

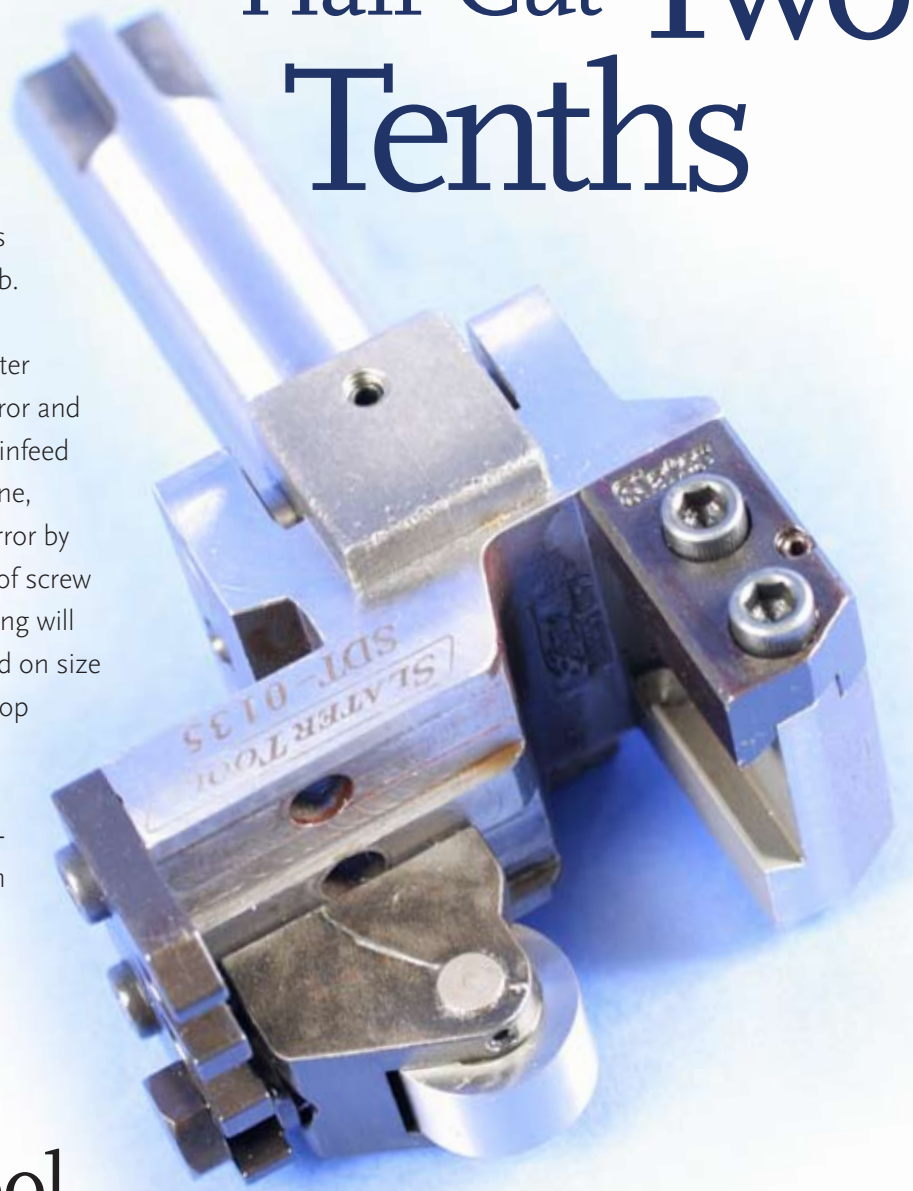
how it works

BY NOAH GRAFF

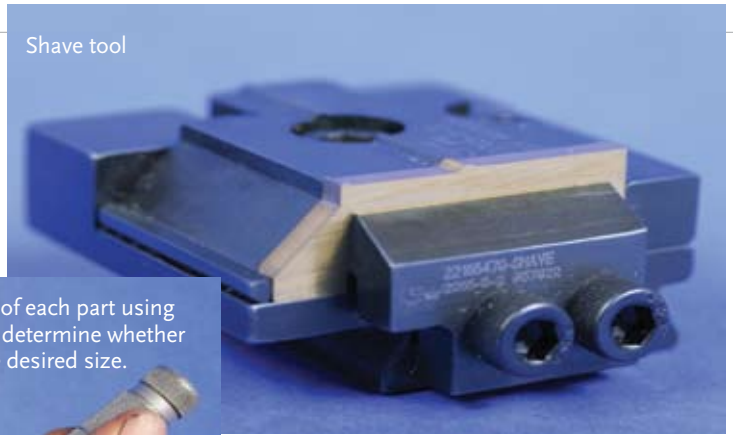
Shave and a Hair Cut Two Tenths

No matter how new or state-of-the-art your screw machine is, sometimes the finish and accuracy it produces are still not acceptable for your job. Shaving overcomes the two main causes of variability on the diameter of screw machine parts, infeed error and spindle index error. It overcomes infeed error by feeding past part centerline, and it overcomes spindle index error by floating on the part. On any type of screw machine in good condition, shaving will yield diameters that are round and on size within $\pm .0005$. Jim Barnette, shop foreman at Graff-Pinkert & Co., who has successfully used shave tool holders for over 30 years, recommends the following approach for setting a shave tool.

How to Set a Shave Tool



Shave tool



1 Determine whether shaving is necessary by running 20 pieces off of each spindle of the machine and then measuring the accuracy of each piece using a micrometer (See A). If you determine that your present finish is unacceptable, employ a professional tool maker to build the proper shaving cutting tool to meet the specifications of your print.

2 Once you have the proper cutter and roll, make a blank with the exact dimension needed, on a lathe. On a workbench, slide the blank between your roll and tool, then preset the distance between them to achieve the perfect fit (See B). Many people use dial calipers to measure the distance between the roll and tool instead of making a blank. If you decide not to create a blank, you must use trial and error on the machine to achieve the correct accuracy. Making a blank will save time and material, and you can use your blank as a reference for future jobs.

3 With a depth indicator, measure the depth from the top of the holder to the base. Set the dimensions



Check the finish of each part using a micrometer to determine whether you can hold the desired size.

equal on each side. Make a scribe line on the back of the shave tool to show the taper line (See C). This will enable you to reset the tool at a later date without having to use a depth micrometer. Remember to save the roller, cutter and blank. Always take a measurement from the tool when the machine is in the back position (the farthest stroke before it indexes). Measure from the point of the tool down to your bar to see if you are on center.

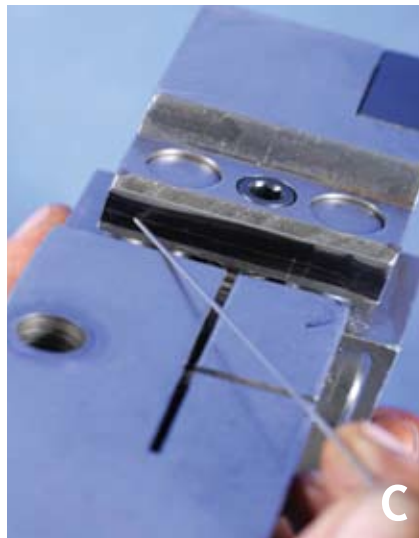
4 The shaving tool must be positioned in the shaving attachment so its cutting edge is in line with the center of the roll (See D). This is accomplished by clamping the shaving tool in the shaving attachment, so the cutting edge is in line with the face of the attachment. Use a straightedge to line the cutting edge with the face of the shaving attachment. Slide the blank between your roll and your tool to get the perfect fit.

5 Mount the roll block on the shaving attachment. Using the roll block adjusting screw, adjust the position of the roll block, so the distance between the roll and the cutting edge of the shaving tool is exactly the same as the finished size of the part.



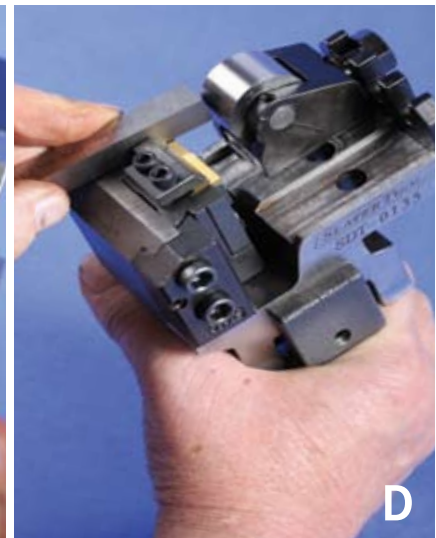
B

Preset the dimensions on a workbench, setting the distance between the roll and the tool.



C

Make a scribe line on the back of the shave tool to show the taper line.



D

Place the cutting tool in the shave tool holder, setting it on center of the tool holder.



Set the shave tool attachment on the cross slide of the machine and tighten the bolts.

6 Mount the assembled shaving tool and attachment on the cross slide and position the tool laterally, relative to the work piece (See E). Clamp the shaving attachment in place. Using the cross slide adjusting screw, move the shaving tool, shaving attachment and cross slide toward the work piece slowly until the roll contacts the work piece. Continue advancing the cross slide until the cutting tool is drawn to within .010 of the work piece.

7 With the feed disengaged, run the main drive motor so only the spindles rotate. While the bar stock is rotating, use the cross slide adjusting screw to slowly move the cross slide toward the work piece until the shaving tool and roll reach the centerline of the work piece. The tool has reached the centerline of the work piece when further advancement of the tool fails to produce any chips. A mirror can be helpful to observe the chips being cut as the tool is advanced. Limit the travel of the tool beyond the centerline to the absolute minimum. Then, tighten the cross slide locking screws in place.

Before proceeding, you must always check the clearance between the attachment and slide.

8 Jog the machine to be sure the work piece clears the shaving attachment and tool when the machine indexes. Finally, measure the OD of the test part and adjust the roll block with its adjusting screw as necessary. If you do presets, you will save a lot of time and material during your shave tool setup.



Special Thanks to Slater Tools for lending us a shave tool holder for this article's photos.

how it works

Trouble shooting potential shave tool problems

Tools wear excessively

Spindle speed high

Reduce spindle speed

Tool set ahead or behind roller

Reset to centerline of roller

Tool going past center

Reset throw of tool

Tool material not correct

Select tool material for abrasion resistance qualities

Feed too heavy

Reduce feed per revolution

Chatter

Feed per revolution heavy

Reduce feed

Spindle speed high

Reduce spindle speed

Roller and/or pin worn

Check and replace

Shave holder worn

Check and replace or shim to snug up

Not enough rake

Increase rake possibly up to 20°; rake generally used is 3°/5°

Too much material being removed

Check and reset to a minimum; i.e., .0015 to .003 on a side

Vibration

Grind 2° shear angle on front of tool; set tool ahead of roller center line; decrease amount of lift of tool holder; attach a large piece of lead to shave tool holder; use heavier springs in holder.

Machine spindles worn/ index

Check and correct condition

Variation of part diameter

Built up edge heavy

Increase rake; decrease feed; change coolant; hone rake

Tool dull

Resharpen

Tool edge ahead or behind center line

Reset tool on center

Blank tapered

Straighten out form tool

Roller or pin has flats or is not round

Replace roller/pin

Too much material being removed by shave tool

Reduce amount of material to be removed on a side; .0015/.003 is best to hold size and roundness.

Tool chips on edge

Spring in holder weak or broken

Replace

Built-up edge high

Reduce feed; increase rake; use proper coolant; grind rake smoother or hone

Workpiece breakage

Tool diving into piece

Increase cam rise and/or reposition tool to center line of part

Piece set too far from collet

Reset job closer to collet

Tool removing too much material

Reduce blank size diameter

Tool ahead or behind roller center line, causing excess pressure

Reset tool to roller center line

Shaved diameter tapered

Tool not squared with roller

Reset tool

Tool not ground square

Resharpen

Defective holder

Check and replace

Holder not square

Adjust

Rough finish

Dull tool

Resharpen

Tool form finish is rough

Remake tool or replace

Blank diameter too large

Reduce blank diameter

Improper or inadequate coolant

Use proper coolant in copious amounts; for steel use active sulfur oil

Blank surface rough

Resharpen blank form tool and increase rake on this tool (use Dykem on blank prior to shave cut; if traces of color are visible after shave cut, blank is too rough)

Tool not set on roller center line

Reset tool

Built-up edge heavy

Increase rake angle; decrease feed; change coolant; increase speed; grind rake or hone extra smooth.

Source: PMPA Troubleshooting Machining Manual, all rights reserved. Copies of the PMPA's Troubleshooting Machining Problems Manual may be purchased for \$6.50 each plus shipping from the Precision Machined Products Association, 6700 West Snowville Road, Brecksville, Ohio 44141.