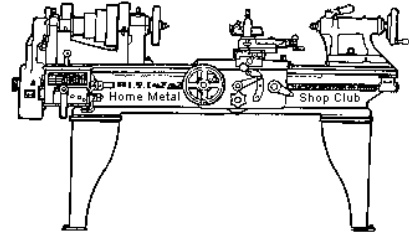




**January 2016**  
Newsletter

Volume 21 - Number 1



<http://www.homemetalshopclub.org/>

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** and a **novice group** activity, where metal working techniques are demonstrated on a small lathe, grinders, and other metal shop equipment.

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>Martin Kennedy</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 948 subscribers located all over the world.

## About the Upcoming 13 February 2016 Meeting

The next general meeting will be held on 13 February at 12:00 PM (Noon) in the meeting rooms of the [Parker Williams County Library](#), 10851 Scarsdale Boulevard, Houston, TX 77089. Chris Marve will give a presentation entitled Heat Treating Aluminum.

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

## 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. These books can be quite costly 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 Ray Thompson](#).

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 'uh ohs' along the way? If so, others would like to read about it. And, as a reward for providing an article, you'll receive a free year's membership the next renewal cycle!

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 09 January 2016 General Meeting

By *Joe Sybille*, with photos by *Jan Rowland*



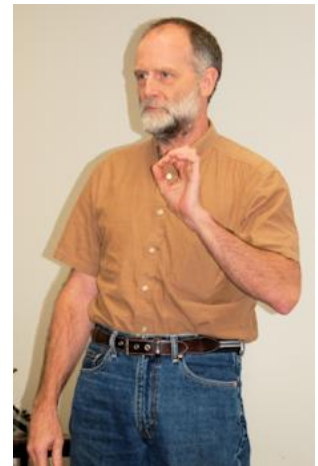
Thirty-four members, including one new member, Doug Bercich, attended the noon meeting at the Parker Williams County Library, 10851 Scarsdale Boulevard, Houston, TX 77089. Doug, welcome to the club. Two visitors, Eric Koudelka and Keith Mitchell, a past club president, attended the meeting. There are



41 members in good standing with the club. President *Vance Burns* led the meeting.

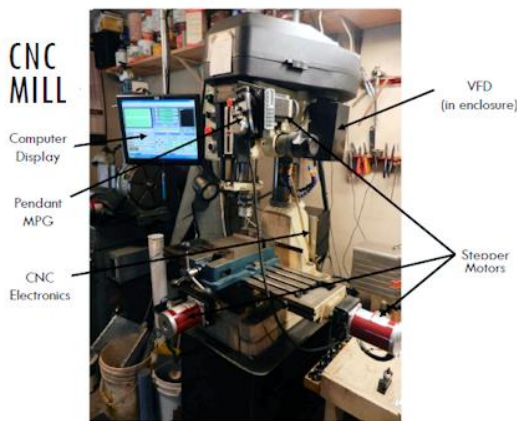
## Presentation

Club member *Martin Kennedy* gave a comprehensive presentation on building your own CNC (Computer Numerical Control) lathe, mill, or router. He tailored the presentation to emphasize the general procedure of getting started down the CNC path. Early on, you must determine what you would like to do with your cutting metal machine and the types of parts and projects that you plan to make. He gave an overview of CNC by describing what it is, why we use CNC and the various options for getting into CNC. Martin then discussed some sample CNC metal cutting machines, such as a mill and a lathe. Afterwards, he discussed the CNC process and later the hardware and the costs.



CNC has been around since the 1940's. It is, in a nutshell, a way to automate machine tool functions to eliminate or minimize manual control. Hobbyists use CNC to control, among other things, mills, lathes, routers, plasma or laser cutting torches, and 3D printing. Advantages include the making of complex parts, the relative ease of making duplicate parts, and making parts faster. Some of the disadvantages include considerable time to program the operation of the machine for a one-off part, steep learning curve, and the cost and complexity of both the hardware and required software.

There are several approaches to getting into CNC. One is the purchase of a dedicated CNC machine. Doing so frees one from the need to design and install control equipment and to modify one's machine. Disadvantages include high cost for a new machine and for older machines, a risk of no longer available software and support for it, software with limited capabilities, and outdated electronics.



Another way to CNC is to buy an older CNC machine and update it to use newer parts such as modern computer control systems, among other things. The drawbacks in this case include the complication of integrating existing hardware to the new control system, hardware that may not work well with new software, and parts, if available, may be expensive.

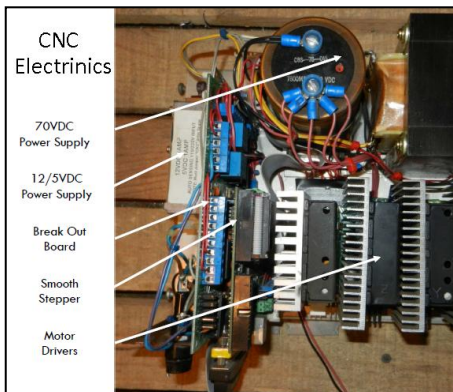
Another option to CNC, and one taken by many, is to convert a non-CNC machine. This can be less expensive, and has the added advantage of the doer acquiring a complete understanding of the installed system once finished. Among the disadvantages are the significant time required to make the conversion and the complex choices of hardware and

software.

Lastly, one can buy a CNC kit. This option is less expensive generally. All the design details have been completed and tested. Support and parts are available readily from the vendor. Routers are ideal tools for the kit option. The time commitment is the least of all the options to get into CNC.

Martin then showed several examples of CNC conversions, including his mill and his latest ongoing effort to convert his lathe.

An understanding of the CNC process is necessary to appreciate the concept. Generally, the process begins with an idea to make something. Ultimately, the goal is to generate the set of instructions (G-code) that commands the machine to perform a task. There are two routes to get there. One is, after the idea is conceived, to reduce the idea to a drawing file. The drawing file may be created using software programs such as Draftsight and AutoCad, among others for 2D drawings. For 3D drawings, the choices are SketchUp, Fusion 360, TurboCad, Solidworks, and Inventor, among others. This file is then sent to a CAM (Computer Aided Manufacturing) program to produce the G-code understandable to the machine. CAM programs include CamBam, Aspire, BobCam, and MasterCam, among others. In between the G-code and the actual machine is a CNC controller. The controller converts the G-code into electrical pulses to drive the stepper motors that move the machine's tables.



Another route to get to the G-code is to use conversational programming. After the idea is conceived, conversational programming is used to create the G-code directly. Conversational programming, in many cases, eliminates the need for CAD and CAM software, and it is built into most CNC controller packages. It is relatively easy to learn and is used for routine but necessary tasks such as making basic shapes, drilling on patterns and tapping holes. Conversational programming may not be suitable for complicated or 3D geometries.

Typical CNC control systems include components such as a breakout board which receives signals from input devices such as switches, a pendant with manual pulse generator and a computer. The pendant allows remote control of the CNC machine. The breakout board sends commands to a motor driver which, in turn, sends a signal to a motor, either stepper or servo. A variable frequency drive (VFD), if installed, also receives signals from the breakout board.

Depending on the complexity of one's system and the approach taken to undertake CNC, the costs could vary from approximately \$400 dollars for those with many of the components on hand to \$8000 upward for the latest components.

*Martin Kennedy's* presentation slides can be [viewed at this web link](#).

## Safety Moment

President *Vance Burns* showed a video of a person being interviewed while undergoing treatment at a hospital for two partly severed fingers resulting from the improper use of a tool. The patient revealed that he had used a circular saw to prune shrubbery in his yard. Observing the tool was not cutting to his satisfaction, he held back the retractable blade guard to expose more of the blade. It was at this point upon restarting the saw that he severed parts of two fingers. Several lessons are present with this scenario. The patient used the wrong tool for the job. He and his wife had argued moments before he began to prune the shrubbery. Using a power tool with his state of mind was an accident waiting to happen, and it did. This scenario is a reminder to always use the proper tool for the task at hand and to avoid working with power tools when unable to keep one's mind on the task.

## Show and Tell

Vice President *Norm Berls* displayed a new tool that he uses to tram his mill. The tool, [EZ-Tram](#), is the best tool that he has found to date to tram his mill, for it allows him to tram it without removing the table vise (Photo at right).



*John Cooper* showed pictures of a chip guard for his lathe that he made from a face shield held in place with a strong magnet. He also talked about scaling a part from a picture printed on a computer. If the dimension of one section of the part is known, other dimensions can be deduced using a scaled ruler. John then showed a chart of gear selector combinations and feed rate tables for his Smithy model CB 1220 XL lathe



*Dick Kostelnicek* showed a picture of an early 1900's vintage grinder that someone wants to restore but is having difficulty identifying and locating information on the grinder (Photo at right).



*Mike Winkler* exhibited one of two leveling feet that he made for a mobile table (Photo at left).

*Richard Pichler* displayed two books related to metal working that he purchased from a garage sale. He donated them to the club library. The club thanks you Richard for your donation.



*Bryan Alley* showed a spring winder that he purchased from a garage sale. (Photo at right.)

*Dan Harper* showed the empty plastic bottle of a rust remover by ZAP rust remover. According to Dan, this is one of the best rust remover solutions he has used.

*Al Wignau* exhibited a fixture that he built to hold drill bits at the proper angle for grinding.



*Keith Mitchell* shared his method of squaring a scope to a rifle barrel using angle indicators from Harbor Freight (Photo at right).



*John Elliott* showed several pictures of a CNC plasma cutting table he designed and is building (Right photo). He exhibited a sheet steel bender that he built for processing the steel parts for the cutting table (Left photo). Slides of John's plasma table presentation can be [viewed at this web link](#).



## Problems and Solutions - *Ask the Blacksmith*

A member wanted to know if anyone in the group had experience with a Hardinge automatic lathe.

Another member has a problem with a cutting torch leaking acetylene. Using a magnifier, examination of the o-ring groove revealed a damaged sealing surface.

Another member wanted to know where a friend could get the crankshaft of a 1951 straight eight flathead engine repaired. Two shops were recommended.

## Articles

### More about Getting into CNC

By *Vance Burns*

If you missed Martin Kennedy's masterful presentation on CNC at the last meeting, you missed a well thought out, carefully documented, and professionally presented overview on the world of Home Shop CNC.

But, if you were there and 99% of it went over your head, then here's an alternate explanation for you.

#### 1. Learn the lingo

Michal Zalewski has a nice tutorial on the web at [Guerrilla guide to CNC machining](#), where Michal takes some extra care and patience assuming you don't know squat about CNC.

Chapters include:

1. Introduction
2. Setting up a CNC mill
3. Mastering CAD and CAM
4. Resin casting and you
5. Essential parts for robot builders
6. Practical part geometries
7. Workshop safety topics
8. Closing notes

#### 2. Understand the components.

[Review Martin's talk](#). Soon, there will be a video of his presentation posted at our [Video Page](#).

Reduce your mental machine to the lowest common denominator. Forget about the CN of CNC for a minute... What is "C"? You can control a stepper with a battery. Applying DC to the right wire and the motor will "step" on one direction. You have seen plenty of DIY table power feeds – that is "C". Google "DIY power feed".

The best way to drive a stepper (Don't complicate this with servo talk; you are not ready.) is with a serious power supply. Your PC has one, but its output is 12 VDC. While there are plenty of 12 VDC stepper motors in mills, for serious work, mills require stepper motors with power supply outputs of 36 VDC or greater. No matter the voltage, the same principle applies.

Ok, now let's get handy! Let's use a dedicated gizmo to manage the step and direction. That is called a driver. The driver takes the step and direction signals from the PC. Let's talk about the PC part.

PC historians will have a cow, but as I have said many times, the PC has a lousy perspective on the world. There are virtually no interfaces to anything. Displays and keyboards are not control interfaces, they are output and input devices. They can't turn on your light switch. Some poor bloke needed hard copy and then invented the first interface for the computer – the LPT (**L**ine **P**rint **T**erminal) port. The line print terminal port is the bidirectional interface on the PC designed to manage a printer. It outputs character strings and looks for signals from the printer (paper out, jamb, etc).

The LPT port has 25 pins but only two are critical in CNC. They are assigned the work of STEP and DIRECTION. There is a pair for horizontal side to side, a dup set for front to back and vertical up and down. Six pins. Not so intimidating is it? There are complications beyond the use of the LPT port and fun to play with, but they will stop you from getting a device working. If you understood Martin's talk, you aren't reading this. If you need this level of help, avoid complexity. The LPT works, build on it, life is short.

The LPT port effectively whispers commands, and the stepper only respects something with a bull-horn. Between the two you need a management device, and that is a driver. It's a lot like a microphone AMP and speaker but it has some smarts in it as well. Remember that dipstick in elementary school play yard that would only communicate with you in Pig Latin? Steppers are a little like that. The driver understands the stepper language and takes the STEP and DIRECTION signals from the LPT port and speaks to them at 36VDC+ to the motor. There is one slight complication, the drivers don't have LPT port interfaces on them. You can wire up an LPT port to a driver but you can also do self surgery to remove gal stones but why would you when the solution is \$6? (I watched a lot of the Lucy show when I was a kid so just go with my logic) Remember that \$6 interface Martin showed? That is the unifier between the LPT and the Driver. It has a 25 pin connector but doesn't do too much to change the LPT whisper that goes into the Driver interface but it does use an isolator circuit so that if you wire it up wrong or the driver decides to go Jihad on you, the PC doesn't catch on fire. Handy. They go by a lot of names but BOB is the most popular, that is Break Out Board.

I like the Gecko G540 because the BOB and four drivers are in one case. CNC wiring schemas are not complicated but it gets intensive and the G540 eliminates a lot of wiring spider webbing. Buying the BOB separately has a lot of flexibility but a lot more wires and errors and we're keeping this simple. You will ignore me and realize I was right when you do it the second time, trash-canning the first smoldering attempt.

Ok, so I've convinced you this may be possible with your skills and abilities. What next?

Well there are a lot of folks doing this and if you ride on their coattails and do what they do there is a very good chance you will have the results they have had. There are a lot of useless CNC projects out there and while they are all interesting they are – useless. This one is useful, the G0704 retrofit.

Grizzly makes some nice gear and the G0704 is a respectable mill as it is sold @ \$1,324 delivered to your door. There is also a host of folks converting it and most blog, communicate on forums and Youtube about their projects in excruciating details. Google gives me 57,000 hits on "G0704 CNC", 30,800 videos. That's lots of company on this excursion.

There are so many converting the mill that Grizzly has decided to offer you an overpriced "kit" to convert it with their help, \$2,725. One guy, Daniel Kemp has a website dedicated to several mill conversions with the G0704 as one of them. He has made mistakes and corrected all in a diorama of technology gone viral.

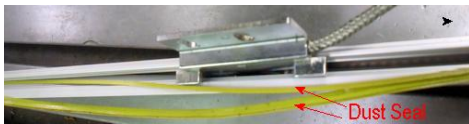
<http://www.hossmachine.info/>

At least one of our members has converted the G0704 and found it to be a handy machine. Are there better? Sure, but you want max support and commiseration. If you ask a question on the G0704 forums about the conversion of your Swedish FlemGustite mill/espresso machine, they will ignore you. That being said, Hobby CNC is really a PC, driver and motor tied to something you want to move.

I will close on one more topic: the software that talks to the driver. The LPT interface is really simple and Craigslist has thousands of PCs sporting parallel ports. Mach3 and LinuxCNC have the configurations using the LPT figured out and they work first time. Are there slicker ways of doing it? Yes, but they take more tweaking and more time. You can tweak or mill, your choice.

## DRO Seal Replacement

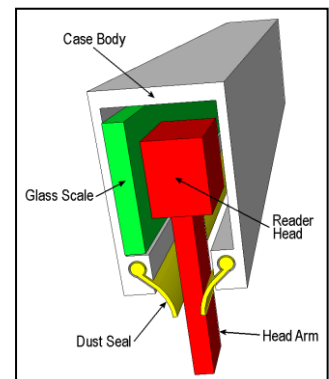
By Dick Kostelnicek



In the course of cleaning and lubricating my vertical milling machine, I noticed that the dust seals on the table's Mitutoyo longitudinal DRO (Digital Read Out) scale had disintegrated and were hanging down in strips (Left photo). Either atmospheric ozone or coolant had destroyed their elasticity and integrity. It would be a simple matter to replace them if new ones could be located. However, a serious search on the internet yielded no results. So I made my own replacement seals.



I stretched out a length of 3/4-inch wide blue (any color would do) vinyl electrical tape, sticky side up, along a meter aluminum measuring rule (Left photo). I placed a length of nylon chalk line (sans chalk) and stuck it to the center of the tape. Then, I folded the tape over on to itself, sticky-side-to-sticky-side in order to form a dust seal (Right photo). I pulled the chalk line and the tape seal into the two grooves in the DRO's case body (Above right drawing).



This repair may be temporary or permanent. It depends on coming across OEM replacement dust seals or the longevity of my home made vinyl tape dust seals.