

Drawing an Approximate Representation of an Involute Spur Gear Tooth

Project Description

Create a solid model and a working drawing of the 24 pitch gears specified below. It is only necessary to create approximates the gear tooth form These models will be used in solid models of mechanical assemblies that you design an build using the GEARS-IDS kit along with other engineering components.

60 Tooth Gear

Pitch	24
Teeth	60
Bore	7/16" Hex
Material	Delrin
Set Screw	#10-24 (not shown)
Hub Dia.	0.90"
Face Width	0.250"
PA	20 ⁰

Note: !0-24 Set Screw to intersect the middle of the flat on the hex bore.

36 Tooth Gear

Pitch	24
Teeth	36
Bore	7/16" Hex
Material	Delrin
Set Screw	#10-24 (not shown)
Hub Dia.	0.90"
Face Width	0.250"
PA	20 ⁰

Note: !0-24 Set Screw to intersect the middle of the flat on the hex bore.

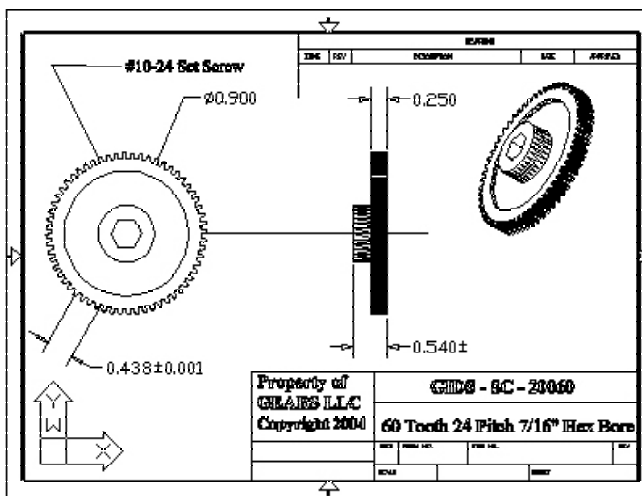


Fig. 6.3.4.1 Working Drawing of a Spur Gear

The figure on the right is an example of a working drawing of the 60 tooth gear specified above.

This example also includes a pictorial representation of the gear. A drawing like this is prepared for a manufacturer so that he/she might prepare a production quote. The only additional information required to estimate the cost of producing this gear would be the quantity required.

Procedure

The following procedure can be used to create the gear models using pencil and paper drafting techniques or CAD workstations. This method will produce a approximation of the gear tooth form. It is neither necessary nor efficient to take the time to draw an exact involute tooth form for the purpose of creating these drawings and models.

Begin by laying out the Pitch, Root and Outside Diameters of the 36 tooth gear. Use the Gear Definitions and Formula document to obtain the necessary formulas and values.

1. Calculate and draw the Pitch Circle. The Pitch Diameter is calculated below;

$$a. \quad D = \frac{N}{P} \quad D = \frac{36}{24} = 1.5"$$

2. Calculate and draw the Root Circle. The formula to determine the Root Circle Diameter is given below;

$$a. \quad RD = \frac{N-2}{P} = RD = \frac{36-2}{24} = RD = \frac{34}{24} = 1.416"$$

3. Calculate and draw the Outside Circle. The formula to determine the Outside Circle Diameter is given below;

$$a. \quad OD = \frac{N+2}{P} = OD = \frac{36+2}{24} = OD = \frac{38}{24} = 1.583"$$

4. Calculate the Circular Thickness.

$$a. \quad T = \frac{3.1416D}{2N} = \frac{1.57}{P} = \frac{1.57}{24} = 0.0654$$

5. Layout the Circular Thickness distance along the circumference of the Pitch Circle.

- a. Convert this distance to an angular measurement using this formula.
 $\frac{360}{36} * 0.5 = 5$ It is necessary to multiply by 0.5 (or divide by 2) since there are an equal number of teeth and spaces in each gear!

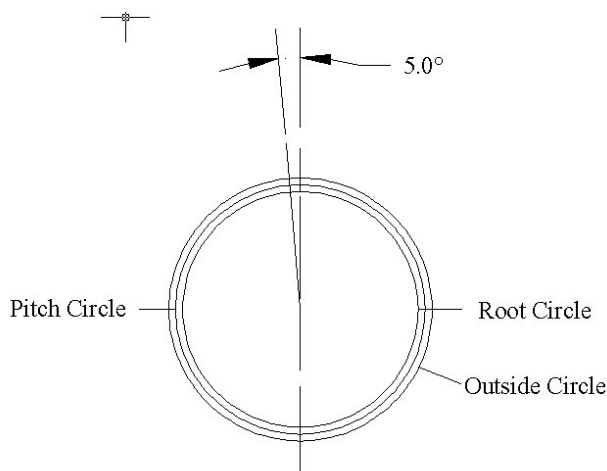


Fig. 6.3.4.2 Initial Layout

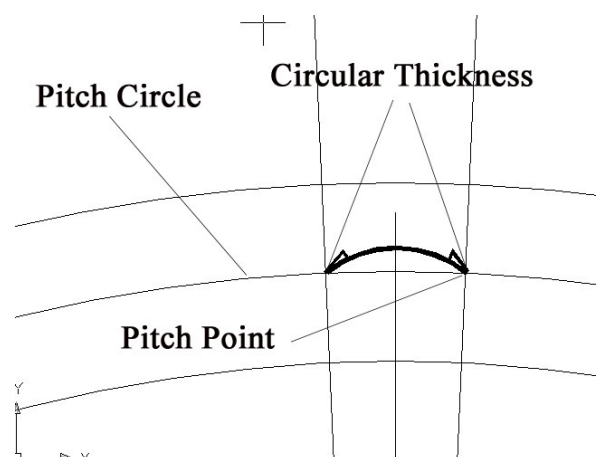


Fig. 6.3.4.3 Circular Thickness

6. Draw the Pressure line. The pressure line is drawn through the pitch point at an angle of 20 degrees from a line tangent to the top of the pitch circle.
7. Draw the Base Circle tangent to the 20 degree line. *Note: For this approximation of a gear tooth form it is not necessary to calculate the Base Circle Diameter.*
8. Draw a circle whose radius is 1/8 of the Pitch Diameter and whose center is at the Pitch Point.
9. Draw another circle of the same radius whose center is at the tangent point (intersection) between the Base Circle and the 20 degree pressure line.

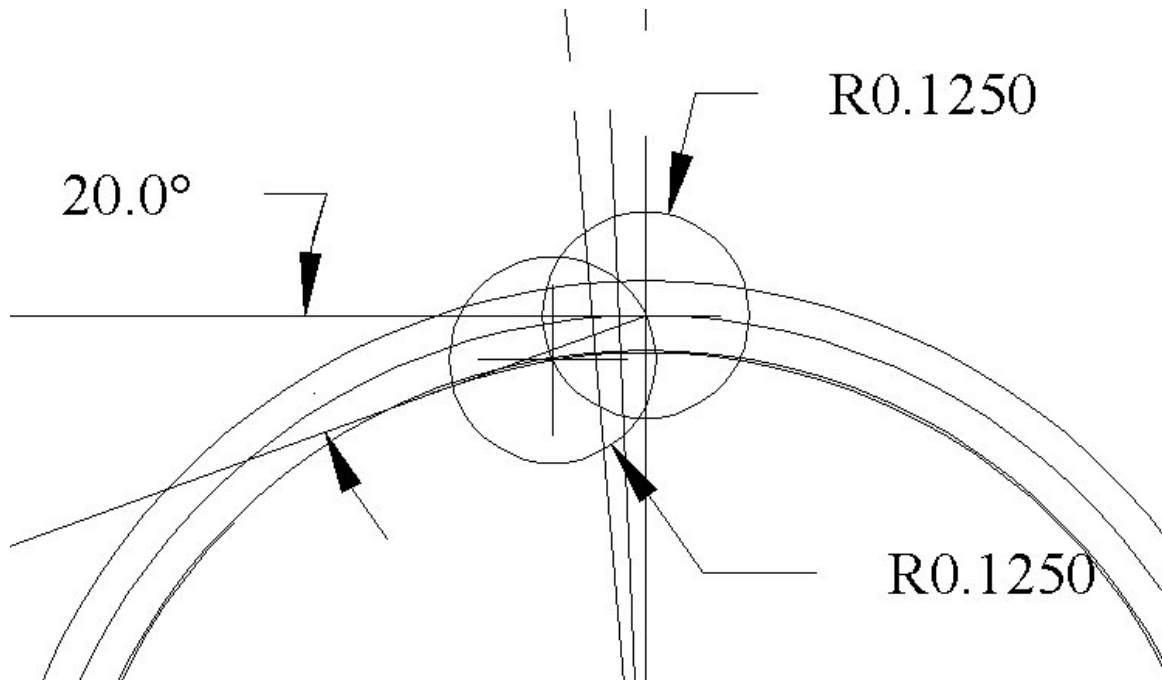


Fig. 6.3.4.4 Curved Portion of the Tooth Form

10. As you can see in this example, the tooth form is generated from the Pitch Point. Continue developing the gear tooth form by repeating this procedure for the opposite Pitch Point.
11. A radial line extending from the Pitch Point to the center of the Pitch Circle forms the tooth profile below the pitch point. You can draw a small fillet where this radial line intersects the Root Circle.
12. You can erase and trim the lines you no longer need, leaving only the gear tooth form.
13. Place your completed drawing(s) in the notebook. For extra credit, produce a working drawing similar to the example in fig. 6.3.4.1.
14. At this point you can add a fillet between the radial line that forms the tooth profile below the Pitch Point and the arc that forms the tooth profile above the pitch point. You can also flatten the top of the gear tooth slightly. (See fig. 6.3.4.5)

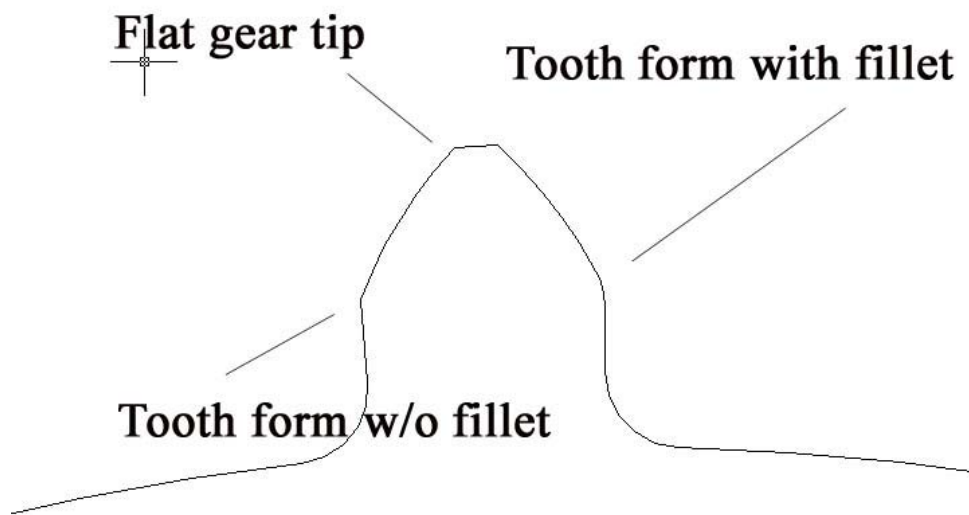


Fig. 6.3.4.5 Tooth Form Modifications

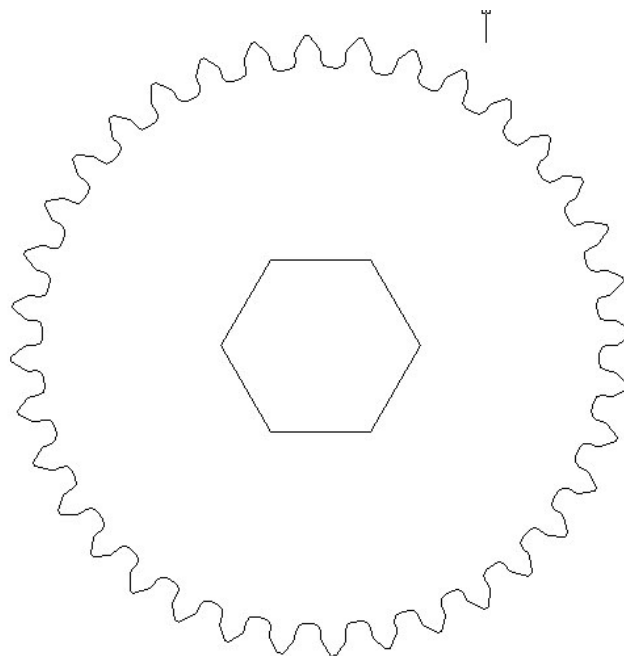


Fig. 6.3.4.6 Completed Gear Profile

15. The completed gear profile is shown above.
16. After modifying the gear profile you can continue drawing the gear. Array the tooth form and extrude the gear .250". Add the hub, bore and set screw per the specifications.