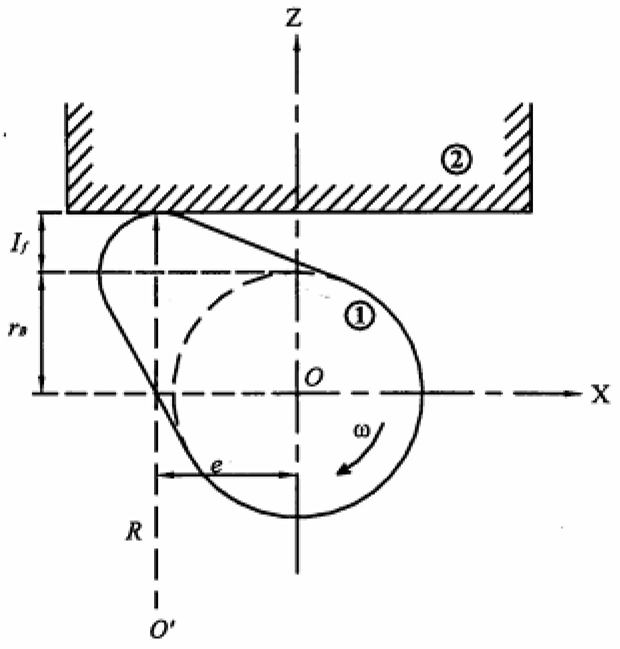

Figure 2.2. View of the cam and follower contact.

The follower can only move along the 'Z' axis, thus its velocity along the 'X' axis is zero. The acceleration can be similarly calculated as

$$a = \frac{d^2 I_f}{dt^2} = \omega \frac{de}{dt} \qquad 2.2$$

where e = eccentricity and I_f = cam lift

The entraining velocity of the lubricant is defined as the mean of the two surface velocities and is expressed as,.

$$V_e = \frac{1}{2}\left((u_1 - u) + (u_2 - u)\right)$$

or

$$V_e = \frac{1}{2}\left(V_C + V_f\right) \qquad 2.3$$

where

u is the velocity of the contact expressed as $\frac{-de}{dt}$. The negative sign indicates a decrease in distance 'e' as the point moves in the X direction, figure 2.2.

u_1 is the velocity of the cam at the point of contact and is given by,

$u_1 = \left(r_b + I_f\right)\omega$

u_2 is the velocity of the follower at the point of contact, which in this case is zero.

Thus the velocity of contact point with respect to the follower in X direction ,

$$V_f = u_2 - u = \frac{de}{dt} = \frac{a}{\omega} = \omega\frac{d^2 I_f}{d\theta^2} \qquad 2.4$$

Also the velocity of contact point with respect to cam in X direction,

$$V_C = u_1 - u = \left(r_b + I_f\right)\omega + \frac{de}{dt}$$

or $$V_C = \left[\left(r_b + I_f\right) + \frac{de}{d\theta}\right]\omega \qquad 2.5$$

As

$$\frac{de}{dt} = \frac{de}{d\theta}\frac{d\theta}{dt} = \frac{de}{d\theta}\omega \qquad 2.6$$

From equation 2.4 and 2.6

$$\frac{de}{d\theta} = \frac{d^2 I_f}{d\theta^2}$$

Hence equation 2.5 becomes

$$V_C = \left[r_b + I_f + \frac{d^2 I_f}{d\theta^2}\right]\omega \qquad 2.7$$

For flat faced follower the instantaneous radius of curvature is given by

$$R = \frac{V_C}{\omega}$$

Substituting equation 2.7 in the above equation, the instantaneous radius of curvature of a point moving along the cam is given by,

$$R = \frac{d^2 I_f}{d\theta^2} + I_f + r_B \qquad 2.8$$

The sliding velocity can be calculated as,

$$V_s = V_C - V_f$$

$$I = \left(M + \frac{1}{3} m \right) a$$

The spring force S, is equal to the product of the spring stiffness and the deflection of the spring from its free length;

$$S = k(I_f + \delta)$$

where δ is the initial displacement of the spring.

Summing loads in the vertical direction, neglecting component weight and friction

$$W = S + I$$

$$W = k\left(I_f + \delta\right) + \left(M + \frac{1}{3} m \right) \omega^2 \frac{d^2 I_f}{d\theta^2} \qquad 2.9$$

Where 'W' is the applied load at the cam/follower interface. Full details of the analysis

Where b, is the contact half width;

$$b = \left[\frac{8WR}{\pi L E'} \right]^{\frac{1}{2}} \qquad 2.21$$

The equivalent radius of curvature R is expressed as,

$$\frac{1}{R} = \frac{1}{r_c} + \frac{1}{r_f}$$

As the follower radius of curvature r_f for a flat faced follower is infinity, the term $(1/r_f)$ tends to zero. Maximum direct stress at the surface occurs at the centre of the rectangular boundary p_{max} and is expressed as,

$$p_{\max} = \frac{2W}{\pi L b} \qquad 2.22$$