Suggested Technique for Creating an Involute Gear

Procedure

1. Create a new part named involute_gear and create a disk **(Insert > Extrude >**  **)** sketched on the FRONT datum plane, with the center at the intersection of TOP and RIGHT. The depth of the disk will be blind. In this example, the diameter of the disk is 20 and the blind depth is 5.
2. Next, create an angled datum plane by selecting **Insert > Model Datum > Plane**. Select A_1 (created from the protruded disk), press CTRL and select the TOP datum plane. Then specify an angle in the rotation field. In this example, the rotation angle is 30 degrees. Click on **Ok** to complete the feature.
3. Sketch a datum curve on the front surface of the disk by selecting **Insert > Model Datum > Sketched Curve**. The curve should be an arc with the center on A_1. The radius of the arc, arc length, and the angle between the endpoints of the arc and DTM1 should be dimensioned. (HINT: To create the angle dimension, a centerline was created, through the endpoint of the arc, and through the center of the disk. The arc length was created by selecting the arc, then clicking **Edit > Convert To > Perimeter**, then pick the radius dimension.)

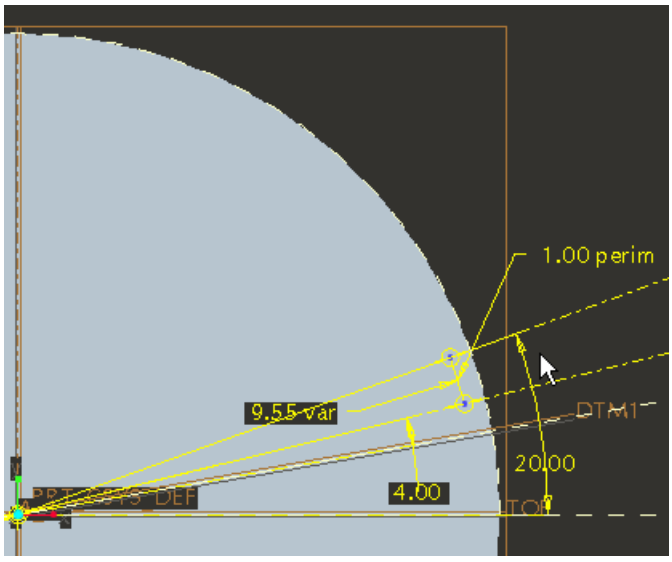

Figure 1

4. This curve will now be used as the spine for a surface created using a variable section sweep feature. To create this feature, click **Insert > Variable Section Sweep**. Select the curve created on the front of the disk, then click  to enter Sketcher mode. Add the bottom face of the disk as a reference (**Sketch > References**), and create the sweep's section as a horizontal line just above the datum curve (between

the datum curve and the edge of the disk). Create a dimension between this line and A_1. Clicking **Tools> Relations**, enter the following relations:

```
rbase = A1
todeg = 180/pi
solve
a*todeg-atan(a)=trajpar*A2
for a
sd4 = rbase*(1+a^2)^.5
```

PLEASE NOTE: The relations used in this example are for illustrative purposes only and should be modified to meet the requirements and design intent of the object being modeled.

sd4 - the dimension created between the sketched line and the central axis
A1 - the radius of the root circle for the gear
A2 - the angular dimension between the endpoint of the arc and DTM1

The variable "a" is used to solve for the dimension value and is set to 1.0 to initialize it so that it can be used to solve the equation. In this example, A1 will be 8 and A2 will be 14. After regenerating, sd4 should snap to 8, the radius of the root circle. Click  to build the feature. The involute surface created is shown below in Figure 2.

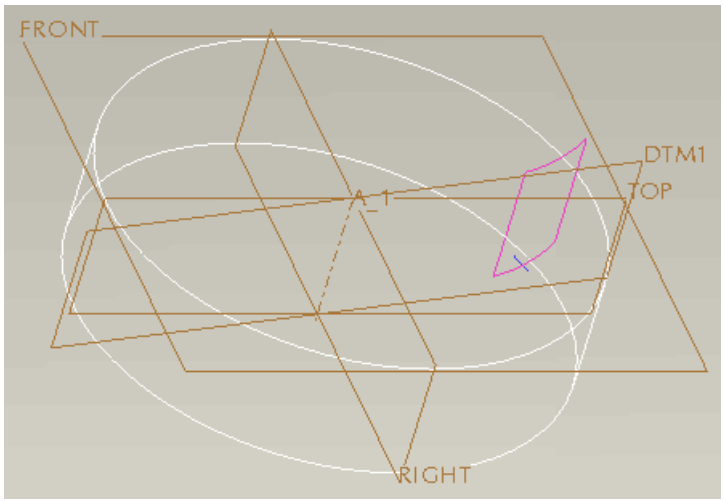

Figure 2

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5. Next, miror the involute surface about DTM1 by selecting the surface, then clicking **Edit > Mirror**, then picking DTM1. Create a cylindrical surface along A_1 with a radius slightly greater that the value for the radius of the root circle of the gear to connect the surface created in Step 6 with the mirror just created. Merge these 3 surfaces together (select two surfaces at a time and click **Edit > Merge**). The resultant surface is shown below in Figure 3. The datum planes have been removed from this figure for clarity.

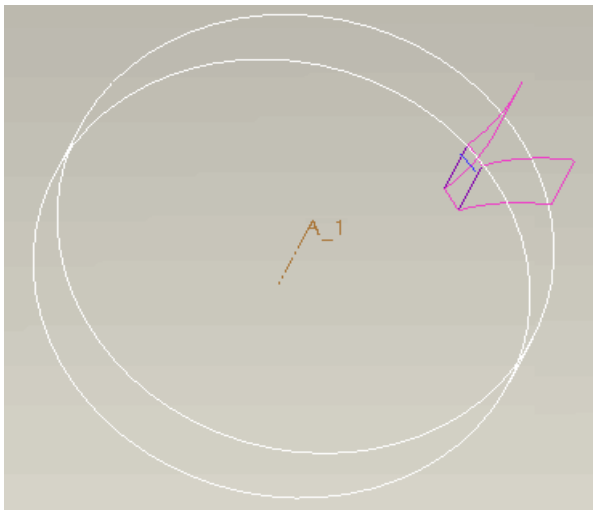

Figure 3

6. Change the Selection Filter to **Quilt** and pick the fully merged quilt. Click **Edit > Move**, and check off **Keep Original** from the **References** tab. Select A_1 and enter the number of degrees desired. In this example the angle is 20 degrees. Finally, pattern the moved surface the number of total teeth, minus one (since the original surface that was moved was preserved).

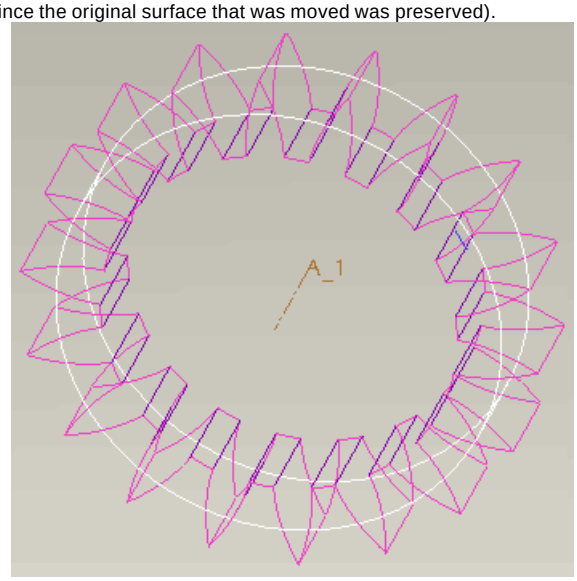

Figure 4

7. Change the Selection Filter to **Quilt** and select the first quilt merged quilt, then click **Edit > Solidify**. Click  to remove material from the solid, then change the direction of the tool operation to remove the material between the teeth. Repeat this step with the leader of the patterned surfaces, then pattern this new feature using the **Reference** option. Two adjacent cuts will create a single tooth. The completed involute gear is shown below in Figure 5.

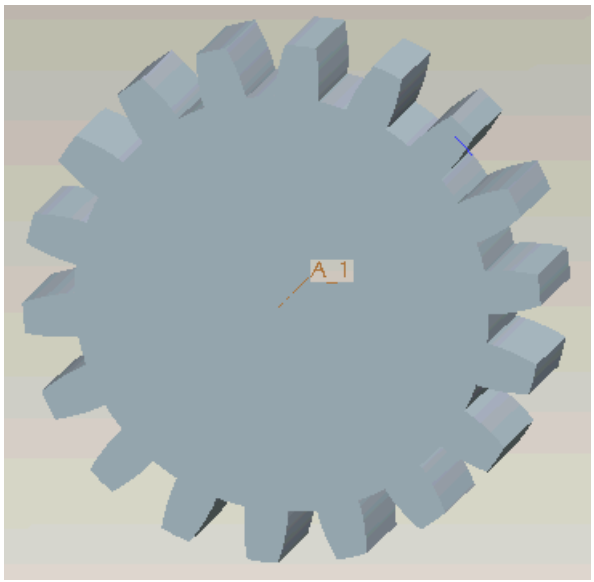

Figure 5

Download Finished Files for this Technique