

Follower Radius and Radius of Curvature

Do not confuse R_p , the *prime circle radius* with R_f , the *radius of the roller follower*. See Figure 7-1 for definitions. You can choose the value of R_f to suit the problem, so you might think that it is simple to satisfy equation 7.9 by just selecting a roller follower with a small value of R_f . Unfortunately it is more complicated than that, as a small roller follower may not be strong enough to withstand the dynamic forces from the cam. The radius of the pin on which the roller follower pivots is substantially smaller than R_f because of the space needed for roller or ball bearings within the follower. Dynamic forces will be addressed in later chapters where we will revisit this problem.

$$|\rho_{\min}| \gg R_f \quad (7.10)$$

The **radius of curvature** ρ is the reciprocal of the **curvature** of the function, also a mathematical property of the function and its derivatives. Figure 7-9 shows an obvious problem with a roller follower (greatly exaggerated) whose own (constant) radius of curvature R_f is too large to follow the locally smaller concave (negative) radius $-\rho$ on the cam.

A more subtle problem occurs when the roller follower radius R_f is larger than the smallest positive (convex) local radius $+\rho$ on the cam pitch curve. This problem is called **undercutting** and is depicted in Figure 7-10. Recall that for a roller follower cam, the cam contour is actually defined as the locus of the center of the roller follower, or the **pitch curve**. The machinist is given these x, y coordinate data (as a file on computer tape or disk) and also told the radius of the follower R_f . The machinist will then cut the cam with a cutter of the same effective radius as the follower, following the pitch curve coordinates with the center of the cutter.

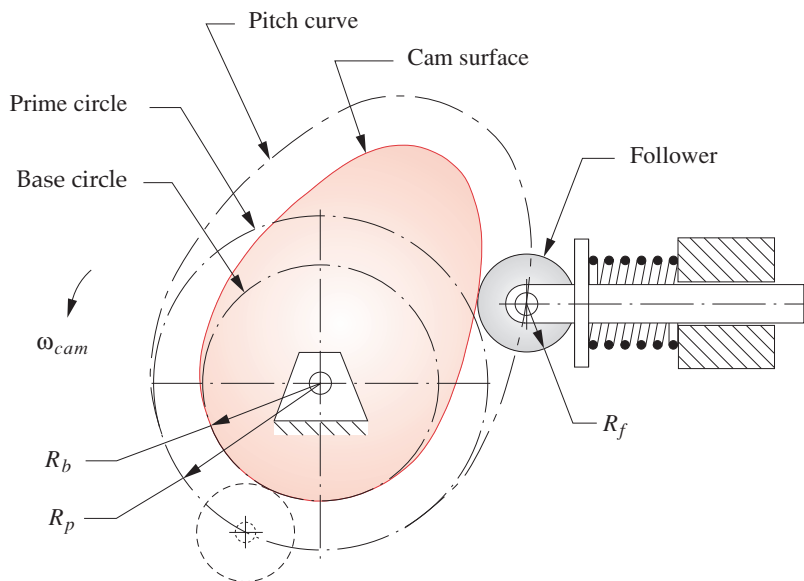
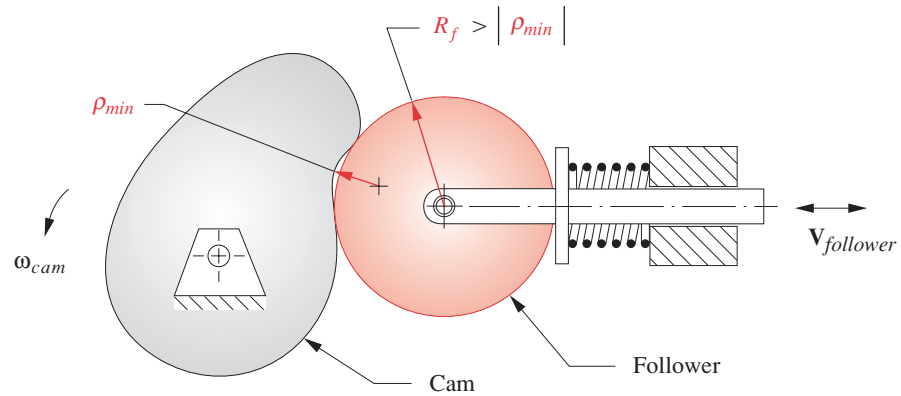
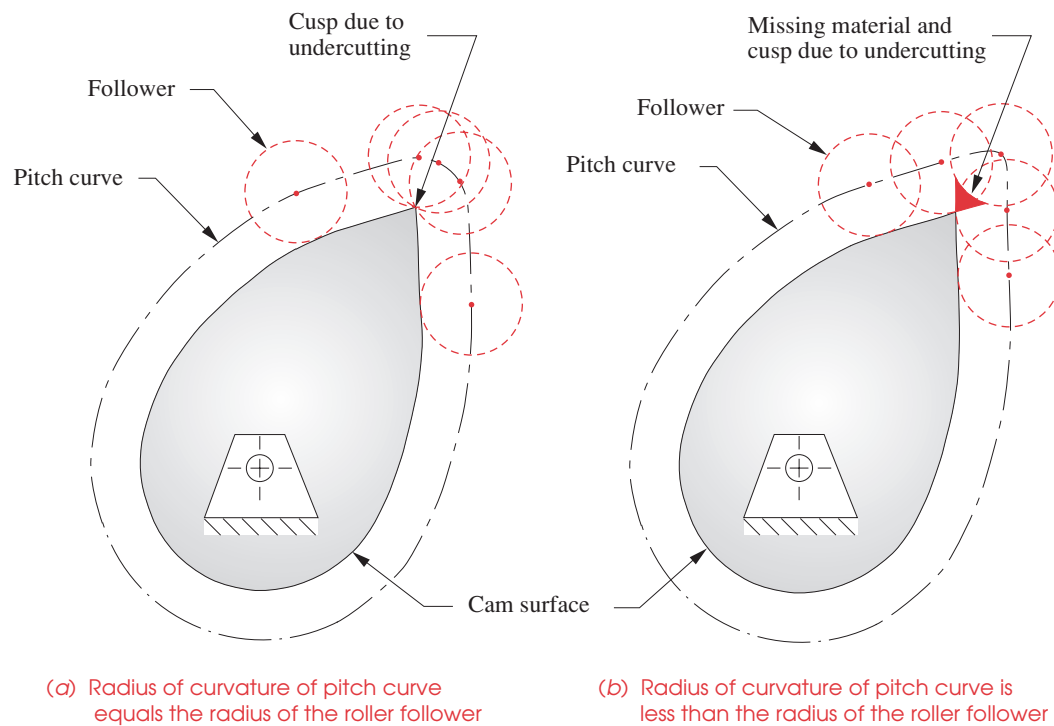


FIGURE 7-1

Base circle R_b , prime circle R_p , and pitch curve of a radial cam with roller follower

**FIGURE 7-10**

The result of using a roller follower larger than the one for which the cam was designed

**FIGURE 7-11**

Small positive radius of curvature can cause undercutting