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MANUS + FACTUS

To make by
Hand

New grains are forming

Material Removal Process :→ "MACHINING"

→ Geometry, Application

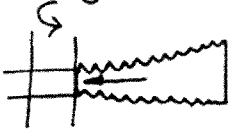
Single Point Cutting tool ←

Multi Point Cutting tool ←

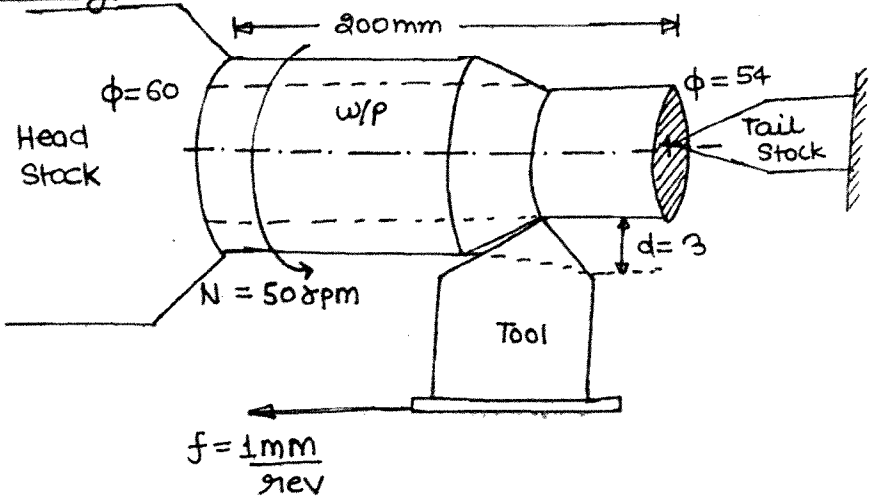
Traditional
- Turning
- Grinding
- Milling
- Broaching etc.

Non-Traditional
- ECM
- EBM
- LBM
- USM
- WIM etc

n × (Single Point Cutting tool)



- **Turning :→**

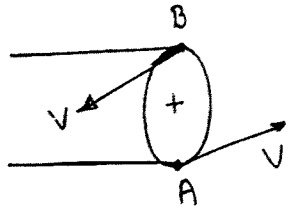


$t_m = \frac{L \rightarrow \omega/p}{V \rightarrow (D,N) \text{ ↳ } \omega/p}$

$t_m = \frac{L_e}{fN} = \frac{200}{1 \times 50} = 4 \text{ min}$

Axial Speed

where $L_e = L_{w/p}$ + Allowance



→ tangential velocity

$V = \phi(D,N)$

$V = \frac{\pi DN}{1000} \frac{m}{min}$

Q→ Evaluate the time of machining a Brass bar of dia 50mm and Length 50mm, final dia is 42 mm. Spindle speed is 450rpm feed 0.2mm/rev., depth of cut 3mm and Length of approach is 3mm.

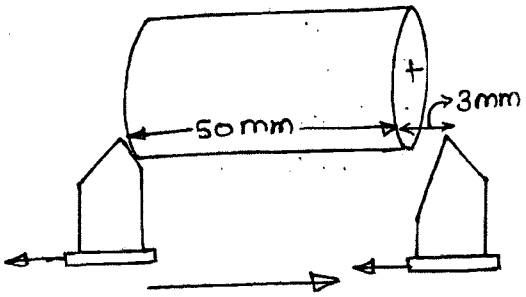
Sol→

D = 50mm
↕ d = 3mm } Roughing
D = 44 mm
↕ d = 1mm } Finishing
D = 42mm

$$t_m = \frac{L_e}{fN} \times n$$

$$t_m = \frac{53}{0.2 \times 450} \times 2$$

$$t_m = 1.177 \text{ min}$$



Rapid tool transverse = G00 (CNC code)

→

Que→ Find the machining time for a mild steel Bar of diameter 52mm which is to be reduced to 44mm dia along the length of 200mm with an approach allowance of 5mm. Cutting Parameter are as follows

Roughing Pass :- $V_{max} = 35 \text{ m/min}$, $d = 3\text{mm}$, $f = 0.3 \text{ mm/rev.}$

Finishing Pass :- $V_{max} = 50 \text{ m/min}$, $d = 1\text{mm}$, $f = 0.1 \text{ mm/rev.}$

$$N = \frac{V \times 1000}{\pi \times D_{max}}$$

$$V = \frac{\pi D N}{1000} \quad \frac{m}{min}$$

Roughing

$$N = \frac{35 \times 1000}{\pi \times 52} = 214.24 \text{ rpm}$$

$$t_{m_1} = \frac{205}{0.3 \times 214.24} = 3.189 \text{ min}$$

$t_m = t_{m_1} + t_{m_2}$

Total time (t_m) = 9.11 min

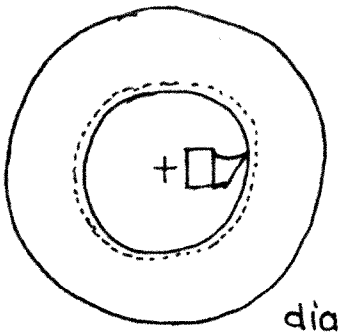
Finishing

$$N = \frac{50 \times 1000}{\pi \times 46} = 345.9 \text{ rpm}$$

$$t_{m_2} = \frac{205}{0.1 \times 346} = 5.92 \text{ min}$$

If V_{max} is given $N = \frac{V \times 1000}{\pi \times D_{max}}$

is V_{avg} is given $N = \frac{V \times 1000}{\pi \times D_{avg}}$



dia enlargement

Hollow cylinder

Internal Turning ⇒ "Boring"

L = 100mm Hollow cylinder d = 2mm V = 30m/min

30mm → 40mm f = 0.1mm/rev.

time of machining

Soln →

30
↓ d = 2
34
↓ d = 2
38
↓ d = 1
40

1st Pass

$$N = \frac{30 \times 1000}{\pi \times 32} = 298.41 \text{ rpm}$$

$$t_1 = \frac{100}{0.1 \times 298.41} = 3.35 \text{ min.}$$

2nd Pass

$$N = \frac{30 \times 1000}{\pi \times 36} = 265.25 \text{ rpm}$$

$$t_2 = \frac{100}{0.1 \times 265.25} = 3.77 \text{ min}$$

3rd Pass

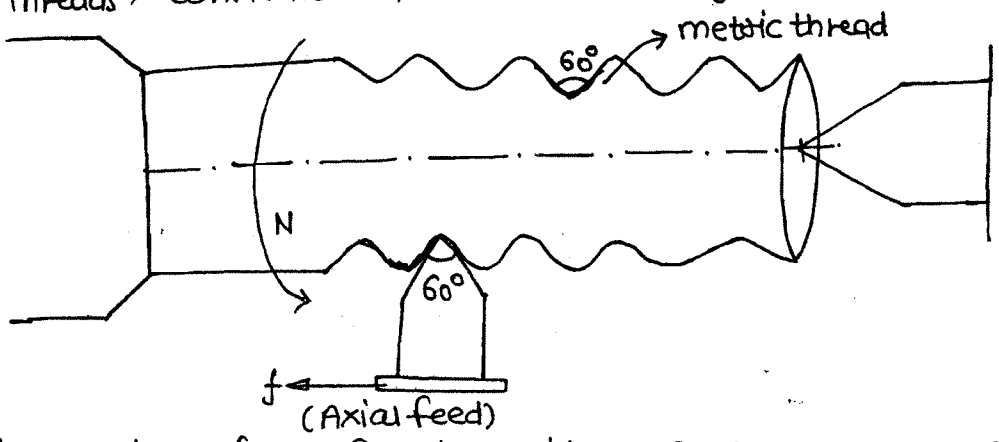
$$N = \frac{30 \times 1000}{\pi \times 39} = 244.85 \text{ rpm}$$

$$t_3 = \frac{100}{0.1 \times 244.85} = 4.08 \text{ min}$$

NOTE:→ if V is given, Calculate N at every Pass.

Threading:→

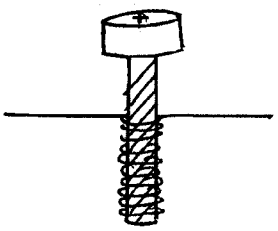
Threads→ conitinuous form of helical ridges.

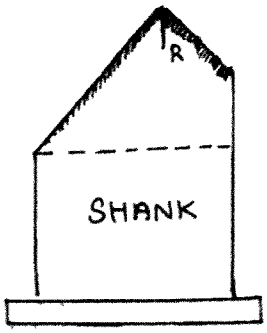


It is a continous form of helical ridges produced over a Cylinder or Frustum Externally or Internally used for motion transmission and fastening two objects.

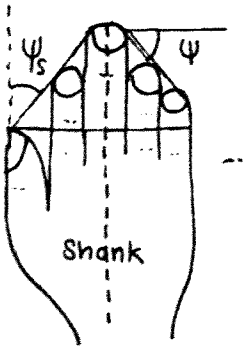
- Threads can be produced by:

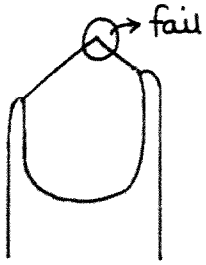
(i) Thread chasing (Lathe)
(ii) Tapping (drilling machine)
(iii) Helical milling (Form milling)
(iv) Grinding
(v) Thread Rolling (Forming)

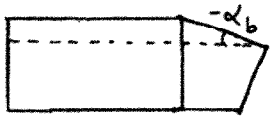




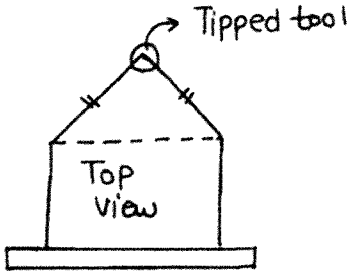
Turning







Threading tool



Threading tool

* Thread chesing: →

- The arrangement is very similar to turning operation
- High quality external threads are produced.

tools used are:

(i) Single point form tools or multi-point form tools

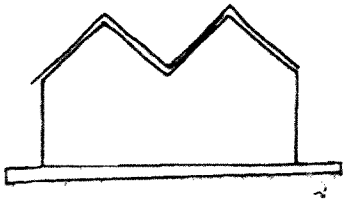
Form tool: → Shape of the tool coorresponds to the profile to be cut or produced.

↓

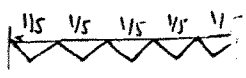
"इच्छाधारी नागिन"

Single start threading ⇒ $f = 1 \cdot P$

Double start threading ⇒ $f = 2 \cdot P$



Imp. eg. No. of threads = 5/cm



$P = \frac{1}{5} cm = 0.2 cm$

$P = 2 mm$

Q For a double start threading if Pitch value is 2mm. then feed in (mm)

Ans $f = 2 \times 2 = 4mm$

Q. To Produce a thread along a ~~10~~ 15 cm long cylindrical workpiece with approach and overe travel 0.5cm each, spindle speed is 88 rpm & No of threads per cm is equal to 3.
Find the time of threading if No. of required for M.S. = 7

GATE 2-mark

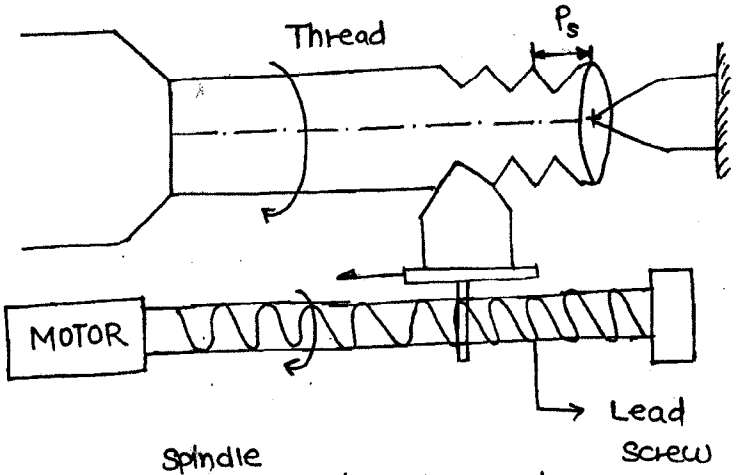
~~Sol~~

$P = \frac{1}{3} cm = 0.333cm = 3.33mm$

$L_e = 15 + 0.5 + 0.5 = 16cm$

$N = 88 rpm$

$t_m = \frac{16}{\frac{1}{3} \times 88} \times 7 = 3.81 minute$



Spindle

Screw Thread →

$N_S = 100 rpm$

$P_S = 2mm/rev.$

$\eta_S = 1$ (No. of Start)

Lead Screw ⇒ Tool

$N_L = 200 rpm$

$P_L = 1mm/rev.$

$\eta_L = 1$ (No. of Start)

$$N_S \cdot P_S \cdot \eta_S = N_L \cdot P_L \cdot \eta_L$$