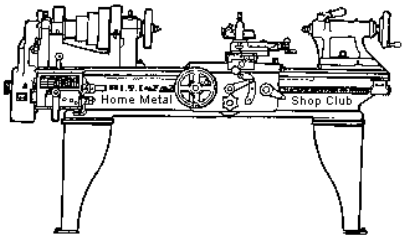
Home Metal Shop Club

November 2011
Newsletter

Volume 16 - Number 11



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 hose 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 December 10 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 and time has been confirmed through December. The next meeting will be held on December 10th. Visit our website for up-to-the-minute details and the presentation topic.

Recap of the November 12 General Meeting

By Martin Kennedy, with photos by Jan Rowland

Twenty-five members and three guests – John McMillan, Francesco Guzman and Dave Bergeron - attended the 12:00 noon meeting at the Parker Williams County Library. President *Vance Burns* led the meeting.

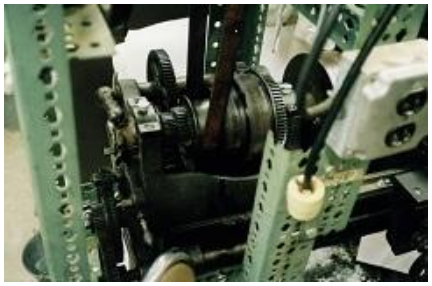
The club has funds available to purchase new books for the library, and is looking for recommendations. Contact librarian Dan Harper. *Rich Pichler* noted that he has a *Beginner's Guide to Machining* in a 3-inch binder available free to novices with their new membership.

Members were encouraged to populate their information on the HMSC biography web page .

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

Web content and newsletter articles are needed. Please submit them to Dick Kostelnicek.

Presentation



Rich Pichler gave a presentation on rebuilding a old small lathe. Rich works part time as an Inspector for the Coast Guard, specializing in barge and ship vapor handling facilities. Rich is also an avid garage sale shopper, and proudly recounts how he purchased most of his tools and equipment at such sales. It was no surprise to the attendees that Rich acquired his lathe when his son found it at a garage sale!

Rich's lathe is quite old, probably dating from the late 1800s or early 1900s. It does not have a nameplate, so it's unknown who originally made it. Rich bought it in early 1980 for $125, which was a lot then. It was set up to be driven by a belt from an overhead line shaft. The ornate cast iron stand was drilled for a foot pedal adaptor. The lathe is a 10x20-inch. It came with two three jaw chucks and one faceplate.

Rich's first project with the lathe was to build an assembly to hold a motor drive on the headstock. He didn't have any prior experience working on machining tools, nor did he have resources available to him in the form of books or a club like ours, so he had to learn everything by trial and error. Rich found a 1/4 HP GE Motor made in 1931. He could not get any information from GE on how the motor was wired, so he had to figure that out, also. He built a frame for the motor from commercial shelving support angle iron. Rich says he's mostly interested in making things that are functional, and not aesthetically pleasing, so that accounts for the way the final product looked!

The motor drives an intermediate pulley that Rich made out of an 8-inch aluminum billet that a friend had cast. At the time, he didn't know that pulleys for belt drives needed a crown. The purpose of the crown is to make the belt run in the center of the pulley. The crown is slight – only about 1/32-inch. Details can be found in *Machinery's Handbook*. Rich used an old machinist's trick to simulate a crown: he added a few wraps of masking tape in the center of the pulley. With his belt drive assembly, the lathe runs between 50 and 480 RPM.

Rich recounted how he made his own drive belt. He didn't want to remove the spindle from the lathe headstock because he was concerned about disturbing the spindle bearings. He decided to glue the belt together in place without disassembly. Gluing the belt turned out to be difficult. First, he had to taper or *skive* the ends of the belt to make a splice. He made the taper 4" long because a belt that he

bought already had a skive of that length. He was unsuccessful in cutting the taper accurately with a knife. Some experimentation showed him that sanding might be a good way to make the taper. Rich passed round a jig that he built to sand the taper using a handheld drill driven drum sander and some angle iron rails bolted to a wood base.

The second step was to glue the belt together. Rich had trouble finding good leather glue. He tried using several kinds without success. In the South Bend book on lathe operations, Rich read a mention of using airplane glue (dope). He found a product called "Ambroid - The original liquid cement" in a 12 oz tube. This did the trick, and the belt has lasted for 6 years. Belt tension can be set with removable washer shims, and Rich keeps it fairly loose, so that it slips if the tool jams on the work.

Rich explained the function of the gears on his lathe. It includes a back gear to reduce the speed of the chuck, a reversing gear to change the direction of the lead screw, and gears to set the thread pitch. Rich wants to make a 48 tooth and 127 tooth (for metric threading) gears for the lathe. He's tried to buy them, but the lathe uses 16 pitch gears, which are not readily available.

Show and Tell

Dick Kostelnicek – broke a tooth on the plastic drive gear when his paper shredder jammed. He was disposing of mail that, unknown to him, contained a religious metal gift from a charitable organization. "*The Lord works in mysterious ways.*" A new replacement gear cost half as much as a new shredder, so he made a replacement brass tooth that he bolted on the plastic gear (right photo).

Dick also passed around a dead center that he made to use with his spin indexer (left photo). He also showed an extension device that allowed a 6-inch dial caliper to make precise measurements up to 36-inch in length. It had movable pins so that ID and OD can be measured.

John Hoff - got a job to make U-shaped handles. He built a fixture similar to a tubing bender to bend 3/8-inch 303 stainless steel rod, plus another fixture to quality check the accuracy of the completed product (right photo).

Gene Rowan – showed a Watts drilling fixture that is used to drill a square hole. He also recounted plans to build a machine to make unusual stainless seals ring gaskets automatically.

Joe Williams – showed a Brown Radiamatic 355631 thermopile built by the Minneapolis-Honeywell Regulator Company. The device has 10 thermocouples under a lens to measure emissivity. It was originally built to measure the temperature of rolled uranium. Joe also showed some tiny Iscar PICCO-CUT carbide boring bars (right photo). He built a holder for the bars so he could use them in the lathe.

Mike Winkler - made a rotary hex broach based on a design he found online. He said it works well on his 7" x 14" lathe.

John McMillan - made an adapter for drilling center holes easily on his lathe. The tool allows a center drill to be mounted directly into the end of a taper that fits into his tailstock.

Dan Harper - recounted how he removed a stuck Brown & Sharpe #9 taper from an adjustable boring head.

Problems and Solutions

A member has 25 taped joint unused Norton belts where the tape has degraded and they come apart when used. He recalled that Randy Slaine said belts had a relatively short shelf life because of this in his presentation on abrasives a few months ago. One member said that he made jig and used superglue. Another member suggested Nylon reinforced strapping tape on the belt's backside.

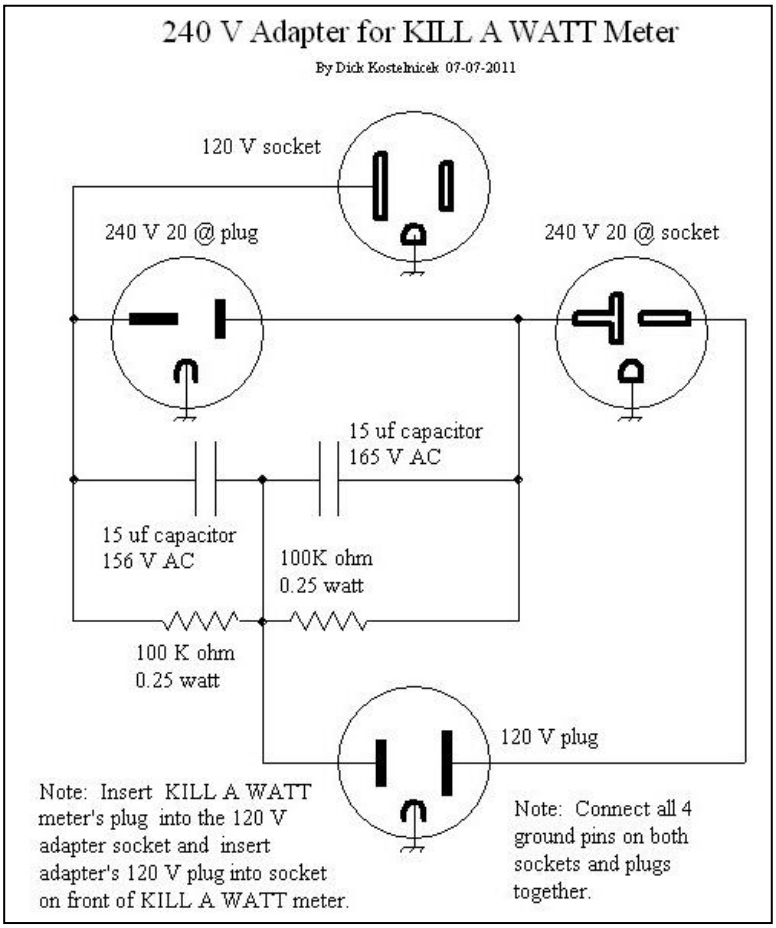
Novice SIG Activities

Rich Pichler and the novice group diagnosed problems with permanent magnet DC motors.

Articles

KILL A WATT ® Meter on 240V

By *Dick Kostelnicek*



The 120 volt KILL A WATT ® meter (lower right photo) is an excellent device for measuring voltage, amps, watts, VA, power factor, frequency, cumulative operation time, and aggregate power consumption. You get all those measurements in real time for less than $20 for the device. However, I wanted to use mine on machine tools; lathe, mill, grinder, etc. Most of my tools run on 240 volt single phase AC electrical power. However, a 240 volt KILL A WATT meter isn't available at this writing.

Now, 240 volt single phase AC power can be split into two opposite 120 volt phases or legs with each one measured independently. In fact the ground connection on a 240 volt line is the center or split

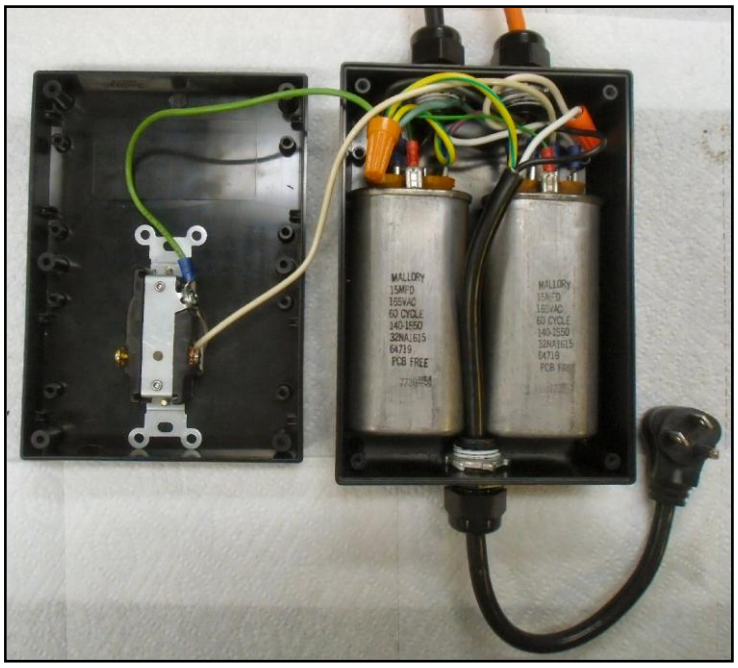
point, but it should not be used directly because it is both dangerous (can carry fatal current) and its use would be against most electrical codes. I designed and built an adapter that allows a 120 volt KILL A WATT meter to be used on 240 volts. It is necessary to force the current from the 240 volt line to pass through the current measuring pin of the meter's plug and socket and to apply a derived 120 volt reference voltage to the meter's other pin. Note that the current measuring pin is the wide one on the meter's left side, while the short pin is used for voltage reference.

The adapter's schematic diagram is shown above The 120 volt reference is obtained at the junction of two equal value capacitors in series placed across the 240 volt line. I employed capacitors because they dissipate no heat. These capacitors should be well matched in value and each capable of handling 120 volt AC. Any capacitance greater than 15 microfarad will work well. Resistors across each capacitor will drain any residual charge when the adapter is unplugged.

When the KILL A WATT meter is used with this 240 volt adapter, the indicated values of volts, watts, VA and KWH must be doubled. The remaining readings are just as indicated by the meter.

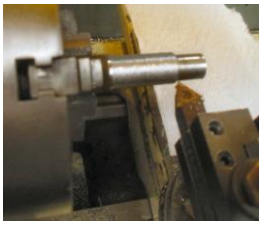
The 240 volt KILL A WATT adapter is built in a 6½ x 4¾ x 2½ inch plastic project case available from Radio Shack or Fry Electroinics.

If you need a 240 volt 3-phase KILL A WATT meter, just use two of these adapters on any two phases and add the measurements for watts and KWH. Note that so called 3-phase power really has just two independent phases. Hence, you need use only two 240 volt adapted KILL A WATT meters.



Power Needed to Remove Metal in a Lathe

By *Dick Kostelnicek*



I measured the electrical power needed to remove metal from a ¾ inch OD mild steel bar in a 9-inch Rockwell lathe. A cut was made dry with a TPMT32.51 carbide insert (right photo). Electrical measurements were made using a **KILL A WATT** ® test meter and a homemade 240 volt meter adapter. Those measurements revealed a stock removal power rate of 5.8 HP per cubic inch per second.

I determined the power that went entirely into metal removal by subtracting the electrical power while rotating but not cutting from the electrical power supplied during the actual cut. Here are the results:

Measured Data

Feed	64 TPI	0.0156 inch / rev
Speed	200 RPM	3.33 rev / sec
Bar Diameter		0.721 inch
Single Depth of Cut		0.025 inch
Power into the Cut	496 – 370 watts	126 watts

Using these measurements, the power needed to remove steel was 4.3 kilowatts or 5.8 HP per cubic inch per second. This represents an energy expenditure of 4300 joules per cubic inch.

Running the lathe at 200 RPM required the following electrical usage by the lathe's ¾ HP - 240 volt – single-phase motor.

Electrical Usage	**At Idle**	**While Cutting**
Power	**370 watts**	**496 watts**
Current	3.92 amps	4.18 amps
Power Factor	0.39	0.50

During the cut, the lathe's ¾ HP or 560 watt motor was nearly taxed at 496 watts. Furthermore, the idle readings indicate that 370 watts or 65% of the motor's rated HP was wasted by mechanical friction, belting, and motor losses.

The 0.50 power factor means that the motor demanded significant out of phase current to run the lathe. Single-phase motors, even those that operate on 240 volts, often have poor power factors. The supply current could be nearly cut in half to 2 amps by placing a 40 microfarad capacitor across the motor's power mains. This would raise the power factor to the ideal of 1.0. But, in the occasionally used home shop, it is not cost effective to correct the power factor of infrequently used fractional HP motors.

What should we make of a stock removal power rate of 5.8 HP per cubic inch per second? This is a reasonable value for single point carbide bit cutting mild steel. Measuring that rate was just one of those things that I found myself capable of doing and it yielded a result not readily obtainable elsewhere. So, I just did it. You can use this stock removal power rate to determine if your lathe is powerful enough to cut metal at a particular feed, speed, etc. However, I prefer to use one of our club member's methods attributed to *Tom Moore*; "*Just increase the feed, speed, or depth of cut till the lathe begins to stall. Then, back off a bi*t".