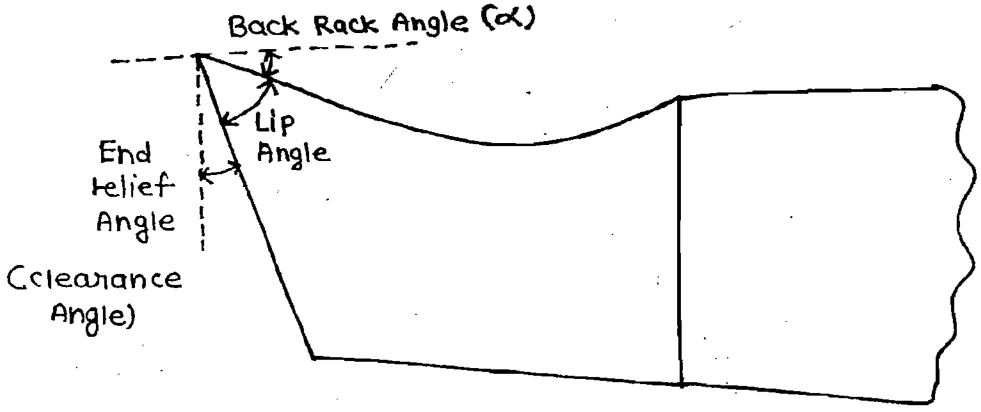
MADE EASY

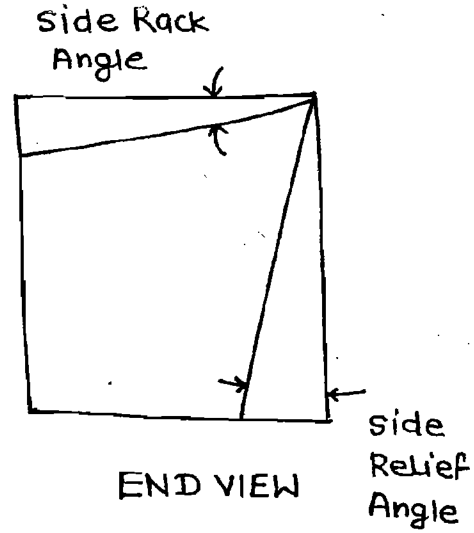
MECHANICAL ENGINEERING

METAL CUTTING

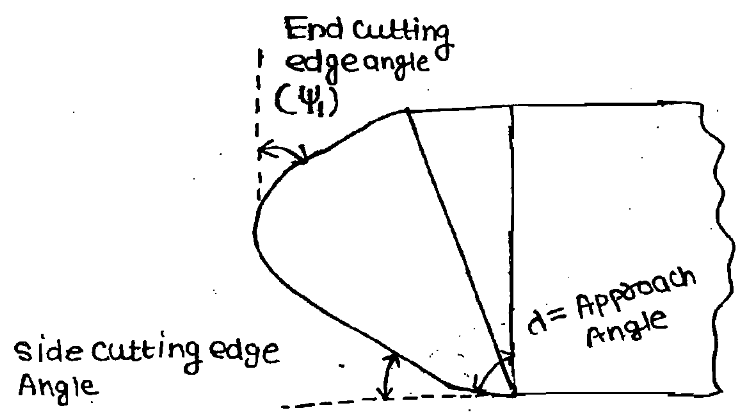
By-SWADESH Sir



ELEVATION



END VIEW

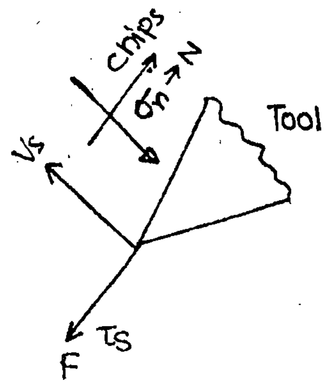


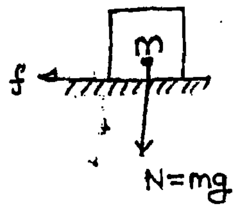
PLAN

Back Rack Angle

A Line is drawn Parallel to the tool Axis Passing through the tip of the tool, the angle this Line makes with the Rack Face is called Back Rack Angle.

This Angle is measured in a Plane Parallel to the tool Axis Perpendicular to the base Plane.





$f = \mu N$

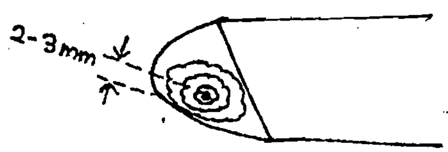
Temp. ↑ μ ↑ $\tau_s = \mu \sigma_n$

τ_s ↑ $\tau_s \not> K'$

↳ Yield strength in Shear

$\tau_s = K'$ Sticking

$\tau_s < K'$ → Slipping

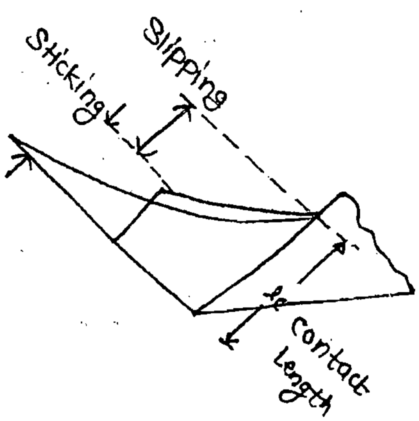


$F_c v = F_s v_s + F v_c$

- $F_c v$ ↓ Cutting energy (Total)
- $F_s v_s$ ↓ Shear Energy
- $F v_c$ ↓ Friction Energy

α ↑, l_c ↓ A ↓

F ↓



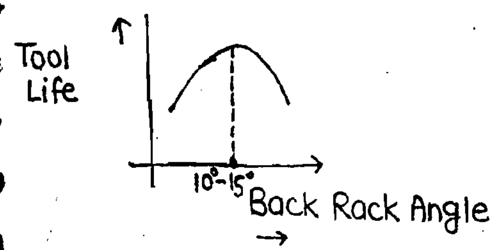
Amonton's Law

$$F = \oint_A \tau_s$$

$$N = \oint_A \sigma_n$$

Machining takes place by breaking the crystal structure of work material. The velocity with which crack is propogating inside the material is called shear velocity. As the crystals are breaking a portion of the energy comes out in the form of Heat. Increase in temperature will increase the coefficient of friction and when the shear stress becomes equal to the yield strength in shear there will be <u>sticking</u> between the two materials.

> After machining as chips are flowing over the Rack face there will be sticking between the chip and the Rack Face due to which chips continues to experience a heavy Drag. So max. temperature over the Rack Face appears 2–3mm away from the cutting edge. By increasing the back Rack Angle there will be decrease in the contact length between the chip and the Rack Face. Hence contact Area will decrease, so lesser energy will be required to overcome the friction between Rack Face and the chip. This will decrease the overall Power consumption.
>
> Secondary function of Back Rack Angle to Guide the chip Flow.



- <u>Select</u>

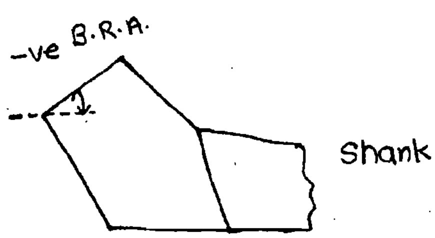
1> work-strong cu alloys (Brass & Bronze)

2> Threading or Plunge cut

(i) $\alpha = 0$

(ii) Aluminium, Pb $\alpha = 5-10^\circ$

3> carbides or ceramics $\alpha = -ve$

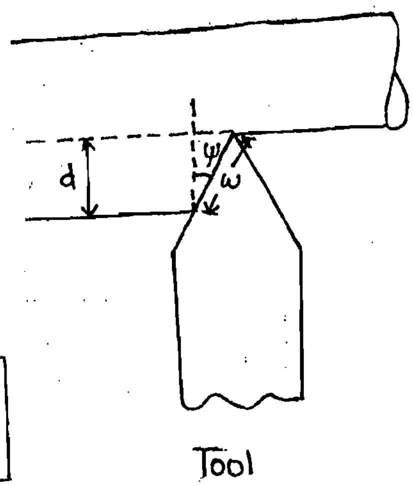


For most of the material when we cutting thread, we will 0° Rack but when we are threading extremly soft material Like Al, Build-up edge will form so we Provide 5°–10° Back Rack.

• Side cutting Edge Angle: →

It is a Angle between the side cutting edge or Principal cutting edge and the Line extending the Shank. This Angle is measured in a Plane Parallel to Base.

Width of chip: →



$\frac{d}{\omega} = \cos\psi$

$$\omega = \frac{d}{\cos\psi}$$

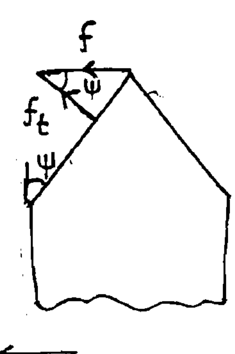
In any machining operation Width of chip is Length of Side-cutting edge covered by the chips.

In any machining operation uncut chip thickness is feed Per Cutting edge expressed Normal to the cutting edge.

f = mm/rev.

f_t = True feed = t_1

$$t_1 = f_t = f\cos\psi$$



diffusion wear → Crator