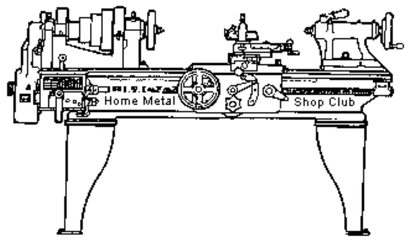
Home Metal Shop Club

October 2011

Newsletter

Volume 16 - Number 10



http://www.homemetalshopclub.org/

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

Our members' interests include Model Engineering, Casting, Blacksmithing, Gunsmithing, Sheet Metal Fabrication, Robotics, CNC, Welding, Metal Art, and others. Members always like to talk 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 a presentation with **Q&A**, followed by ***Show and Tell*** wherein the members can share their work and experiences.

President *Vance Burns*	Vice President *John Hoff*	Secretary *Martin Kennedy*	Treasurer *Emmett Carstens*	Librarian *Dan Harper*
Webmaster/Editor *Dick Kostelnicek*	Photographer *Jan Rowland*	CNC SIG *Dennis Cranston*	Casting SIG *Tom Moore*	Novice SIG *Rich Pichler*

About the Upcoming November 12 Meeting

General meetings are usually held on the second Saturday of each month at 12:00 noon in the meeting rooms of the Parker Williams County Library, 10851 Scarsdale Boulevard, Houston, TX 77089. The meeting location has been confirmed through December, 2011. This month's meeting will be held on November 12th. Visit our website for up-to-the-minute details.

The presentation topic for the November meeting has not yet been announced

Recap of the October 8 General Meeting

By Martin Kennedy, with photos by Dick Kostelnicek, Jan Rowland and Martin Kennedy

Twenty-nine members and one guest, Garth Sanders, attended the 12:00 noon meeting at the Parker Williams County Library. President *Vance Burns* led the meeting.

Ideas for programs at our monthly meeting are always welcome. If you have an idea for a meeting topic, or if you know someone that can make a presentation, please contact John Hoff.

Joe Scott is interested in a basic class in CNC. Three other members also expressed interest. After the meeting, *Shannon DeWolfe* shared that Houston Hackerspace offers inexpensive classes, and has two classes on CNC and one on 3D CAD.

Membership dues have been received from 33 members. If you have not yet paid your dues, please remit them to the club treasurer *Emmett Carstens* at our next meeting.

The member location map from the last newsletter was discussed in relation to a more central meeting site. *John Hoff* has not yet had a chance to look into an alternate meeting location.

Vance Burns solicited web content, articles, videos and newsletter articles. If you would like to contribute such content, contact the editor/webmaster *Dick Kostelnicek*.

Dan Harper, our librarian asked that members check to see if they have any books that should returned. He also asked for book donations.

Presentation

Bill Swann spoke on photovoltaic arrays, also known as solar panels. Bill has an avid interest in alternative power sources, and owns several electric vehicles. He installed a solar array in his backyard after becoming interested in solar power a few years ago. Bill designs mechanical systems for a living, so he is very knowledgeable on component design software and manufacture. He has a website called Watt Tracker that describes many aspects of photovoltaic array tracking systems with reference information and links. It can be used to investigate the economies of photovoltaic systems.

Bill's system uses four panels totaling 700W, which produce 600W of useable power. Each panel uses a separate micro-inverter, which converts the DC generated by the panel to AC. Up to 16 micro-inverters can be used in cascade. An alternate way to convert the power is by using a single large inverter. Bill was attracted to the micro-inverter solution because of the low entry cost and because he could slowly build up his system to a larger capacity if he wanted. The main advantage of a single inverter is overall economy.

Today, the cost of an array is about $1.50 per watt, which is down from $3 per watt just a few years ago when he first acquired his system. Payback is about 10 years from his calculations. Panels are designed to last for quite some time, and are usually warranted to provide 80% of initial performance during 20 years.

The permitting process for connecting a solar system to a home electrical system is easy. A lockable disconnect is required so that the power company can bypass the solar system when they're working on the power lines, since the solar system can back-feed into the power grid. It is even possible to sell excess power back to the power company.

Panels can be of fixed orientation or tracked. A tracking system follows the sun during the day. The power produced by a panel is at its maximum when it is perpendicular to the sun. If not perpendicular, power is reduced by a factor equal to the cosine of the angle it makes to the sun's rays. For instance, at 45° angle, it generates only 71% as much power. An analysis of a tracking system should be done, since the components have a cost, and it may be more cost effective to add additional panels rather than tracking.

Bill reviewed 3D CAD models of some of the design cases he's considering for a tracking system for multiple 170 watt panels. Tracking systems can have either one or two axes of rotation, with the two axis version being the more costly, but also allows a higher average power output. The one axis version that Bill designed incorporated a manual system to adjust for seasonality and more closely approximate the performance of the two axis version.

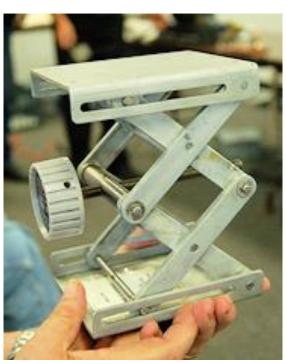
A second design, which he plans to build, tracks in two axes. It uses a stepper motor and worm gear for rotation azimuthally. A stepper motor turning a lead screw controls elevation.

His third design uses 12 panels, but it's quite large, and he does not think he'll build it.

The logic to move the array is controlled from a weatherproof box containing an AVR microcontroller, a real time clock, relay board, a LCD display, and control buttons. This drives both 72 RPM stepping motors. The microcontroller is programmed in the C by the Flowcode graphical programming software. The control system has the capability to "park" the array horizontally overnight in order to protect from damage caused by wind storms.

Show and Tell

Joe Williams passed around a tooling plate he built for his mill to hold odd shapes during milling operations (see article below).

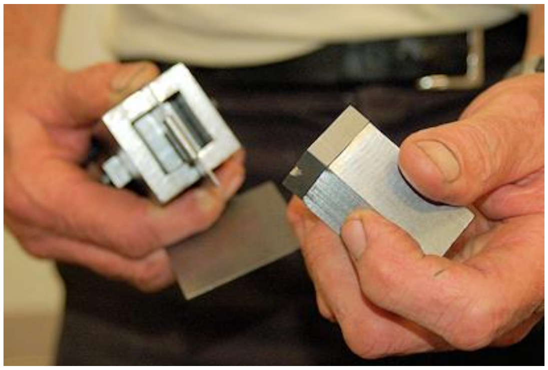


Dick Kostelnicek showed a rebuilt CENCO Lab Jack that he found corroding away in salt water. The refurb job involved a total remake of one side. This is the ideal tool for installing a garbage disposer under a kitchen sink.

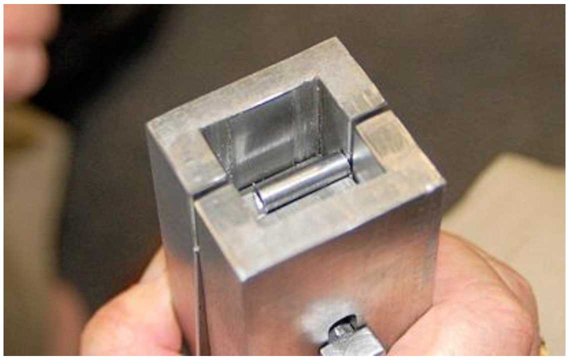
He also showed an old video taken in 1936 of the Pontiac auto assembly factory, and a video from a Dijet, a Japanese company that builds a tool to produce a square hole by milling/drilling.

W. G. Robinson passed around an English magazine called Model Engineer's

Workshop.



John Hoff built a fixture that allowed him to make the rolled part of hinges. The fixture held a flat blank so that it could be curled accurately using a press.



Jan Rowland brought in a bunch of magazines to give away. He also made a poster recounting how he had completed a job quickly to make 88 plastic disks to tight tolerances by machining many at once by stacking them and cutting them on his lathe.

Tom Moore described a project where he needed to make an 8-TPI thread right up to a shoulder, which was exactly 11 turns. To accomplish this, he used a hand crank. An alternative way to do this would have been to make the thread left to right, in reverse, using an upside down cutter mounted on the back side of the carriage.

Martin Kennedy demonstrated a Stirling Engine he built based on excellent plans from Jan Ridder. He also showed a handwheel that he built to manually turn the lathe for threading. An article on how this was built is included below in this newsletter.

Joe Scott brought in an SRD drill grinder that he recently purchased inexpensively on eBay. He passed around the drill bit holder (right photo). It has a cup grinding wheel that sharpens the bits. It can be used on drill sizes from 1/16 to 9/16 inch. Joe also brought a small motor to give away.

Rich Pichler challenged the membership to identify the purpose of a crude cast aluminum hammer he bought in Honduras. It turned out that it was used to crack lobsters.

Problems and Solutions

A member recounted an accident he had recently that turned out to be more serious than he originally thought. He was struck on the head by a 5 foot length of 2x4 that was propped up on another plywood board that he was trying to move. It hurt, but he felt OK. Thirty days later, he found that he could not use his right foot or hand. He went to the hospital for testing, and ended up being scheduled for emergency brain surgery. A hematoma had formed between his brain and skull. The doctors removed a 21 cm hematoma from his skull. Five days later, he had another surgery, and the next day, he had a third surgery. He's now OK. He was told that this was not uncommon among people that thought they had just minor head injuries.

A member sought advice on how to make an s-cleat for sheet metal work. He had been unable to find a place to purchase them. It was suggested he find a place that makes duct work, and he could obtain them there.

Novice SIG Activities

Rich Pichler talked about thermocouples during the novice group meeting. Several examples of "J" and "K" thermocouples were shown to the group. The selection of a thermocouple depends on the temperature range, corrosion, wire size, sheathing, etc. Welding of thermocouple wire can be accomplished using an oxygen torch or spot/TIG arc welder. A simple readout meter was demonstrated along with an ice bath calibrator.

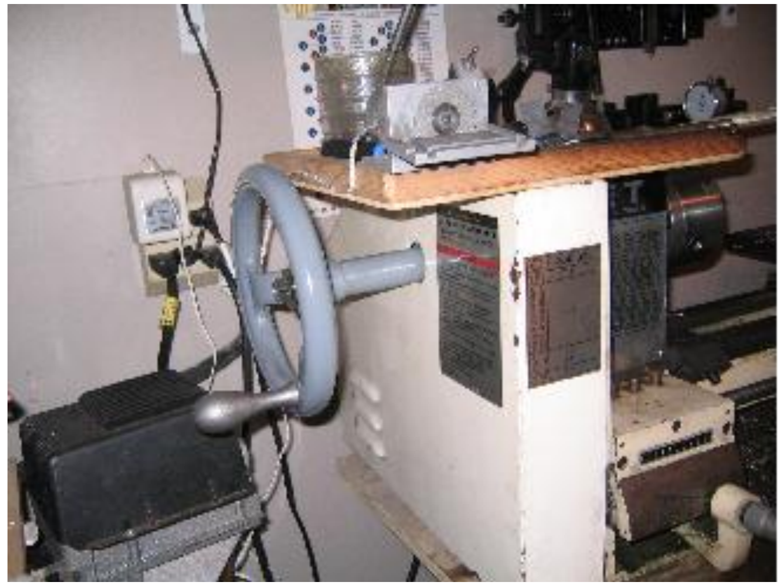
If a thermocouple is used to switch an electric circuit on or off, a controller is needed. One source of an inexpensive controller is Omega corporation, that has a very versatile PID controller for less than $100. Tuning of the PID controller can be quite complicated, and it is necessary to follow the directions for proper operation.

The usual controller cannot switch over about 5 amps of power. However, the controller switch can be used to operate a power relay. A power relay with contacts can only switch significant power a limited number of times. If the power relay has a reactive load, for example a variable transformer, power stat, Variac, etc., the ordinary power relay my also have a limited life. An alarm/shut down backup circuit should be considered for the case of relay failure. The power relay life can be improved by switching only the output of the variable transformer. The variable transformer remains powered up during the duty cycle.

A mercury power relay is more reliable than an ordinary contact relay. The mercury power relay has some environmental issues and cannot be purchased in some areas.

A Handwheel for Manual Threading on the Lathe

By *Martin Kennedy*

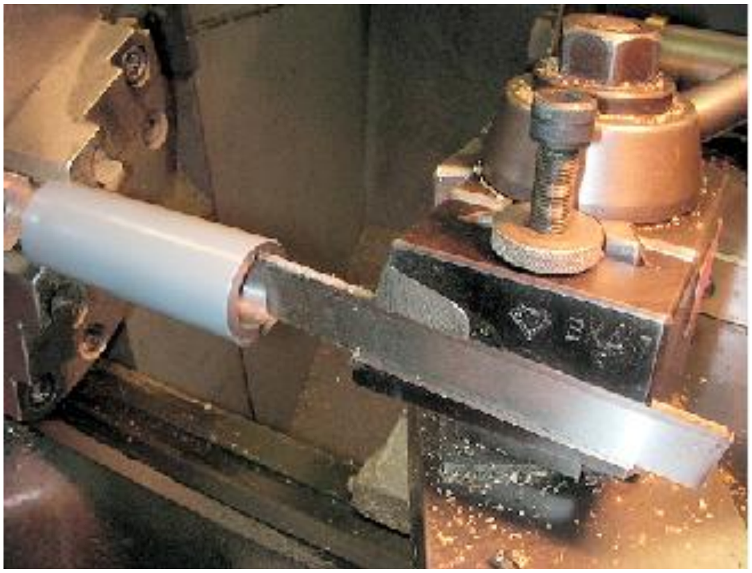


Sometimes it can be difficult to cut threads on the lathe. This can be a result of the need to thread up to a shoulder or by the use of a coarse thread that's hard to stop accurately. My lathe turns about 300 RPM, which is equal to 5 RPS. If I'm cutting 8TPI, each pass of the threading operation over a 1" long thread only takes 8/5 of a second! I can slow the speed down by moving the drive belts around, but I still can't get the lathe to run at a very slow speed. Another option would be to cut the thread in reverse, away from the shoulder. Unfortunately, my lathe does not have a reverse gear for the automatic feed.

The ability to turn the chuck by hand solves this problem. By hand, you have excellent control of the stopping point and can easily thread up to a shoulder. I built a handwheel drive to let me accomplish this easily.

This was a fairly simple project, once I figured out a design. I based the design around an old handwheel that I acquired at a garage sale. I considered two ways to attach the apparatus inside of the lathe's spindle. The first was to use an expanding collet and a two piece shaft. The second, and the one I used, was to use a design similar to one that's used to affix bicycle handlebars, with a 45° cut across the handwheel shaft that offsets when tightened. This design also allowed me to make a one-piece shaft.

The most complicated part to make was the shaft. It's threaded on both ends. There's a short section with a square cross section. Then there's a round section to keep the shaft from rotating inside of the body of the tool with four key slots. The shaft is tapered towards the threads, so that when the shaft is tightened, it can offset slightly inside of the body of the tool.



The body of the tool was made in one piece, threaded at the bottom, and then cut at a 45° angle as the last operation. It was necessary to cut an internal key slot inside of the top of the body. It could not be broached conventionally, since there was a shoulder at the bottom of the slot. I cut a relief on one side of the bottom of the slot using a long shank T-Slot cutter for a chip breaker during the broaching operation. I could have also internally cut this recess by using an internal backcutting tool on the lathe. I broached the slot using a cut-off tool installed parallel to the body. After locking the lathe chuck to prevent rotation, I made small cuts, feeding the tool in by hand with the lathe carriage, and then turning the adjustment nut on the BXA tool holder to raise the cut-off tool slightly between cuts.

The tool was assembled by screwing the shaft into the bottom part of the body through the top part of the body. After bottoming out the shaft, it was backed off a half turn, and then the brass key was inserted in the key slots. The key allows the shaft to move in and out, but not rotate. The shaft was designed so that it was recessed slightly inside of the body. I cut the key and slots so that they didn't fit too tightly, in case I needed to remove the key later. Installation of the handwheel and nut completed the tool.

The way the tool works is that tightening the nut on the handwheel pushes the handwheel against the body of the tool, and simultaneously pulls the shaft towards the handwheel. Note that you have to make the shaft such that the larger section with the key slots is recessed in the body of the tool slightly so that it can move towards the handwheel. This causes the bottom section of the tool to offset at the 45° bevel, which wedges it inside of the spindle.

Tooling Plate

By *J. R. Williams*

Future work on my CNC mill will require clamping small parts to a surface and machining around the perimeter. This requires moving several clamps as I do not want hold down bolt holes inside the part's perimeter. My metal stock pile turned up a section of 1-1/2 inch thick aluminum that is a little over 5 x 8 inch with a small corner cut off. This was a good test of my CNC mill's capability. The block was machined on two sides to provide parallel sides so it could be held firmly in the mill's vise. The mill was programmed to drill the tap about 70 holes. The CNC control has the feature of programming an array of holes simply by denoting the number of holes in the X and Y direction and listing any hole locations that you want to skip. In this exercise, holes number 10,11 and 12 were skipped for both the drilling and tapping operation.

Tapping is done using a spring loaded tap holder (tension-compression) that allows a small range of Z axis feed errors and not damage the tap (photo below). Coolant is supplied via an air actuated spray nozzle using water soluble oil. The thread depth was the length of the threads on the tap. The design of the hold down clamps has not yet been determined.