

A diagram showing a 2D lattice with a unit cell. The unit cell is a parallelogram with side lengths  $a$  and  $b$ , and an interior angle  $\alpha$ . The lattice vectors are labeled  $\mathbf{a}$  and  $\mathbf{b}$ . The distance between nearest neighbor atoms is labeled  $S$ . The diagram also shows the reciprocal lattice vectors  $\mathbf{a}^*$  and  $\mathbf{b}^*$  and the reciprocal lattice constant  $S^*$ .

(FOR  
HEAT  
TRANSFER)

~~Column 1 :  $\left( \frac{w-d}{\epsilon} \right) + 1$~~

~~Column 2 =  $\left( \frac{w-d-(s/2)}{s} \right) + 1$~~

~~Row 1:  $\frac{1-1}{(2)(\sqrt{5}/2)^5} + 1 \Rightarrow \left(\frac{1-1}{\sqrt{35}}\right) + 1$~~

~~Row 2:  $\left( \frac{1-2-\sqrt{3}i}{2.5} \right)$~~

$$x = r \cos \omega t + \sqrt{l^2 - (r \sin \omega t)^2} = r \cos \omega t + l \sqrt{1 - (r/l \sin \omega t)^2}$$

$$\dot{x} = \frac{dx}{dt} = -r\omega \sin \omega t + l(1 - (r/l \sin \omega t)^2)^{1/2} \frac{d}{dt}(1 - (r/l \sin \omega t)^2)$$

$$\frac{d}{dt} \sin^2 \omega t = 2 \sin \omega t (-\cos \omega t) = -\sin 2\omega t$$

$$\left[ (1 - (r/l \sin \omega t)^2)^{1/2} \right]$$

$$b = - (r/l \sin \omega t)^2$$

$$\rho = 1/2$$

$$r/l < 1 \quad (r/l)^n \rightarrow 1$$

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$$\beta = 3.2$$

Stroke = 3.54"n

$$B/S = 0.85$$

$$L/R = 3.5, \quad R/L = 1/3.5 \ll 1$$

$$\Delta F = m \ddot{x}$$

$$\sum F - m\ddot{x} = 0$$

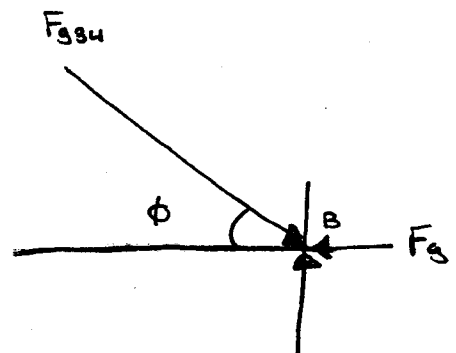
↳ inertia force

T<sub>2</sub>

↳ link force is acting  
↳ link that applies

$\hat{i}$  = unit vector in x-axis

$$A_p = \pi/4 B^2$$



$$\sum F_x = 0$$

$$\hookrightarrow F_{33k} \cdot \cos \phi = F_g \quad (1)$$

$$\sum F_g = 0$$

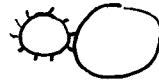
$$\hookrightarrow F_{a34} \cdot \sin \phi = F_{b14} \quad (2)$$

$$\frac{(2)}{(1)} = \ln \phi$$

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$P = T \times \omega$   
Power is rating

backlash - impact



$$\begin{array}{c} I_{13} = O_3 \quad / \quad I_{12} = O_2 \\ 3 - 2 \\ I_{23} \end{array}$$

$$N_P = 10 \quad N_G = 20$$

$$\omega_P = 100 \text{ RPM} \quad \omega_G = 50 \text{ RPM}$$

Common normal line

$$V_P = \omega_2 \overline{O_2 P} = \omega_3 \overline{O_3 P}$$

 $m_v = \text{const.}$   $P$  is Fixed point

$$\omega_3 = m_v \omega_2$$

$$\overline{O_2 P} = r_P \quad (\text{radius of pitch circle})$$

$$\overline{O_3 P} = r_g$$

$$p_c = \frac{\pi d}{N}$$

$$p_c = \frac{\pi}{N/d} = \frac{\pi}{p_d}$$

(Pitch circle)

where  $d$  = diameter of pitch circle $N$  = No. of teeth

$$p_d = \frac{N}{d} \quad \left( \frac{\text{teeth}}{\text{in}} \right)$$

→ Small number, large teeth (stronger)  
large number, small teeth (weaker)

$$m_p = 1 \quad (\text{one pair in teeth in contact})$$

$$m_p < 1 \quad (\text{brief period where there is no contact})$$

Preferred →  $m_p > 1$  (some overlapping period of contact)