#### Cam-Follower Systems – Part #4

3D Modeling of a Cam Profile in PTC Creo®.



#### Learning Outcomes – Part #4

• 3D Modeling of a Cam Profile Design in PTC Creo®.

The construction involves drawing a semi-circle and dividing it into the same number of parts as the cam-displacement angle. In this case, the diameter of the semi-circle is equal to the rise and fall of the follower. The graph passes through successive intersections as indicated in Figure (k):



Figure (k) Construction of a Harmonic Displacement Diagram.

Source: Myszka, D.H. Machines and Mech. Applied Kinematic Analysis. Prentice Hall. 4th Edition. USA.

- The follower motion sequence is as follows:
  - 1. Rise 40mm during 90° rotation of the Cam using the simple harmonic motion scheme.
  - 2. Dwell next 30° of the Cam rotation.
  - 3. Fall 40mm during the next 60° rotation of the Cam using the simple harmonic motion scheme.
  - 4. Dwell for the next 180°.
- The base circle radius is = 40mm
- The Cam Shaft Diameter is = 25 mm and shaft rotation speed is 100 rpm, clockwise.

- 1. Create the Displacement Diagram for the Follower. Use a sketch in a Front view (left window).
- 2. Remember to save the file as "Cam\_Profile".
- 3. Draw construction lines or centerlines to construct the displacement diagram; draw the rise distance h = 40 mm and divide the time period for each sequence of follower motion [see Figure (k)]. In PTC Creo®, we can divide of each follower motion into six parts using "Linear Pattern" with the dimension increment initially equal to the scale value (next slide):

- 4. In this case, we are using a scale of  $5mm \equiv 10^{\circ}$  to draw the Displacement Diagram as follows:
  - 1. Rise 40mm during  $90^{\circ} \equiv 45 \text{ mm}$ .
  - 2. Dwell next  $30^\circ \equiv 15 \text{ mm}$ .
  - 3. Fall 40mm during the next  $60^\circ \equiv 30 \text{ mm}$ .
  - 4. Dwell for the next  $180^\circ \equiv 90 \text{ mm}$ .
- 5. In the next slide, Figure (m) shows how the displacement diagram should look:



6. Draw a semi-circle and dividing it into the same number of parts as the camdisplacement angle [as seen in Figure (k)]. The sequence of the follower motion should look like as in Figure (n):



7. Draw the Cam base circle with radius dimension = 40mm (or diameter = 80mm). Then, dividing it into the same number of parts as the cam-displacement angle as shown in Figure (I):



Figure (I)

7. Draw the profile as coincident lines of the same dimensions that appear in the displacement diagram [blue lines in Figure (n) for rise and fall sequence]. Figure (o) illustrates this:



Figure (o)

8. Draw splines lines and use coincident constraint between the end points in Figure (o) and the spline to finish the profile as shown in Figure (p) below:



*Note:* Don't forget to constraint those arcs as tangent constraints.

8. Draw the follower as separate part in PTC Creo. Then, create an assembly and save it as "Cam\_Profile\_Assembly". Figure (q) shows the Cam profile design:



#### End of Part #4