next month) brought a few of his new turned bowls. His new One-Way lathe is doing some good work.

Judy Gill, one of our new members, sent one of her recent carvings. She could not attend this month but sent it with Gary Rock. This was appropriate as it is a carving of Gary holding a bowl and a gouge. You can see it on the LCWW web site.

Our host, George Kuffel got a couple of bowling pins from Eltee recently. He turned one of them into a nice mallet that his spouse Nancy immediately claimed as a meat tenderizer. So George has to turn another one for the shop.

Edwin Blessing brought one of his newly completed child's rockers. Edwin is focused on high quality rockers for his copyrighted design. He described the finishing process that includes many coats of gloss polyeurethane.

Coming Up . . . Saturday, October 11, 9:00 a.m.
We'll meet at the shop of Gary Rock where he'll show off his new lathe and new work bench.

TIPS FOR SAFE ROUTING

Dick Trouth recently sent this set of simple router safety tips. Read them and please follow them.

Never Touch A Moving Router Bit. The first rule to follow is never touch a moving router bit. Before you say of course, remember how many times you have been tempted, after you have shut the router off, to brush away the dust and shavings with the back of your hand before the bit has actually stopped. Even after the bit has stopped, remember that they are designed to cut something a lot harder than your hands and fingers. Keep your brush handy and use it. It is a lot safer than using your hands.

Tighten That Bit. This certainly makes sense, but have you ever heard some strange sound from your router, stopped and found that the bit is loose? Always check to be sure the bit is properly seated and in the collett far enough. A three or four shoulder collett is best. You should replace any old two-shoulder colletts.

Direction Of Feed. The most important item to remember in using a router is the correct direction of feed. Take a minute before starting a cut to look at the bit and the direction it is running. You can never do wrong by always feeding into this cutting action. A quick way to check when you are using your router in a table mount is to get your eye down to table level and look at the bit from the side you intend to feed. If you can see the carbide bit face you are feeding correctly. Using a hand held router, always remember the direction of the rotation of the bit and cut into the stock.

Never feed stock between the bit and a fence. The router could shoot it like a cannon. With the bit turning 20,000+ RPM, a peice of wood can come off the bit at several hundred miles per hour and you don't want to be standing anywhere near it.

Organize Your Project. A good project uses time for thinking and time for cutting. It is a good idea to do your thinking first. Besides, it saves a lot of money on wasted stock.

Control Tear Out. Tear out occurs when a bit cuts through the back of the material and has no solid edge to cut into. Most tear out can be controlled by using a backing block to feed material, or by using ordinary masking tape along the cutting line.

THE CUTTING EDGE MOVES IN

Steve and Terri LeGrue's new location is open! A couple of years ago they began planning for a new one to handle even more woodworking tools and classroom space.

The new location is at 11760 S. Sam Houston Pkwy W., Houston, TX 77031. The telephone number remains the same at 713-981-9228 and you can order by phone at 800-790-7980. Every Saturday from 11:00 a.m. to Noon, they offer a workshop on tool use or techniques. Their hours of operation are the same: weekdays 9:00 a.m. to 6:00 p.m. and 10:00 a.m. to 5:00 p.m. on Saturdays. To get there from here, drive to Houston. Merge onto US-59 S (exit 770A) toward Downtown. Take the Frontage Rd exit toward Beltway 8 North. Stay straight to go onto Southwest Fwy. Turn left onto Beltway 8 W Sam Houston Pkwy S W Belt Dr. S. and turn left. Then turn left onto Beltway 8/ W Sam Houston Pkwy S/ W Belt Dr.

METALLURGY DEMYSTIFIED

Taiwanese tool manufacturers tout the advantages of high-carbon steel, while North American suppliers are often silent about the merits of the far superior high-speed steel (HSS). Too often, woodworkers must rely upon the promotional "facts" that manufacturers use to sell their products. The truth is not always clear. For example, HSS often has the same amount of carbon as high-carbon steel. HS steels often contain molybdenum or tungsten as their principal alloying element, the same ingredient used in carbide tools.

Higher prices are not always proportional to higher quality. Rather than purchasing the next tool for which carbide becomes the material of choice, find out which type of a specific tool best fits your needs. To do so, you have to understand a little bit about metallurgy.

All cutting tools can cut materials of a lesser hardness — for a while. Some cutting edges stand up longer than others. This is due to a number of factors other than absolute hardness. Properties such as heat resistance, shock resistance, toughness, hardness and red hardness all affect the durability of a tool.

Alloying elements – carbon, nickel, chromium, vanadium, molybdenum and tungsten – affect these attributes in a variety of ways. These elements, when used in isolation or in conjunction with one another, alter the cutting characteristics. It is also important to understand how a metal behaves under load and why.

Dislocation Theory or Why Steel Isn't Mush. As a metal cools, small particles form in the liquid and crystals develop in a regular 3-D geometric pattern. Because the particles solidify randomly throughout the liquid, the crystals or grains will eventually obstruct one another and form grain boundaries. The atoms at the grain boundaries are not as well bonded to their neighbours as they are to others within the same crystal or grain.

Usually there are many breaks (called dislocations) in the neat atomic structure, which allow the atomic bonds to break in a progressive manner, each at very low forces, rather than simultaneously.

Solid metal doesn't become mush because the many dislocation lines interact with one another, impeding the progression of each dislocation. Since the slip planes of neighbouring crystals are rarely in exact orientation with one another, a dislocation is also stopped by a grain boundary. So, the greater the number of crystals in a given area, the greater the strength, hardness and impact resistance, all resulting in higher toughness. But what do these elements do?

Carbon increases hardness (at the expense of ductility). No cutting tools are made of low-carbon steel (less than 0.3% carbon), as there would be insufficient carbon to allow hardening. Medium-carbon steel (0.3 to 0.6% carbon) possesses increased hardness and toughness. High-carbon steel (HCS) (0.6 to 1.2% carbon) has good wear resistance and hardenability, but is not as tough as carbon steel with lower carbon contents. Toughness is necessary when, for instance, a drill bit encounters a hard pin knot. A HCS drill bit will have reasonable longevity between sharpenings, but if its cutting edge encounters

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an abrupt change in the material, it is likely to fail at that contact point.

A drawback of HCS tools is their inability to hold an edge at elevated temperatures. Beyond 400°F, HCS begins to lose its hardness. The tips of cutting edges are often subjected to such temperatures, and once their hardness is lost, the edge breaks down in ductile failure.

Nickel increases toughness and impact resistance, while reducing the tendency to distort as the material is quenched during the hardening process.

Vanadium is another alloying material that forms strong carbides. These carbides do not readily disperse into the molten steel, so as solidification progresses, grain growth is inhibited.

Chromium, when added to steel during the manufacturing process, joins with carbon to form chromium carbides. This increases the material's ability to harden, as well as its abrasion and wear resistance.

Molybdenum joins with carbon to form stable carbides but resists grain growth at elevated temperatures. Consequently, fine grain size is retained. It is resistant to tempering, and promotes exceptional toughness. Molybdenum is not as good as tungsten at promoting red hardness at very high temperatures, it costs less, and is adequate for less extreme temperatures.

Tungsten is very effective at promoting the formation of stable carbides at high temperatures. When the tungsten content is more than 18%, and combined with lesser percentage of chromium and vanadium, the most common formulation of HSS is formed.

To produce so-called **tungsten carbide**, tungsten powder is mixed with carbon at a ratio of approximately 94% to 6%. Small amounts of **cobalt** are then added, which will act as the binding element. When this powdered mixture is held under high pressures and temperatures (about 2500°F), tungsten carbide is formed, held together in a matrix of cobalt. The result is an extremely hard, but brittle, cutting material. Provided sudden shocks can be avoided, failure occurs most frequently when the lower-melting cobalt wears away, exposing poorly held carbide particles, which are apt to break off. The higher melting temperatures of **tantalum** and **titanium** make them more suitable as binding elements. They form “tantalum carbide” and “titanium carbide”, which cost more.

Coated carbide is a recent development and is produced by a very thin application of an even harder and extremely brittle alloy, to any grade of carbide. Titanium Nitride or “TIN” coating as it is often called, is the most popular hard coating, and is easily recognized by its gold color. This vapor deposition coating is so hard that it can only be applied .0002 to .0003" thick, otherwise it would fracture within itself. It must also be supported by a tougher, but very hard material, such as carbide. It is the combination of the extremely hard, thin coating, plus the substrate's ability to provide the required toughness, that makes TIN coated tools effective. The only drawback (besides the added cost) is that it is removed at the first resharpening.

What Tools Need What? The commonly used woodworking tools listed below are grouped with other tools that have similar property requirements at their cutting edges.

Because the cutting edges of chisels, plane irons and carving tools often form acute angles (15 degrees to 30 degrees), they must possess a high degree of toughness. These tools must be able to hold an edge over long use, but the keen edge must also resist fracturing under wide ranging loads. Chromium or vanadium are used most often to increase toughness (some blades have a “Cr-V” stamp). Increased toughness is necessary in low-angle plane blades (as they have less material supporting the cutting edge), and on higher-angled mortise chisels. The addition of molybdenum increases toughness even further.

Saws and scrapers must posses a high degree of hardness, as well as ductility, and so are made almost exclusively of medium to high-carbon steel (or "spring steel"). Any alloying elements other than carbon reduce ductility to the point where the blade may snap if bowed (intentionally, as a cabinet scraper is, or inadvertently, as can happen when a push-stroke saw is forced). In general, the harder the steel, the better. For example, cabinet scrapers made from high-carbon steel typically range form Rc 38 to 52. The harder scrapers require more effort to burnish a hook, but it will last longer.

As western saws cut on the push stroke, the teeth must posses both hardness and ductility, so the blade will not snap when inadvertently bowed. Japanese saws cut on the pull stroke; if binding occurs, it will be while the blade is in tension, eliminating the possibility of bending. Japanese pull-stroke saws usually have harder teeth than western saws.

HSS drill bits and power saw blades have superior toughness and red hardness, which a power tool bit or blade needs. Although not as long lasting as carbide, HSS is less expensive, and can be sharpened by traditional means (e.g., aluminum oxide grinding stones). Carbide can be sharpened only with silicon carbide or diamond stones.

Carbide bits and blades last the longest. Besides their higher cost, they are susceptible to chipping; as hardness increases, toughness is reduced, and the steel becomes more brittle. If a carbide tip hits a nail, that tooth is likely to be damaged beyond repair. A high-speed bit, however, usually escapes with a small fracture, which can be easily reground.

With the exception of carbide-tipped masonry bits, carbide-tipped drill bits are not as popular as carbide-tipped circular saw blades. The rim speed of a 1/2" drill bit travelling at 2000 rpm is far lower than the rim speed of a 10 diameter blade travelling at similar rpm. The saw blade encounters much higher forces and temperatures, hence the need for a material that resists both.

HSS turning tools are favored because the work hitting the cutting edge of turning tools is moving at speeds equivalent to those of circular saw blades. Carbide-tipped wood turning tools are not very common, although carbide-tipped tools are used almost exclusively in the metal turning industry.

At 20,000 to 50,000 rpm, the heat generated would burn a carbon steel router bit in an instant. HSS that has sufficient tungsten will not remain sharp as long as carbide will. However, for odd-shaped bits that are used only occasionally (or even once), a high-speed steel router bit may do. From *Lee Valley Tools.*