

$$F = 1 + \frac{R_g}{R_s} + \frac{r}{\alpha} \left(\frac{\omega}{\omega_T} \right) \frac{1}{2} \frac{L}{\sqrt{6 \mu_n C_D R_s} \cdot Q^{\frac{3}{2}}}$$

✓

$$F_{ss} = 1 + \frac{R_g}{R_s} + \left(\frac{1}{2} \frac{r}{\alpha} \cdot \omega + \frac{1}{2} \frac{d\delta}{ds} \omega + |c| \sqrt{\frac{\delta r}{s}} \omega \right) \frac{1}{Q \omega_T} \\ + 2 \left(\frac{Q}{\omega_T} \right) \omega \frac{d\delta}{ds}$$

$$= 1 + \frac{R_g}{R_s} + \left(\frac{1}{2} \frac{r}{\alpha} \omega + \frac{1}{2} \frac{d\delta}{ds} \omega + |c| \sqrt{\frac{\delta r}{s}} \omega \right) \\ \times \frac{1}{\frac{L}{\sqrt{6 \mu_n C_D R_s}}} \frac{L}{Q^{\frac{3}{2}}} \\ + 2 \omega \frac{d\delta}{ds} \frac{L}{\sqrt{6 \mu_n C_D \cdot \omega \cdot R_s}} Q^{\frac{1}{2}}$$

$$\frac{\partial F}{\partial Q} = 0$$

$$\Rightarrow \left(\frac{1}{2} \frac{r}{\alpha} \omega + \frac{1}{2} \frac{d\delta}{ds} \omega + |c| \sqrt{\frac{\delta r}{s}} \omega \right) \left(-\frac{3}{2} \right) Q^{-\frac{5}{2}} \\ + \left(2 \omega \frac{d\delta}{ds} \right) \frac{1}{2} Q^{-\frac{1}{2}} = 0$$

$$\Rightarrow Q^* = \frac{\frac{3}{2} \left(\frac{1}{2} \frac{r}{\alpha} \omega + \frac{1}{2} \frac{d\delta}{ds} \omega + |c| \sqrt{\frac{\delta r}{s}} \omega \right)}{\frac{1}{2} \left(2 \omega \frac{d\delta}{ds} \right)}$$