Project #109
Hammer Handle Calculations
(7/28/14 wrr)

Project Description:

The Hammer Handle project is the second of three components of the hammer. The hammer handle will required the student to calculate and offset a lathe tailstock to accurately machine the tapered surface of the handle. This section of the project will help you calculate the offset needed for this taper.

Project Objectives:

After you have completed this project, you should be able to:

1. Calculate the taper per inch of a tapered part from the blue print specifications.
2. Calculate the offset of a lathe's tailstock for a given taper.

References/ Study Material:

Precision Machining Technology (PMT) textbook:

Section 2, Unit 4, pg. 136-140, (Applications of Test Indicator, Sine Tools, and Sine Bars)
Section 5, Unit 5, pg. 447-453, (Taper Turning)
Section 5, Unit 5, pg. 456-458, (Offset Tailstock Method)

Machine Tool Study Guide: Pages 109-2 thru 109-4 and 110-5

Video Tapes: **MS-31**, Turning Tapers with the Offset Method, 22 minutes

Materials Needed: Hammer Handle Blue Print: (Page 110-5)

Additional Tooling:

Formulas for Calculating Cylindrical Taper

Before cutting tapered diameters on a lathe you must ask yourself some questions:

1. What taper do I want to turn?
2. How far do I have to offset the tailstock to cut that taper?
3. How do I check the taper on my part?

Step #1 - What taper do I want to turn?

Cylindrical taper is defined as a uniform change in diameter. If we know the taper per inch for any one inch distance on a part, that taper will be consistent over the entire length of the taper.

We use the formula: Taper = (D – d) / Lt (Length between the diameters)

D = a large diameter on the part

d = a small diameter on the part

Lt = the length of the taper from D to d

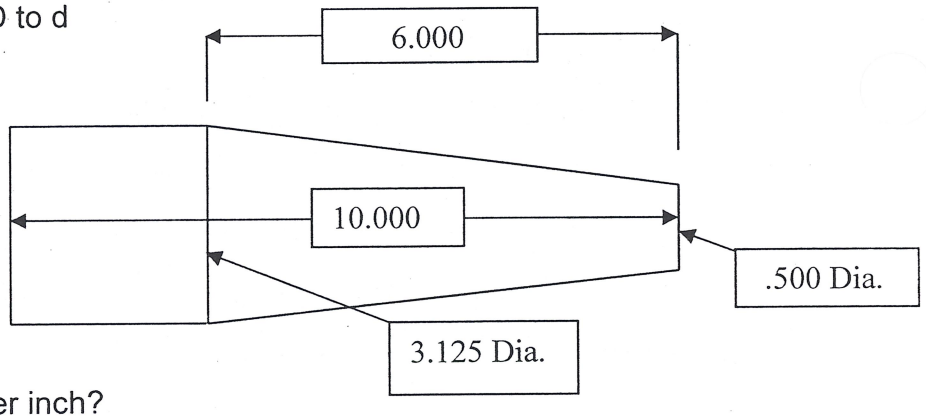
Example:

Calculate the following taper:

D = 3.125 diameter

d = .500 diameter

Lt = 6.000 inches



Did you get .4375 inches taper per inch?

This means, the part will get larger or smaller by .4375 inches over every inch of linear travel.

Calculate the taper for the **Hammer Handle**, using the formula from above:

(Note: see print on page 110-5)

Write your answer here (show all decimal places)_____ taper/inch

Step #2 - How far do I have to offset the tailstock to cut this taper?

The formula for tailstock offset = (TPI x LT) / 2

TPI = Taper Per Inch

LT = Total length of your work piece (6.000 this includes extra stock for machining)

/ 2 = When working on a lathe, any offset done to one side will be doubled as the part rotates around the centerline.

Example:

TPI = .4375

LT = 10.000 inches

Offset = (.4375 (TPI) x 10.000 (LT)) / 2

Offset = 2.1875 inches

Calculate the tailstock offset for the **Hammer Handle**, using the formula from above: (Note: your blue print tells you the finish length of the part is 4.736. During the machining of the taper, the part will be 6.000" long and that is what should be used for the offset calculation)

(4th decimal place) _____ inches of offset.

Step #3 - How do I check the taper on my part?

We will be using a 5-inch sine bar, gage blocks, surface plate, and a .0001" reading indicator to measure the taper on the hammer handle. We want to hold the taper on your hammer handle to a tolerance of .0015 or less for the required taper.

To calculate the sine bar constant when the (TPI) taper per inch and sine bar length is known. Multiply the (TPI) taper per inch by the length of the sine bar.

Example: .0625 TPI X 5" (length of sine bar) = .3125"

Round off this answer to the fourth decimal place: .3125. This is the total size of the gage block stack to place under one end of the sine bar.

Your Project:

Multiply the (TPI) taper per inch (for the hammer handle) by five inches: _____

Round off this answer to the fourth decimal place: _____. This is the total size of the gage block stack to place under one end of the sine bar.

To choose the proper gage blocks you must start at the right end (4th decimal place) first!

Example:	Lathe Center Project:
Gage block amount needed .3125	Gage block amount needed _____
First gage block .0505	First gage block _____
Second gage block .112	Second gage block _____
Third gage block .150	Third gage block _____
Fourth gage block not needed	Forth gage block _____
Fifth gage block not needed	Fifth gage block _____