**May 2017**

Newsletter

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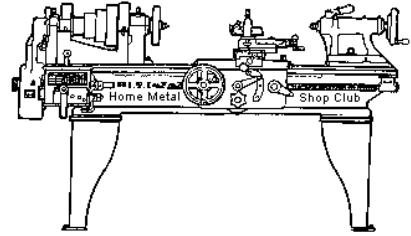
The Home Metal Shop Club has brought together metal workers from all over the Southeast Texas area since its founding by John Korman in 1996.

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 *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 | Vice President | Secretary | Treasurer | Librarian |
|---|---|---|---|---|
| *Brian Alley* | *Ray Thompson* | *Joe Sybille* | *Emmett Carstens* | *Ray Thompson* |
| Webmaster/Editor | Photographer | CNC SIG | Casting SIG | Novice SIG |
| *Dick Kostelnicek* | *Jan Rowland* | *Martin Kennedy* | *Tom Moore* | *John Cooper* |

This newsletter is available as an electronic subscription from the front page of our website.  We currently have over 1027 subscribers located all over the world.

## About the Upcoming 10 June 2017 Meeting

The next general meeting will be held on 10 June at 12:00 P. M. at the Barbara Bush Harris County Library, 6817 Cypresswood Drive, Spring, TX 77379.  At this time, there is no formal presentation to announce.  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.

There is a field trip scheduled to see the precision machinery laboratory at Texas State Technical College, 26706 Southwest Freeway, Rosenberg, TX 77471 on Wednesday, 21 June 2017, at 7:30 PM. Explicit directions to the facility will be given during the general meeting.

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 Ray Thompson.

Design contest results: Club member Norm Berls won best business card holder and Vance Burns won best card design. Congratulations Norm and Vance. See winning entries in right photo.



## Recap of the 13 May 2017 General Meeting
By *Joe Sybille*, with photos by *Dick Kostelnicek*



Eighteen (18) members attended the 12:00 P.M. (Noon) meeting at Spring Branch Memorial Library, located at 930 Corbindale Road, Houston, TX 77024. There are thirty-three (33) members in good standing with the club.

President Brian Alley led the meeting (right photo).

Visitor Peter Graves gave a short presentation on the merits of a rust preventer and lubricant manufactured by Aidant Brands of Houston, Texas. Afterwards, he gave samples to several members of the product Rust Patrol.

## Presentation
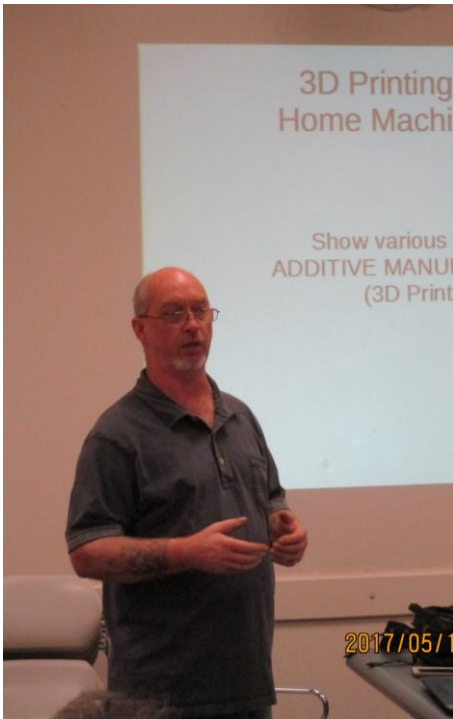
Club member Brian Alley gave a talk on '3D Printing in the Home Machine Shop'. He began by describing several types of 3D printing methods such as Fused Deposition Modeling (FDM), Stereo Lithography (SLA), Digital Light Processing (DLP), and Selective laser sintering (SLS). Of the four methods cited, FDM is the most common and served as the focus of his presentation.

SLA is the second most common type of 3D printing. It uses a liquid resin exposed to a UV laser to harden. Fine detail is possible with items made using SLA, but some parts of the item are fragile. DLP is similar to SLA, but this process uses a digital projector and light sensitive resin. SLS uses a powdered material and is costly to operate. Sintered metal parts can be made using this process.

The popularity of FDM can be attributed to simplicity of operation of the 3D printer, relatively inexpensive to get started, and the wide range of items that can be made using the printing process. The major drawback is the time it takes to print certain parts. Small simple parts print relatively quickly. Larger geometrically complex parts can take hours to print. Printing complex parts overnight is common when using the FDM process.

FDM is an additive process whereby a plastic filament is unwound from a coil and fed through an extrusion nozzle. The nozzle melts the filament and extrudes it onto a base in successive steps until layer after layer the item is built from the bottom up. The nozzle and the base follow a tool path controlled by a computer aided manufacturing (CAM) software program.

Filament types include Polylactic Acid (PLA), Acrylonitrile Butadiene Styrene (ABS), Polyethylene terephthalate and Glycerol (PETG), and Nylon. Differences among the filaments include strength, durability, flexibility, whether the filament is food grade, the amount of shrinkage during cooling, the range of temperatures to melt the filament, the odor when printing, and solubility, among others.

The workflow from start to finish for an item created using the 3D process is as follows:

Create or download from the web the 3D model.
Edit a downloaded model in the software of choice
Mathematically 'Slice' the model using Gcode file format, *.x3g file format, or another file format.
Send the output to the 3D printer

'Slicing' is an important part of the 3D printing process. The slicer software takes the 3D model file, described three dimensionally, and cuts the model into horizontal layers and produces a tool path the printhead can follow. The slicer software also sets nozzle temperatures, feed rate, fan control, wall thickness, supports for overhangs and other machine specific functions.

3D models have been created by ingenious persons willing to share their expertise. Those models are found on sites such as Thingiverse.com, Pinshape.com, Tinkercad.com, and Grabcad.com, among others. Some of the models may require minor editing to suit one's interest. In many cases, editing an existing file is easier than building a model from the beginning.

Brian then used Tinkercad to demonstrate the ease at which one may download an existing model or create a new one.

Items made by Brian using 3D printing are shown below.
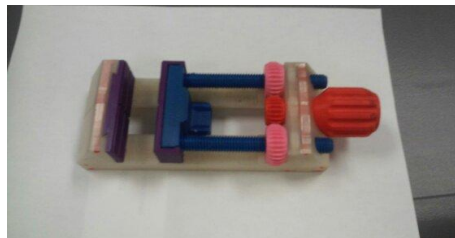


His slide presentation may be viewed at this link.

## Safety Moment

President Brian Alley showed a safety video on the perils of workers who take unsafe risks.

## Show and Tell



*John Cooper* showed a set of rollers and a tow jack that he made to move heavy machinery in his shop (left photo).

*Dick Kostelnicek* discussed how E27 (220 volt) LED bulbs will work in fixtures designed for E26 (110 volt) LED bulbs. The socket diameters differ by just 1mm and are a loose fit. Furthermore, most 220 volt LED bulbs will operate on 85 – 250 volts since they have a switching voltage regulator built into their bases.

*John King* displayed grinding wheels acquired recently for his shop (right photo).

*Norm Berls* explained the unique features of a cart he designed and fabricated (left photo).



*Richard Douglas* showed pictures of a mill he acquired recently. Note the homemade support used to move the 2500 pound mill (right photo).



## Problems and Solutions

A member asked for suggestions on the best way to reassemble a ball screw he inadvertently disassembled. Suggestions included purchasing a replacement ball screw to getting prepared to spend many hours sorting through ball bearings of sizes varying by only several thousandths of an inch. This member also requested recommendations on resolving a lubrication problem with his recently acquired mill. Several suggestions were offered.

## Articles



*Drawn with Sketchup V8*
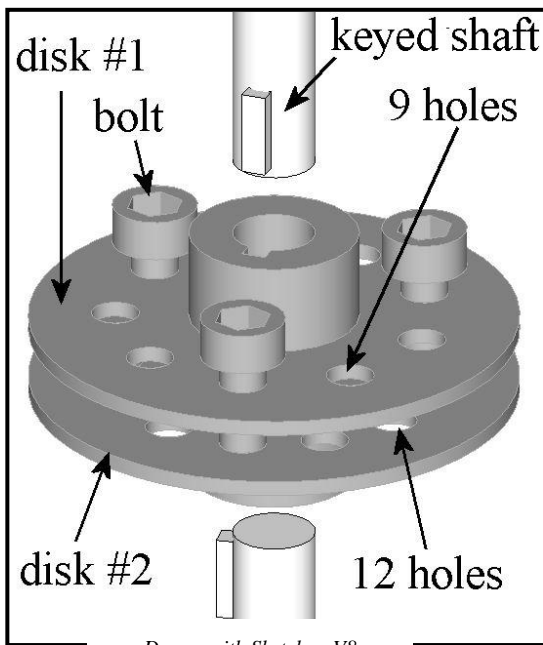
### Indexable Shaft Coupling
by *Dick Kostelnicek*

Two coaxial shafts can be indexed to one another and securely joined by the coupling illustrated in the left drawing. The coupling is fabricated from two disks having their faces in intimate contact with one another and each keyed to its respective shaft. Each disk has a different number of equally spaced holes that are located at the same radius. The disks are joined together with either 2 or 3 equally spaced bolts that are inserted through holes that line up in both disks. The table below shows that the number of holes in disk # 1 is determined by the number of bolts times a module number. Disk # 2 has either 2 or 3 additional holes depending on the number of bolts employed.

For example:  It is desired to index two shafts for 36 equally spaced angular offsets, equivalently, 10 degree increments.   Three bolts spaced 120 degrees apart will secure the disks.  Then, disk #1 would require 9 equally spaced holes and disk #2 would need 12 equally spaced holes (see yellow outlined row in table below).

| bolts | 2 | | | | 3 | | | |
|---|---|---|---|---|---|---|---|---|
| module | disk #1 holes | disk #2 holes | offsets | degrees | disk #1 holes | disk #2 holes | offsets | degrees |
| 1 | 2 | 4 | 4 | 90.00 | 3 | 6 | 6 | 60.00 |
| 2 | 4 | 6 | 12 | 30.00 | 6 | 9 | 18 | 20.00 |
| 3 | 6 | 8 | 24 | 15.00 | 9 | 12 | 36 | 10.00 |
| 4 | 8 | 10 | 40 | 9.00 | 12 | 15 | 60 | 6.00 |
| 5 | 10 | 12 | 60 | 6.00 | 15 | 18 | 90 | 4.00 |
| 6 | 12 | 14 | 84 | 4.29 | 18 | 21 | 126 | 2.86 |
| 7 | 14 | 16 | 112 | 3.21 | 21 | 24 | 168 | 2.14 |
| 8 | 16 | 18 | 144 | 2.50 | 24 | 27 | 216 | 1.67 |
| 9 | 18 | 20 | 180 | 2.00 | 27 | 30 | 270 | 1.33 |
| 10 | 20 | 22 | 220 | 1.64 | 30 | 33 | 330 | 1.09 |

(Disk #1 holes) = bolts * module                     offsets = module * (module +1) * bolts
(Disk #2 holes) = bolts * (module + 1)                          degrees = 360 / offsets