August 2016
Newsletter

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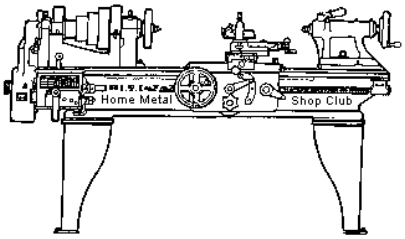


http://www.homemetalshopclub.org/

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 1010 subscribers located all over the world.

About the Upcoming 10 September 2016 Meeting

The next general meeting will be held on 10 September at 12:00 P.M. (Noon) at the South Houston Branch County Library, 607 Avenue A, Houston, TX 77587. Jan Rowland will give a presentation on items he has built in his shop during a span of several years.

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 Ray Thompson.

Recap of the 13 August 2016 General Meeting

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

Nineteen (19) members attended the 12:30 P.M. meeting at the Spring Branch Memorial Library, 930 Corbindale Road, Houston, TX 77024. One visitor and previous member, Richard Thomas, attended the meeting. There are forty-seven (47) members in good standing with the club.

President *Brian Alley* led the meeting.

Presentation

Club member*, Martin Kennedy*, gave a presentation on 'Shop Safety'. The importance of shop safety cannot be overemphasized. Too many times one becomes comfortable working in one's shop. It is at those times when accidents occur. Here are a few things to consider when discussing shop safety. Let us begin with clothing. By far the number one safety item is the wearing of safety glasses. Shirts should be tucked in pants when working around rotating equipment. Steel toed shoes protect one's feet from injury from falling tools or small objects. Long hair should be restrained and there should be no loose clothing such as ties. Around rotating equipment avoid gloves, necklaces, rings, watches, and bracelets. Sandals and flip flops have no place in the workshop.

Next we shall consider physical and environmental conditions. Under no circumstances should one operate machines while under the influence of medicine, alcohol, or drugs. Avoid operating machines when tired. Resist the urge to make that final cut of the day. Many times that final cut results in ruining a work piece. Ensure there is enough light in the workshop. Shadows from inadequate lighting have been the root cause of many 'uh ohs' in the work shop. If possible, one should have two means of exiting the workshop in case of an emergency. Storage of flammable chemicals should be in accordance with generally acceptable safety practices. Keep tweezers and a powerful magnet on hand to remove splinters. A cell phone in the shop allows one to call for help in the event of an emergency. An emergency plan is essential. Know beforehand who to call if injured in the shop.

Next identify sources of distraction and eliminate them. Video, television, radio, animals, insects, children playing, among others, are distractions one should eliminate from the workshop. However, if possible, have someone check on you periodically to make sure you are okay.

Another thing to consider is shop cleanliness and tidiness. One should instinctively wipe up liquids ASAP. Avoid the buildup of dust or chips. The space around a machine on which one is operating should be free of chairs, articles on the floor, and other persons. No items should be left on the lathe head, for example, the check key. One should always disconnect the power to a machine when cleaning it. Do not allow a mass accumulation of metal chips in the chip pan. Use a brush instead of compressed air to clean metal chips from the machine. Wear safety glasses when cleaning to protect the eyes.

Next, before starting, say, the lathe, check the workpiece for cracks, holes, and any bends. Tighten the workpiece and remove the chuck key. Tighten the turret, if so equipped, and remove all keys. There should be no objects or instruments left on the ways while operating the lathe. Ensure that the compound does not hit the chuck mounted on the spindle nose. Additionally, to minimize flexure of the workpiece, be sure to mount it close to the chuck. For each speed change, turn off the machine.

Lastly, while operating the machine, whether lathe, mill, drill, or band saw, or any device with a reciprocating or rotary motion, keep hands away from the moving parts. Avoid leaning toward the machine, and do not leave machine running unattended. Talking to others while operating a machine is an opportunity to lose concentration on the task at hand and to risk causing injury to one's self or damage to the machine. While operating the machine one should not experiment with an unknown operation of the machine, for damage to the machine could occur and possibly injury to the operator. Depending on the machine operated, glasses, hard hat, steel toed shoes, goggles, gloves, welding goggles and shields, face shield, and ear plugs are among the personal protective equipment that should be worn by the operator. For protection against airborne hot particles entering one's waistband when welding or grinding, one may consider leaving the shirt tail outside the pants. Separate containers of water, sand, and oil dry near machinery come in handy in the case of small fires and inadvertent oil spills. Caution must be exercised when storing steel wool, for it ignites easily.

Remember, safety is in one's hands and should always be on one's mind when working in the shop.

Martin's presentation slides may be viewed at this link.

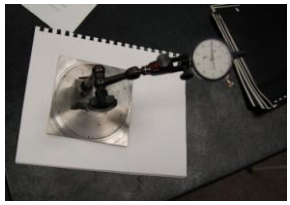
Safety Moment

Brian Alley showed a video on safety hazards which tend to increase in number when one person does not wear the appropriate personal protective equipment (PPE).

Show and Tell

Dick Kostelnicek showed how he made a sheet metal radius gauge using a chassis hole punch (left photo). He then gave a demonstration on how to install PEM nuts in sheet metal. Finally, Dick showed a few short videos of 'CNC pecking' operations used when drilling holes with his mill.

Martin Kennedy showed a face mill that he purchased on-line. Also, he displayed an indicator holder that is the best he has ever used(right photos).



Allan May exhibited Cree LED's, and then gave away samples of the LED's (left photo).

Tom Moore demonstrated a novel method of truing a workpiece in a four-jaw chuck using a wood 4X4 (right photo).

Ray Thompson gave a short description of centerless grinding.

Dan Harper revealed that, when using his lathe, he considers the chuck key as part of his hand. Doing so has allowed him to avoid leaving the key in the chuck.

Brian Alley showed pictures of an enclosure that he built to observe the proficiency of a tank cleaning apparatus.

Problems and Solutions - *Ask the Blacksmith*

A member wanted to know what he could do to see the weld puddle when using his MIG welder. He was advised to use lighter lens in the 9 to 9 1/2 range.

Another member sought options on techniques to square the two faces of a three inch diameter by six inch long steel cylinder. He was advised to use a steady rest when truing the faces.

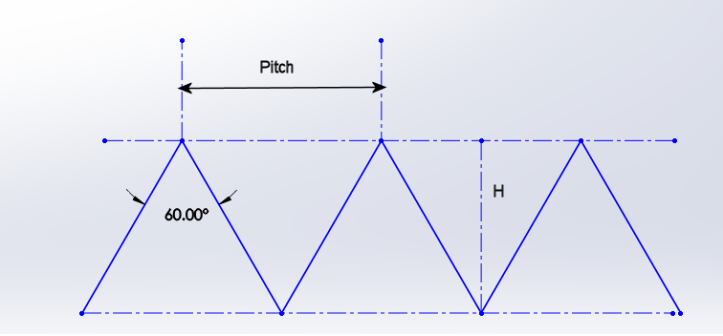
Articles

Thread Depth

By *Martin Kennedy*

I recently wrote some G-code for conversational programming on my CNC lathe to make internal and external threads. For the code, I needed to be able to calculate the required thread depth. At first, I thought that it would be fairly straight forward. It turns out that it's more complicated than that. When I manually cut threads on the lathe, I figured out when the threads were deep enough by either trying a nut or using thread gauges. I knew that there was a way to calculate the depth, but for *one-off* threads, it was easier to cut and try than to do it rigorously using a calculation or looking up the number in a table.

For my G-code, I needed to do the math. I looked around on the internet, and I found a variety of techniques and formulas that people used to calculate depth. The most common I found is the simplistic model shown in the left photo:

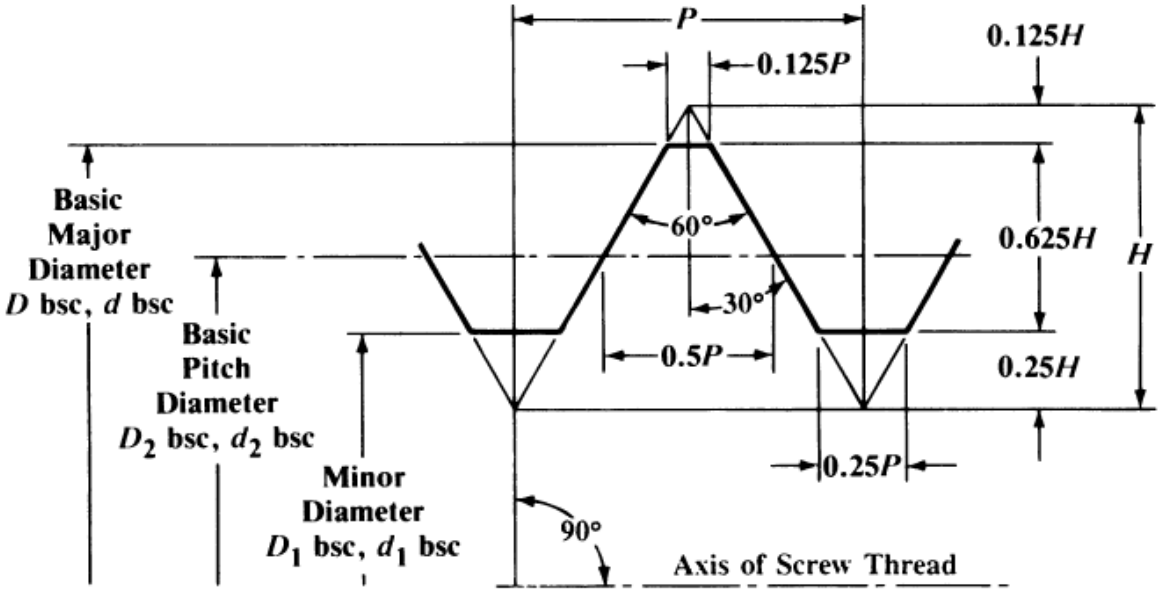


The triangles formed are equilateral, so H, the thread depth, can be determined through trigonometry, and is equal to ½ * pitch * SQRT(3), or 0.866 * pitch.

Note that the pitch is in inches/thread or mm/thread. For American units, we generally use threads per inch (TPI), which is the inverse of pitch: Pitch = 1/TPI. So:

H = thread depth = 0.866 / TPI

It turns out that the above thread model is not quite correct. Here's a picture of an American standard thread from Machinery's Handbook:



Basic Profile of UN and UNF Screw Threads

The top portion of the diagram is an internal thread, and the bottom portion is an external thread. Several things can be noted from the drawing

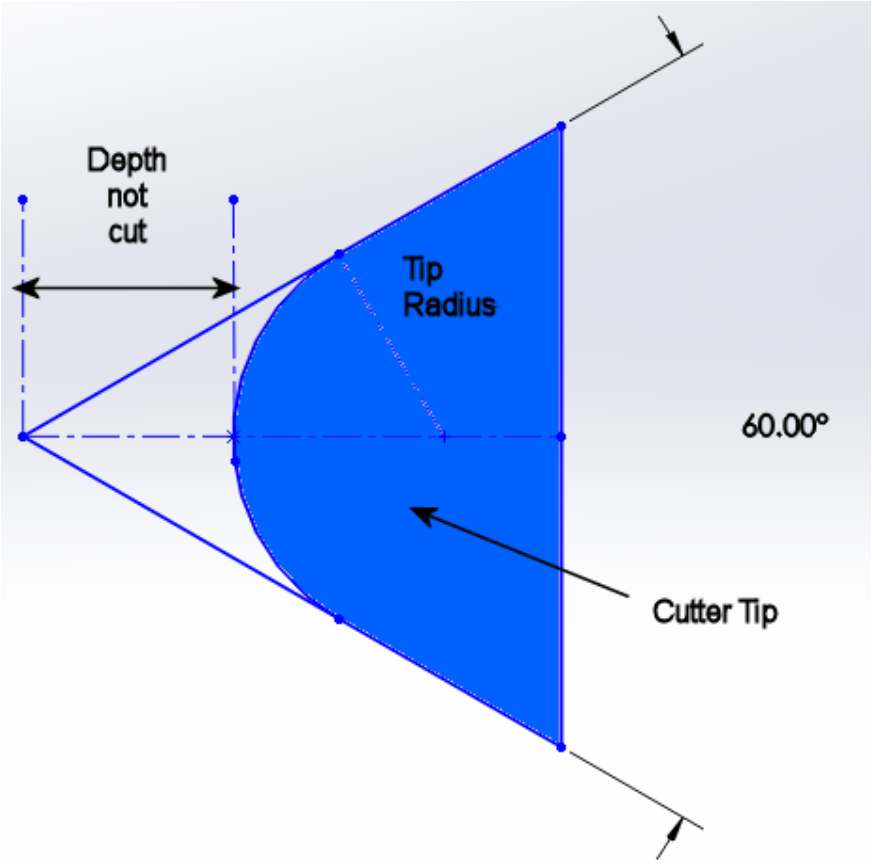
- The threads are truncated at the top and bottom
- The thread profile is asymmetric
- Internal threads have a larger flat spot on the outside of the thread than external threads
- The Major Diameter is not the apex of the thread
- The Minor Diameter is not the apex of the thread

The Minor Diameter is equal to the Major Diameter – 2 * 0.625 * H, or Major Diameter – 1.25 * H. (The 2 is required to convert from radius to diameter) Since H = 0.866 / TPI, this equates to

Minor Diameter = Major Diameter – 1.0825 / TPI

So when cutting an internal thread, this is the size of the hole that should be machined before performing threading operations.

Another consideration in calculating the necessary thread depth is that threading cutters may have a small radius on the tip of the cutter, especially if they are slightly worn. This may or may not match up with the required flat at the bottom of the thread.



The Depth not cut can be calculated as Tip Radius / sin(30°) – Tip Radius. Sin(30°) = ½, so the Depth not cut = Tip Radius.

It can be seen from the Machinery's Handbook drawing that for an external thread, and using a cutter tip that comes to a perfect point, that the cut depth = 0.625 * H + 0.25 * H, or 0.875 * H.
Similarly, for an internal thread, the cut depth = 0.625 * H + 0.125 * H, or 0.750 * H.
Of course, our cutting tools likely don't come to a perfect point. And carbide cutters typically have a small radius at the end, on the order of 0.003" to 0.005". So to calculate the necessary cut depth, we have to adjust for a real-world cutter:

External Thread

Cut depth = 0.875 * H, where H = 0.866 / TPI
Cut depth = (0.7578 / TPI) – Tip Radius

Internal Thread

Cut depth = 0.750 * H, where H = 0.866 / TPI
Cut depth = (0.6495 / TPI) – Tip Radius

We can make one more calculation. When you manually cut threads on a lathe, you generally set the compound to 29.5°. So what is the required thread depth as it will be shown on the compound? To obtain this, we need to multiply the required thread depth by 1 / cos(29.5°), or 1.149

External Thread

Cut depth shown on compound = 1.149 * ((0.7578 / TPI) – Tip Radius)

Internal Thread

Cut depth shown on compound = 1.149 * ((0.6495 / TPI) – Tip Radius)

If your compound is like mine, it shows diameter, not radius. In that case, you should double the results when using these formulas.