Home Metal Shop Club

December 2011
Newsletter

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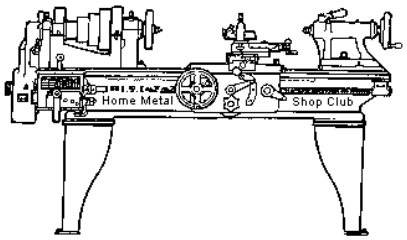


http://www.homemetalshopclub.org/

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 a presentation with Q&A, followed by ***show and tell*** where the members can share their work and experiences.

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

About the Upcoming January 14 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 February. This month's meeting will be held on January 14th. Visit our website for up-to-the-minute details and for meeting topic.

Recap of the December 10 General Meeting

By Martin Kennedy, with photos by Jan Rowland

Twenty-six members and two visitors – Paul and Joe McMillan - 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 Dan Harper.

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

Emmett Carstens reported that the club currently has 39 paid members. Please pay your 2012 dues if you have not done so already!

Presentation

Dennis Cranston gave a presentation titled **Mechatronics- Using Microcontrollers**. Mechatronics is defined as a combination of mechanics and electronics.

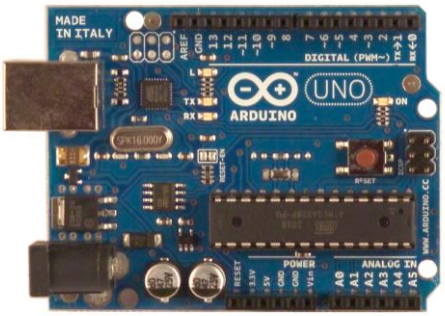
Dennis' first involvement with "personal computers" was in the 1950's with an IBM 650 (right photo). At that time, computer use was scheduled in 15 minute blocks. Programs were input with punch cards. Output was also on punch cards. The computer cost about $500,000, which was considered relatively inexpensive for a computer at the at that time.

His next involvement with computers was with the first successful mini computer - a DEC PDP-8 (left photo). This computer was available with 4-16k of memory. Input was with a teletype, and programs were saved on paper tape. It was the *Swiss Army Knife* of the industry and among other uses was employed to control mechanical processes. Dennis was involved in a project where a DEC computer was used to control injection molding machines.

Dennis recommendes a book called The Soul of a New Machine by Tracy Kidder that documents the development of these machines.

From mini computers, the next generation was microprocessors. This started with single board computers, such as one that Dennis used that employed a Z80 processor and a hexadecimal keyboard. The board included a prototyping area for development of electronic circuits. The programs were input from the keyboard using hexadecimal code.

The current generation of mechanical control computers use microcontrollers, with the entire computer contained on a single chip. They generally have the program and data located in separate types of memory, with the program being persistent during loss of power. An early microcontroller was the Intel 8035, introduced in 1976. More current examples are the Parallax Basic Stamp and ARM architecture chips.



Three functions are required for successful use of microcontrollers – the ability to develop a program, the capability to download and burn the program to the microcontroller (usually from another computer), and the ability to test the prototype program. It helps to have an integrated development environment, which usually includes the capacity to emulate the microcontroller system during development.

Dennis used a microcontroller for a semaphore signaling project for the Houston Area Live Steamers train club. After considering several microcontrollers, he selected the Arduino, which uses an AVR microcontroller. He selected the Arduino for several reasons; including easy availability, C-like programming language, plentiful support, example code, and attachment hardware availablility.

Dennis has also used an inexpensive Arduino Pro Mini that can be used by its self after code is developed and tested on a larger system.

Many places in Houston have the Arduino, such as EPO (both stores), MicroCenter, Radio Shack and Frys. There are many online sources such as Sparkfun, Adafruit, and Pololu.

Dennis gave several examples of Arduino code. A simple application used the outputs to directly drive a blinking LED. The code has a C-like structure. For application that require more current or voltage than the Arduino can provide, he uses TIP120 (NTE 261) transistors to switch devices requiring up to 60V at 6A. If a variable voltage is needed for analog use, such as varying the speed of a motor or the intensity of a light, the Arduino can produce PWM (pulse width modulation) outputs.

The Arduino boards can accept inputs as well as outputs. Similar in use to the digital outputs, the boards can be used to read discrete inputs, such as the status of a switch. The chip has internal pull up resistors to combat against stray signals. It can also directly accept analog signals, so it can measure 0-5V inputs.

It also can be interfaced with an H Bridge to control DC motors. These devices will control a motor and allow it to freewheel, run forward, run reverse, or brake.

There are a wide variety of special purpose boards, called Shields, that piggyback onto the Arduino boards. Examples of these boards are a dual stepper driver board, additional memory employing microSD, wi-fi, ethernet, bluetooth, LCD and GPS. Dennis is using some of these to build a weather station that collects and stores data.

On the programming side, a powerful ability of the Arduino is the availability of user-built libraries. By using these libraries, the programmer has easy to his program functions without having to develop complicated code. Examples are code to drive serial communications, a keypad or a display.

The system is scalable, with a growth path to the Mega 2560 processor, then the ARM series processors. Larger units can handle more inputs and outputs.

Dennis programs the Arduino with AVR Studio software, available free of charge.

A good place to start learning about the Arduino is with the book "Beginning Arduino Programming". Dennis donated a copy to the club library. Thanks, Dennis!

Dennis' presentation slides are at this web link.

Show and Tell

Dick Kostelnicek – showed a Watts drill for producing square holes. The drill was patented in 1918. It works in conjunction with a square guide template and a wobbly drive coupling (right photo).

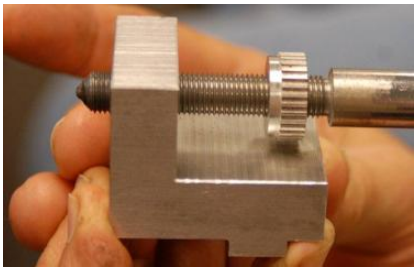
Dick had a wooden model he built to illustrate how non-round bearings worked, with three and five sided examples (left photo). His model, and the Watts drill, use Rouleaux polygons that have an odd number of sides. It could be seen that the drill bit rotated eccentrically. By making this wobbly motion, you can drill a square hole.

A Watts drill is one of several tools that can be used to create a square hole. You can use a square broach which makes sharp right angle corners but leaves partially rounded sides due to the oversize pilot hole. A Watts drill leaves slightly rounded corners with straight sides. A shallow square hole can also be made with a rotary broach, similar to the one Mike Winkler showed last month.

Joe Williams – built clamps for the tooling block he showed two months ago. Although he built them with 01-tool steel, he didn't harden them in case he accidentally hit the clamp with a milling cutter!

Martin Kennedy – bought a small spotlight from IKEA that employed a single bright LED. The spotlight has proved useful on his lathe. He then gave a presentation on how he built a support arm to hold the touchscreen on his CNC mill. Also, refer to the photo at the left and the support arm article by J. R. Williams in this newsletter.

Mike Winkler – made a guide to use a diamond dresser to square the wheel on his grinder from plans on the internet, such as these (right photo).



Joe Scott – donated a book titled Fine Shotguns by John Taylor to the club's library. He also modeled a pair of video camera glasses with interchangeable lenses (left photo). The glasses will allow him to document machining operations without the need for another person holding the camera for our website's video page. The camera will record up to three hours of content. He purchased his at Wal-Mart. They are also readily available on ebay.

Dan Harper – brought in his toolmaker's vice. He determined that it's best to put parts in the vice first, before bolting it down, so that he can verify that the parts are properly engaged. He has had parts slip while machining. He prefers a regular vice to the toolmaker's vice.

Dan also brought a lathe center finder that can be held in a tailstock drill chuck and engaged in a dimple on the part held in the lathe's chuck (right photo). The spring allows bending due to off-centering. He can then use a dial indicator against the device to measure concentricity.

John Hoff – passed around a scraping tool he made using a triangular carbide insert (left photo).

Two new club videos were shown to the attendees: one on inductive heating by *Mike Hancock*, and a video introducing the club to web surfers by President Vance Burns.

Problems and Solutions

Equipment from the club's foundary at Zube Park, including a furnace, a muller, a sand bench, steel flats, and some coal, has been relocated to a rented storage building. The club is looking for a member to store the equipment for the club.

A member has a custom built CNC operating system that he wrote to run in Basic on a PC running Windows 98. The program does not work with XP or newer operating systems. It was suggested that he should create a dual boot PC to run both operating systems.

A member asked if anyone had built a Quorn tool grinder, and if anyone had spare castings. It was suggested that this is a very difficult project, and that it might be easier to buy a commercial grinder.

A member wanted to buy some high speed steel inserts. Before he purchased them, he wanted to understand the different tip radii available on tools. The Novice Group had various bits and said that they would demonstrate the effect of the different tips on the finish.

There is one remaining piece of equipment located at Zube Park that needs to be moved. It's an enormous drill press that was installed on site, and then the building was built around it. It's free to good home. It originally came from a locomotive shop in Galveston.

Novice SIG Activities

Rich Pichler and the novice group investigated ways to make a fine finish on steel shafts using the club's portable lathe. Rich needs a dolly for transporting the lathe to club meetings. Any designs and construction help would be appreciated. Contact Rich at his email address.

Articles

CNC Control & Monitor Support Arm

By *J. R. Williams*

The recent upgrade of the control system for my milling machine included a new control panel with a flat screen monitor. The control panel, when in the operating position, was satisfactory. However, the support arm would not swing enough so it was in the way when the mill was operating, I decided to add a short arm section to provided an additional joint in the system in order to allow the control panel to be pulled forward when setting up the milling operation and then pushed back out of the way when the system was shut down.

I fabricated the arm out of ¼-inch steel plate and made the top and bottom section from two large diameter rigid spacers. That worked but flexed under the heavy load of the control box. So, I went back to the drawing board. The final revision was to make two additional plates and a small end plate that were welded in place to fully box-in the arm assembly. The pivot pins are machined from ¾-inch stainless steel bolt blanks. The design also includes large fiber washers to provide rotational friction. This solved the deflection problem and allowed me to move the control panel forward and backward almost two feet. See photo above.

Improvements in Wheelbarrow Technology

By *Dick Kostelnicek*

I've put in my time operating wheelbarrows. My wife and I built our own abode. I helped pour the foundation and laid all the bricks. During construction I used a conventional wheelbarrow that had a single tire, metal bin, and used carriage bolts to attach the bin to the two wood frame handles. While transporting wet concrete or mortar, the operating technique was mostly a matter of balance and inertial dynamics to keep from inadvertently dumping the load. During my working career, nearly all wheelbarrows had a single tire and two wooden hand grips. This 3-point suspension made it difficult to keep the load's center of gravity over the stability triangle formed by the tire and two grips. Also, those carriage bolts that held the bin to the handles always caught a shovel's edge as you tried mix concrete in the bin or scoop up the last bit of its contents. To add insult to injury, it was impossible to remove hardened cement from the metal bin without denting it. As an alternative, I once tried to remove hardened mortar with muriatic acid and ended up with a very rusty wheelbarrow.

Recently, I browsed the wheelbarrow offerings at my local home improvement center. At the low end of the selection was that familiar metal bin, one tire rascal that I grew up with. At the high end and for about three times the price was my dream wheelbarrow. It has two tires, side by side and spaced about two feet apart. Obviously they'll provide stable transport without the balancing act. The bin is still fastened to the handles with carriage bolts. But, the bolt heads are sunken into the crater of a volcano shape protrusion molded into the bottom of the bin. Anyone can see that a shovel's edge just can't get caught under these protected bolt heads. The bin is made from flexible poly plastic. Surely, a well intentioned tap of a shovel's back side against the bin will knock off any hardened cement from its flexible sides. And about ending up with a rusty bin or having to repaint it, just dismiss such thoughts.

Well, all these improvements are too late for me. I'm too old to be doing wheelbarrow work. However, I still keep my friend around; an ancient 50+ year old Sears Roebuck wheelbarrow, complete with single tire, protruding carriage bolt heads, and concrete encrusted rusty metal bin. I just can't bring myself to discard my old friend as it is steeped in memories of past accomplishments and brave deeds.