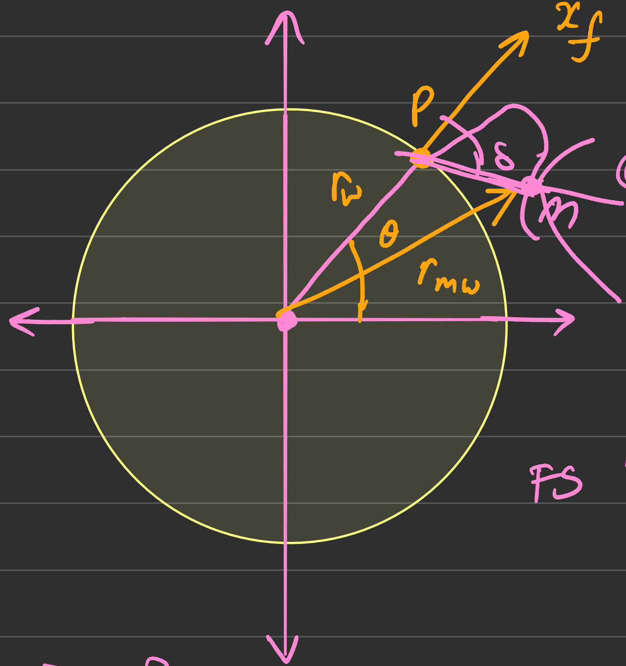


$r_w = R(\theta)\cos\theta\,\hat{i} + R(\theta)\sin\theta\,\hat{j}$

So we will try find the contact point between the FS and CS.

→ For point of contact, we need to satisfy this equation for the points coming in contact.

→ $V^{fc} \cdot n^c = 0$ — (1)

$V^{fc} \cdot n^f = 0$ — (2)

→ $V^{fc}$ is the relative velocity between the contact points of FS and CS teeth and $n^c$ is normal to tooth profile.

→ Let the angle from the rotating frame of normal be $\delta$. So coordinates are $[\cos\delta_c \hat{i} + \sin\delta_c \hat{j}.]$

So coordinates at any point on normal be $\left[ n^c = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \left[ n_c^m \right] \right]$ wrt to

↔ ground frame.

→ The velocity of M on the conjugate gear,

$$V^{MC} = \omega_c r_m$$

$$\boxed{V^{MC} = W_c \begin{bmatrix} \cos\theta_\omega & -\sin\theta_\omega \\ \sin\theta_\omega & \cos\theta_\omega \end{bmatrix} [r_{cm}]}$$

→ The velocity of point M on flexspline will be

→ $V^{mf} = V^{Of} + V^{O_f m}$

→ $V^{mf} = V^{Of} + W_f \left( B_c r_c^m - r^{O_f} \right)$

→ $v^{mf} = v^{O_f} + \omega_f \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} r_c^M - w_f r^{O_f}$

→

Hence Relative Velocity b/w CS and FS

$v^{fc} = v^{mf} - v^{mc} = v^{O_f} + w_f B_c r_c^M - w_f r^{O_f} - w_c B_c r_c^m$

$$\boxed{R(1-\omega_f)\sin(\psi_c) + \dot{s}\cos\psi_c + r_c(\omega_f - \omega_c)\sin(\phi_c - \psi_c) = 0}$$

→

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