

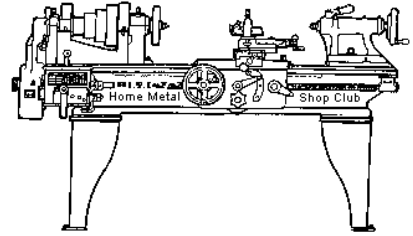


Home Metal Shop Club

March 2015

Newsletter

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The Home Metal Shop Club has brought together metal workers from all over the Southeast Texas area since its founding by John Korman in 1996.

Our members' interests include Model Engineering, Casting, Blacksmithing, Gunsmithing, Sheet Metal Fabrication, Robotics, CNC, Welding, Metal Art, and others. Members enjoy getting together and talking about their craft and shops. Shops range from full machine shops to those limited to a bench vise and hacksaw.

If you like to make things, run metal working machines, or just talk about tools, this is your place. Meetings generally consist of **general announcements**, an **extended presentation** with Q&A, a **safety moment**, **show and tell** where attendees share their work and experiences, and **problems and solutions** where attendees can get answers to their questions or describe how they approached a problem. The meeting ends with **free discussion**.

President <i>Vance Burns</i>	Vice President <i>Norm Berls</i>	Secretary <i>Joe Sybille</i>	Treasurer <i>Emmett Carstens</i>	Librarian <i>Ray Thompson</i>
Webmaster/Editor <i>Dick Kostelnicek</i>	Photographer <i>Jan Rowland</i>	CNC SIG <i>Dennis Cranston</i>	Casting SIG <i>Tom Moore</i>	Novice SIG <i>Unfilled</i>

This newsletter is available as an electronic subscription from the front page of our [website](#). We currently have over 812 subscribers located all over the world.

About the Upcoming 11 April 2015 Meeting

The next general meeting will be held on 11 April at 12:00 noon at [Rollformers of Texas Corp](#), the shop of member Gene Rowan, located at [1005 Broadway \(Avenue F\) at 11th St. San Leon](#), TX 77539.

Gene will give a presentation on Rollforming of Structural Elements. Gene has also kindly offered to provide a Bar-B-Que lunch at the meeting. Wear your safety equipment! Steel toed boots, head and eye protection, and possibly hearing protection.

Visit our [website](#) for up-to-the-minute details, date, location, and presentation topic for future meetings.

General Announcements

[Videos of recent meetings](#) can be viewed on the HMSC website.

The HMSC has a large library of metal shop related books and videos available for members to check out at each meeting. The library is maintained by the [club Librarian, Ray Thompson](#). These books can be quite expensive, and are not usually available at local public libraries. Access to the library is one of the many benefits of club membership.

The club has funds to purchase new books for the library. If you have suggestions, contact the [Librarian](#).

We need more articles for the monthly newsletter! If you would like to write an article, or would like to discuss writing an article, please contact the [Webmaster Dick Kostelnicek](#). Think about your last project. Was it a success, with perhaps a few 'ugh ohs' along the way? If so, others would like to read about it. In the September 2012 HMSC board meeting, the board elected to waive membership fees during the next membership renewal cycle for those providing newsletter articles.

Ideas for programs at our monthly meeting are always welcomed. If you have an idea for a meeting topic, or if you know someone that could make a presentation, please contact [Vice President Norm Berls](#).

Recap of the 14 March 2015 General Meeting

By Joe Sybille, with photos by Jan Rowland

Twenty-five members, including one returning member, William (Bill) A. Kimbrough, attended the noon meeting at the Parker Williams Library, 10851 Scarsdale Blvd., Houston, Texas 77089. Welcome back Bill. One visitor attended today, Jesse Lasaway. There are 53 members in good standing with the club. President *Vance Burns* led the meeting.



Presentation



Former club president, *George Carlson*, gave a presentation on assembly and operation of a computer numerically controlled (CNC) multi-axis router.

He began the presentation by showing examples of manually controlled machines in his home workshop that he



has converted to CNC. Among the machines that he has converted are a Grizzly G0704 mill and a router for woodworking. The woodworking router has a working table area of 27 inches by 48 inches. There are three main requirements to consider when converting a machine to CNC, namely mechanical components, electronics, and software. Decisions must be made pertaining to the basic machine layout. Questions arise such as the following. Which type of drive mechanism will be used, acme lead screw or ball screw? Which type of drive motors will be used, stepper or servo? Which spindle type to use, trim router, air cooled DC router, or water cooled three phase? Drive couplings for axis motion must be considered, too. Oldham couplings develop backlash when worn. Spiral cut couplings exhibit no backlash.

Whichever drive motor is selected, an appropriate electrical motor driver must be employed. Limit switches, while not required, are helpful, and can avert damage to the router setup in the event of an errant software command. A touch-off pad is a useful addition to zero the z-axis at the beginning of every job. A computer monitor with a touch screen to execute software commands is more convenient to use for CNC operations than a mouse and keyboard. Pendants, i.e., remote manual jogging switches, are used to manually control the spindle's location. Several types are available, and the choice is merely personal preference.

Choices abound for the software to run a CNC machine. From conception of an idea to the production of the part, software plays an integral role. Once the idea for a part is conceived, the part must be designed using software. Software choices include, among others, AutoCAD, Draft Sight, Adobe Illustrator, Corel Draw, and Inkscape. After the part is drawn, the file depicting the part must be converted to G-code. Basically, G-code is a computer programming language whose files send commands on how to advance a machine tool along its axis. Choices to generate G-code include CAMBAM, and V-carve, among others. Before the computerized machine can execute the G-code commands, the CNC control software must read the G-code and translate it into motion instructions the computerized machine can follow. Choices include MACH3 and LinuxCNC, among others. George remarked that it is better to generate the G-code on a separate computer and then transfer the code to the controlling computer.



George then demonstrated how his CNC router worked by making a club logo in the shape of a gear (see above photos). [Click here to view George's presentation slides.](#)

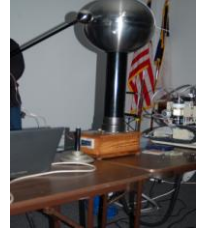
Safety Moment

Vance Burns showed a [safety video](#) on forklift safety. The video emphasized the importance of following safe forklift practices and the consequences of failing to do so.

Emmett Carstens spoke of an incident whereby workers failed to use safety clamps when buffing sheet metal. Upon commencement of buffing operations, the buffing wheel friction force flung a piece of sheet metal into the body of a nearby worker, fatally injuring him.

Show and Tell

George Carlson demonstrated the workings of his home made Van de Graaff generator that he built in his shop. (Photo at right)



Al Wignall displayed an etching machine that he assembled from plans purchased on-line. (Photo at left)

Bill Kimbrough showed a clamping device with an attached heater that he made and uses to re-glue belts for sanders. Failing belts caused by the decomposition of the original glue served as the impetus for this project. (Photo at right)



Dan Harper exhibited a tool that he made to fit a lathe tool holder. The tool is used to facilitate centering of work in a four jaw chuck. Harper also showed an arbor that he made to hold slitting saw blades.



Tom Darragh showed parts of tools that he is fabricating to enable him to true a rifle action. According to Tom, the accuracy of many rifles purchased off the shelf may be improved by truing the action. (Photo at left)



Walter Potter displayed an assortment of machinists' tools not well known among hobbyists. Among those shown were a pi tape with a vernier scale used for gauging a pipe diameter from its circumference, a dial indicator with a one inch total travel, a one inch to two inch inside diameter micrometer, and hold down plates for securing low profile items on a mill (Photo at right).

Problems and Solutions - Ask the Blacksmith

A member requested suggestions on how to regain the ability to reassign a computer's parallel port for CNC control. He lost the assignment capability when the new computer with a new operating system was employed, i.e., Windows XP instead of Windows 98. One suggestion was to install Windows 8 alongside Windows XP on the same computer. Having the dual booting option will restore the ability to control the parallel port.

Another member wanted to know if anyone in attendance had success with replacing a crystal on a dial indicator. Not one present had experienced such success.

Articles

Phosphoric Acid





By Vance Burns

Phosphoric acid is a colorless liquid, an inorganic acid having the chemical formula H_3PO_4 . I first became aware of it when searching for a chemical process for rust removal. Phosphoric acid does not remove rust, instead it converts Fe_2O_3 (rust) to ferric phosphate, $FePO_4$.



Naval Jelly is a suspension/jell of Phosphoric acid but at 10% to 30% depending on the brand. Most of the Phosphoric acid that is sold as acid is 75% or greater concentration.

Phosphoric acid comes in many different products and is readily available:

			
1 Gallon 85 Food Grade Phosphoric Acid Rust Remover Clean Etch Metal \$29.99 from 3 stores	Miracle Sealants Floor Polish 32 oz. Fast-Acting Phosphoric Acid ... \$11.49 from 4 stores	Skyco Oospho Metal Treatment Primer - 1 gal bottle \$28.50 from 5+ stores \$12.95 from 3 stores	Technical Grade Phosphoric Acid , 85%, 500ml \$19.95 from The Science Company

The product is very easy to use, simply brush, spray or dip. Rust conversion happens within a few hours and I typically just let it set overnight.

Surface prep is not critical but Phosphoric acid has to “see” the metal so paint, grease, anything that creates a barrier will stop the Phosphoric acid action. I found that heavy rust was not completely converted to ferric phosphate but found that the rust buildup was much easier to deal with (physical intervention) and reapplication of Phosphoric acid usually completed the problem.

No matter how much surface prep you do before painting a previously rusted part, there will be rust that is beyond anything but the most intensive resurfacing. Any voids in a weld or wrinkle in a pressed part will harbor rust. Pores in the surface will, under careful examination, be a haven for rust. Phosphoric acid that has been brushed, sprayed or into which the part has been dipped will have a greater chance of protecting the metal. I paint over the ferric phosphate directly unless there is significant scale.

If you spray Phosphoric acid, be aware of overspray. It’s not serious but it will change anything on which it alights. If you spray, clean the sprayer after the job and return any unused acid to the spray bottle. The Phosphoric acid will not harm the plastic bottle but if left to dry, it will crystallize and act like sand in the sprayer’s delicate pump parts.

Another use for Phosphoric acid is to breakdown Sebum. That discoloration you have on your collar and old T-Shirts is sebum. The reason your wife stopped buying white sheets is due to the sebum stains. When Consumer Reports preps washing machine torture tests, they buy sebum by the bucket load.

There are commercial products for this job. However, I use cheap Phosphoric acid I bought at the hardware store in a spray bottle and saturate the sebum areas, allowing it to soak for 20 minutes then machine wash. Occasionally I will have to do it twice.



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Other uses for Phosphoric acid is as an acidifying agent to give soda pop a tangy flavor profile. Interestingly, only a small fraction of the phosphate in diets comes from additives in soft drinks. Most comes from meat and dairy products. The active agent you have to be concerned with in Coca-Cola is the sugar, not the acid.

Phosphorus-containing substances occur naturally in foods such as milk, meat, poultry, fish, nuts, and egg yolks.

Tap H-Number

By *Dick Kostelnicek*



When you buy a tap, you may have the choice of selecting a 'H'-number. For example: A 1/4-20 tap may be offered with a H2, H3, or H5 designation. The 'H' implies 'High' or larger than the nominal size. The number that follows the 'H' indicates the number of 0.0005 or 1/2 thousandths of an inch above the nominal pitch diameter for taps up to 1 inch diameter. A 'H' tap produces an oversized threaded hole and, thereby gives a loose fit with a nominally sized bolt or screw.

Sometimes a 'G' is included such a GH3. The 'G' indicates that the tap has a ground thread.

You may also encounter 'L' in place of 'H'. 'L' implies 'Lower' and the number that follows it is the number of 0.0005 inches below the nominal pitch diameter. Holes threaded with 'L' taps yield an interference fit with a nominally sized bolt and are often used in situations where mechanical vibrations could loosen the fastener.

I mostly use H3 taps since the bolts are easy to engage in a tapped hole with just thumb and forefinger with little reduction in ultimate strength. Since H3 taps are the most common offering, they are usually the least expensive.