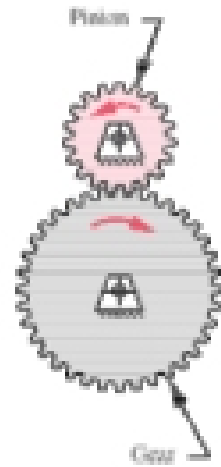


Outline

- ❖ Gear Theory
- ❖ Nomenclature
- ❖ Gear Trains



Fundamental Law of Gearing

Functionally, a gearsset is a device to exchange torque for velocity

$$P = T\omega$$

the angular velocity ratio of the gears of a gearsset must remain constant throughout the mesh

$$m_v = \frac{\omega_{out}}{\omega_{in}} = \frac{T_{in}}{T_{out}}$$

Towards the Involute Profile

A belt connecting the two cylinders



line of action, pressure angle ϕ

The Involute Profile

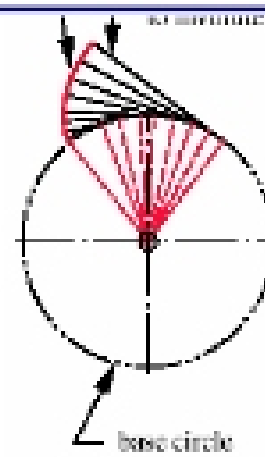
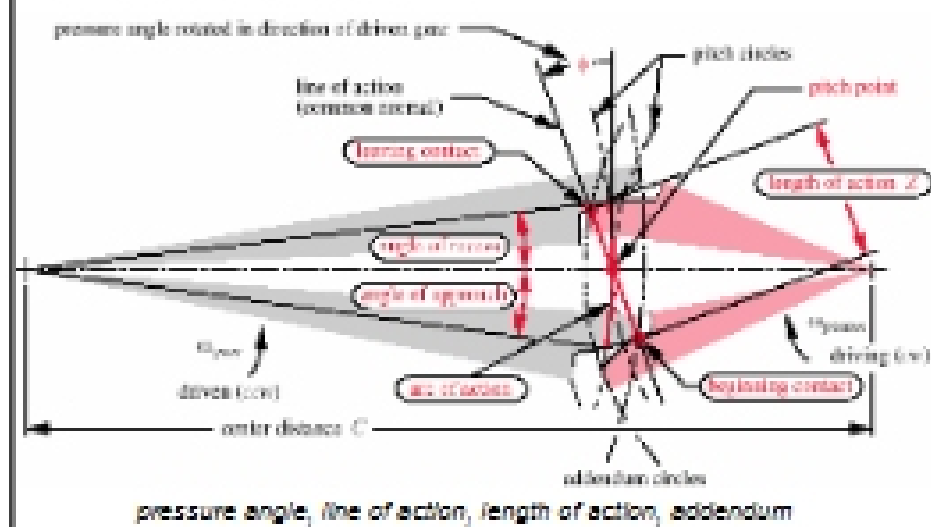


FIGURE 11-3

Meshing



pressure angle, line of action, length of action, addendum

Nomenclature

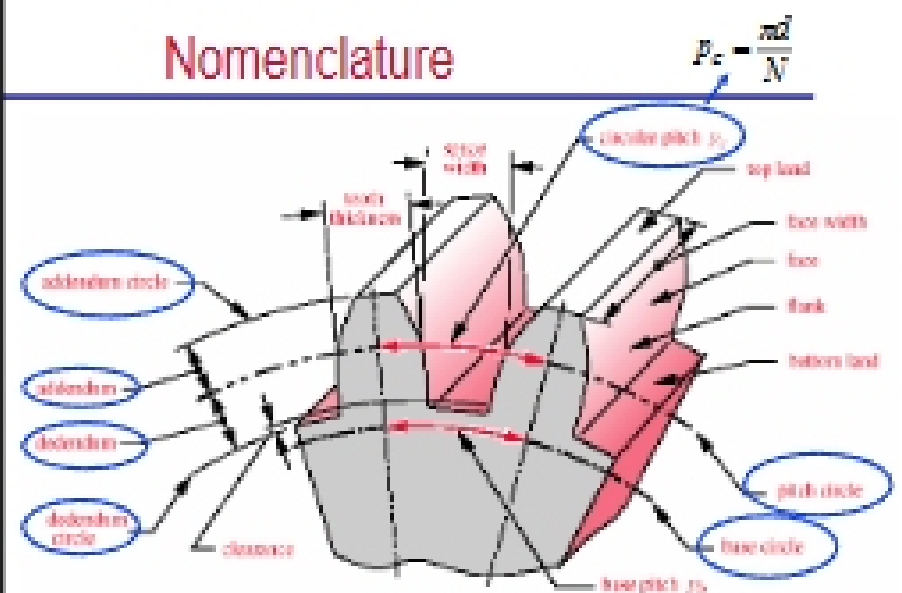


Figure 11-8

Pitches, Etc.

circular pitch (mm, in.) $p_c = \frac{\pi d}{N}$

base pitch (mm, in.) $p_b = p_c \cos \phi$

diametral pitch (teeth/in.) $p_d = \frac{N}{d}$

module (mm/teeth) $m = \frac{d}{N}$

Velocity Ratio

itches must be equal for mating gears, therefore

$$m_V = \pm \frac{r_{out}}{r_{in}} = \pm \frac{N_{out}}{N_{in}}$$

Contact Ratio

average number of teeth in contact at any one time
=

length of action divided by the base pitch, or,

$$m_p = \frac{p_d Z}{\pi \cos \phi}$$

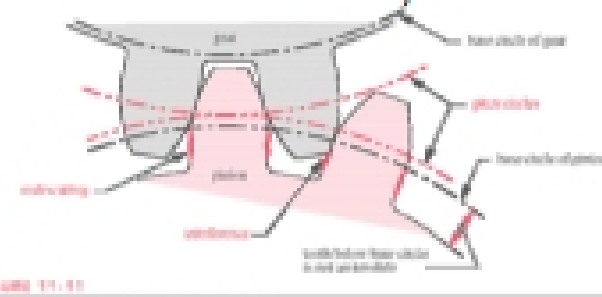
$$Z = \sqrt{(r_p + a_p)^2 - (r_p \cos \phi)^2} + \sqrt{(r_g + a_g)^2 - (r_g \cos \phi)^2} - C \sin \phi$$

where C=center distance= $(N_p+N_g)^{1/2} p_c^{1/2}$

Minimum # of Teeth

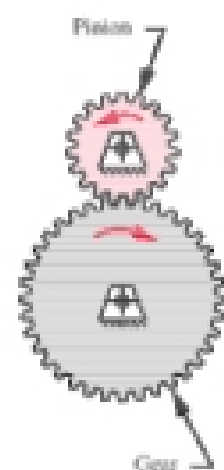
minimum # of teeth to avoid undercutting with gear and rack

$$N_{min} = \frac{2}{\sin^2 \phi}$$



Outline

- ❖ Gear Theory
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Simple Gear Trains

