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Msc Visual Nastran

22.5rpm

(

Week

Mehta .[]

Chen .[]

.[]

Kang .

.[]

Choi

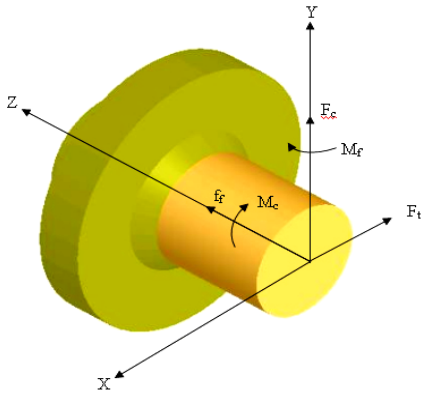
.[]

100°C

.[]

100000rpm)

[] (



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Visual Nastran

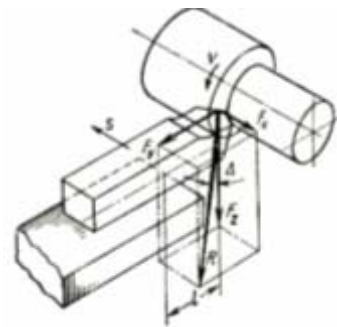
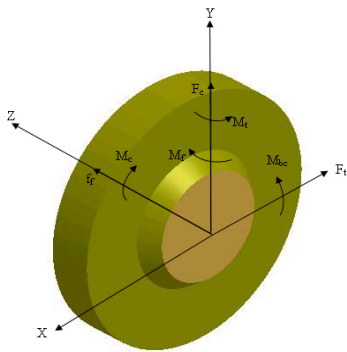
$$M_c = F_c \times \frac{D_2}{2}$$

()

$$M_f = F_f \times \frac{D_2}{2}$$

()

()



:Fx

:Fz

:Fy

:D

$$M_t = F_t \cdot L$$

()

$$M_{bc} = F_c \cdot L$$

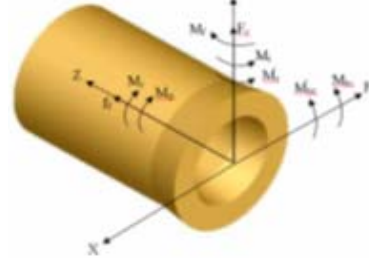
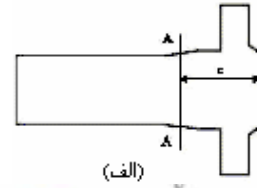
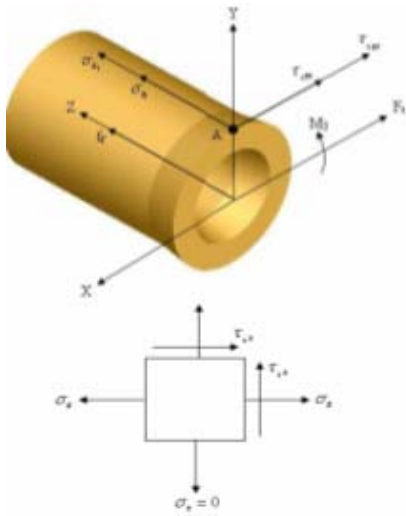
()

[]

L

$$M_\varphi \quad ()$$

: A



()

() () A-A :

$$\tau_{1zx} = \frac{4 F_c}{3 A}$$

()

$$M'_t = F_t \times C$$

()

$$\sigma_{z1} = \frac{f_f}{A}$$

()

$$M'_{bc} = F_c \times C$$

()

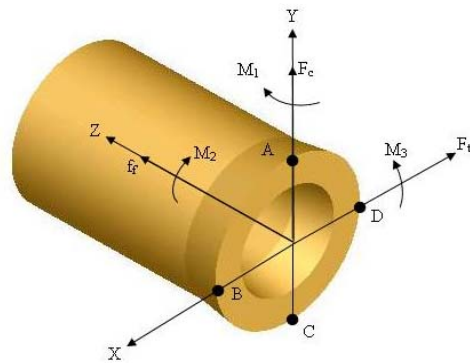
$$\sigma_{z2} = \frac{M_3 C}{I} = \frac{M_3 (\frac{d_o}{2})}{\frac{\pi}{64} (d_o^4 - d_i^4)}$$

()

:()

$$\tau_{2zx} = \frac{Tr}{j} = \frac{M_2 (\frac{d_o}{2})}{\frac{\pi}{32} (d_o^4 - d_i^4)}$$

()



Z

M₃

F_t

M₂

d_i

d_o

σ_{z1}

σ_{z2}

τ_{1zx}

τ_{2zx}

$$M_1 = M_f + M_t + M'_t$$

()

$$M_2 = M_c + M_\varphi$$

()

$$M_3 = M_{bc} + M'_{bc}$$

()

$$\sigma_z(\text{total}) = \frac{f_f}{A} + \frac{M_3 (\frac{d_o}{2})}{\frac{\pi}{64} (d_o^4 - d_i^4)}$$

()

$$P = -AE\alpha\Delta T$$

()

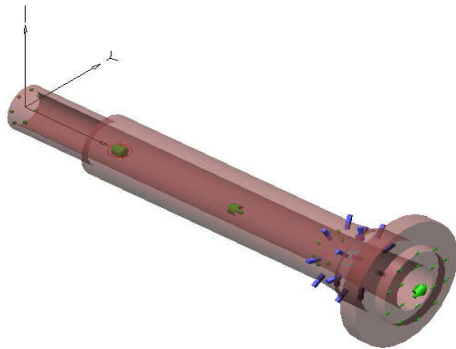
$$\sigma_T = \frac{P}{A} = -E\alpha\Delta T$$

()

Visual Nastran

Solid Works

Visual Nastran



()

$$\tau_{zx}(total) = \frac{4 F_t}{3 A} + \frac{M_2(\frac{d_o}{2})}{\frac{\pi}{32}(d_o^4 - d_i^4)}$$

()

$$\sigma_{1,2} = \frac{\sigma_x + \sigma_z}{2} \pm \sqrt{(\frac{\sigma_x + \sigma_z}{2})^2 + (\tau_{zx})^2}$$

()

$$\sigma_1 = \frac{\sigma_z}{2} + \sqrt{(\frac{\sigma_{xz}}{2})^2 + (\tau_{zx})^2}$$

()

$$\sigma_2 = \frac{\sigma_z}{2} - \sqrt{(\frac{\sigma_{xz}}{2})^2 + (\tau_{zx})^2}$$

()

: σ_1

: σ_2

B A

(Z) A M_3
 (Z) B

B A

A B,C,D

$$\Delta T L$$

$$\delta_T$$

: []

$$\Delta T$$

$$\delta_T = \alpha(\Delta T)L$$

()

α

$$\delta_T$$

$$\epsilon_T = \delta_T / L$$

:

$$\epsilon_T = \alpha \Delta T$$

()

ϵ_T

()

:

$$\delta = \delta_T + \delta_P = \alpha(\Delta T)L + \frac{PL}{AE} = 0$$

()

$$(f_c, f_t, f_a)$$

$$(U_x, U_y, U_z)$$

()

$$(M_1, M_2, M_3)$$

$$F_c = \frac{\tau_s A_c \cos(\beta - \gamma_{ne})}{\sin \phi \sin(\phi + \beta - \gamma_{ne})}$$

()

$$F_t = F_c \tan(\beta - \gamma_{ne})$$

()

$$F_a = \frac{P_f}{\nu}$$

()

: γ_{ne}

: F_c

: τ_s

: F_t

: P_f

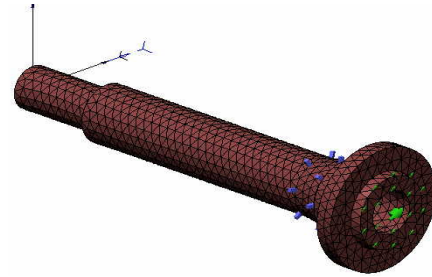
: F_a

: ν

: β

: ϕ

: A_c



()

L=300mm

D=100mm

	Steel 4340	210 (Gpa)	$\nu=0.3$
n (rpm)	22.5 , 255 , 355 , 1000 , 2000		
(mm/rev)	0.2 , 0.3 , 0.4 , 0.5 , 0.6		
a_p (mm)	1 , 2 , 3 , 4 , 5		

$$\delta T_2 \quad \delta T_1 \quad \text{rpm}$$

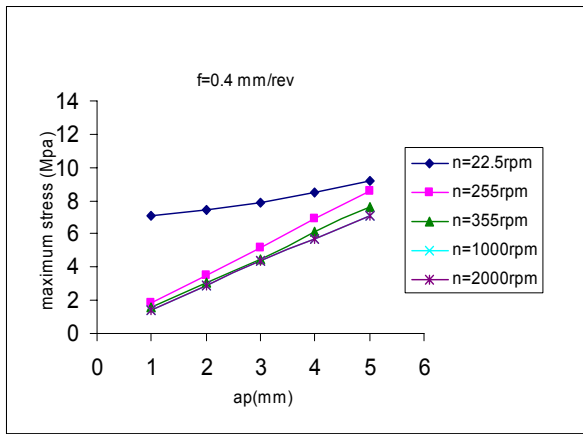
: []

$$\delta T_1 = -1.03 \times 10^{-9} \omega^3 + 9.25 \times 10^{-6} \omega^2 - 6.84 \times 10^{-3} \omega - 1.24 \times 10^{-1}$$

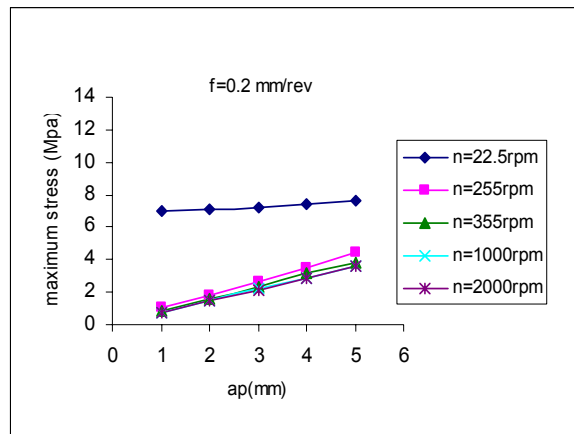
()

$$\delta T_2 = -1.01 \times 10^{-9} \omega^3 + 6.01 \times 10^{-6} \omega^2 - 4.59 \times 10^{-3} \omega - 5.37 \times 10^{-2}$$

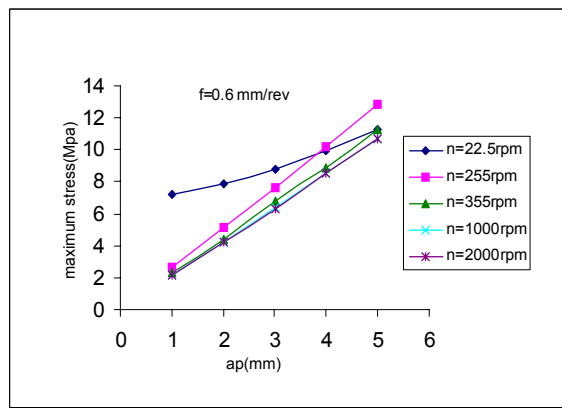
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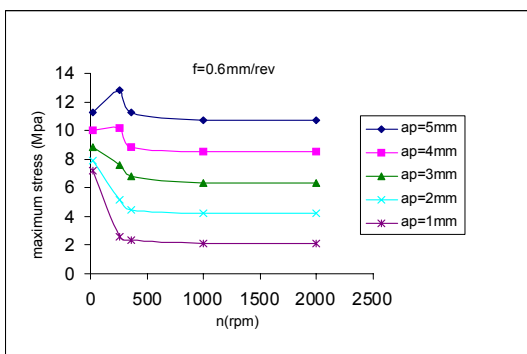
(b)



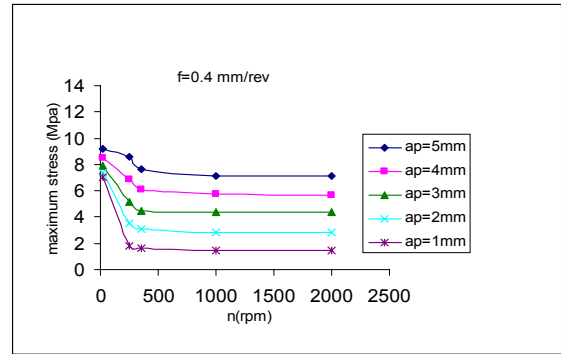
(a)



(c)



(b)



(a)

(a)
 (b)
 ()
 ()

(b)
 (a) $n=255rpm$ $f=0.6mm/rev$
 (n=255rpm)
 (n=255rpm)
 ,300mm)
 ,1500mm 900mm ,500mm
 : ,600mm , 1200mm
)
 (a,b,c)
 (a,b)

(a,b,c)
 $n=255rpm$
 ()
 :
 -
 - ()
 -

$n = 22.5 rpm$

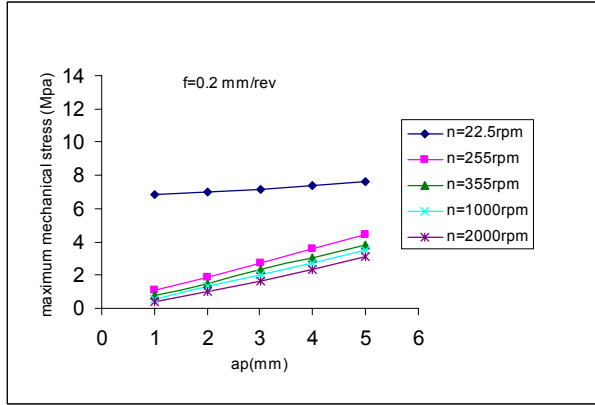
()
 ()
 (a)
 (b)

(255,355,1000,2000)

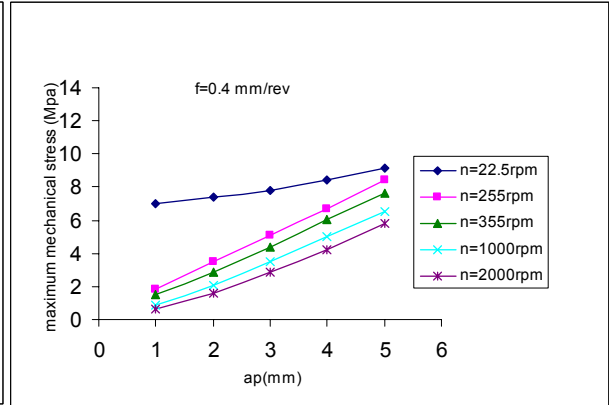
$n = 255rpm$

22.5 rpm

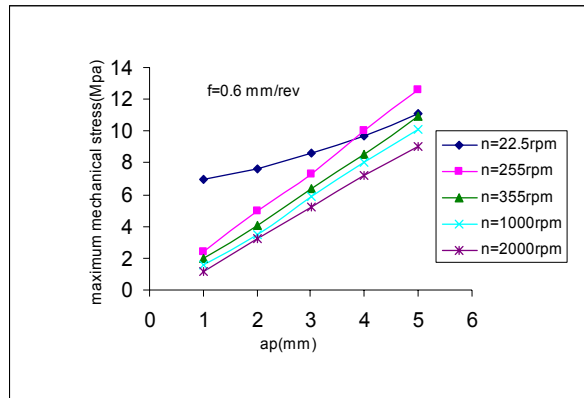
(1000,2000 rpm)



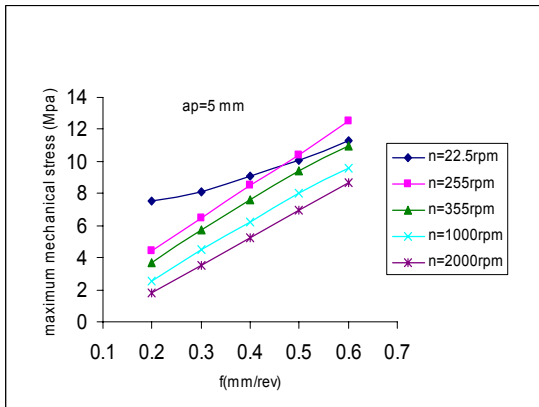
(a)



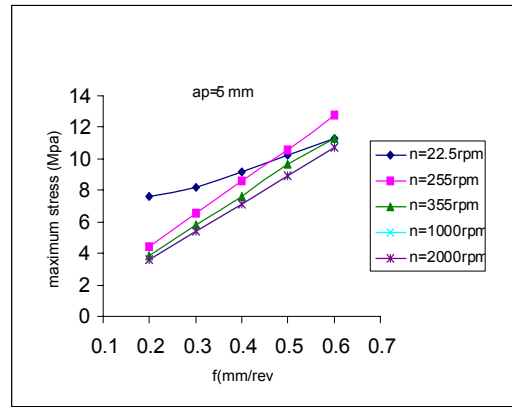
(b)



(c)



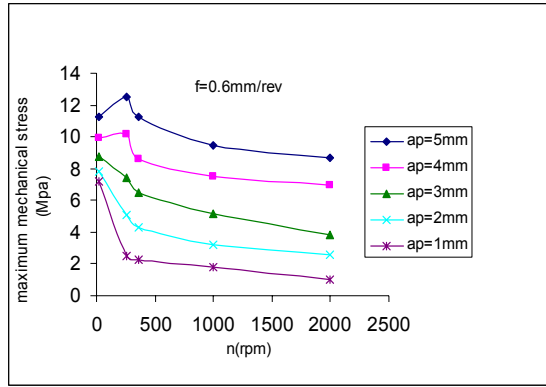
(b)



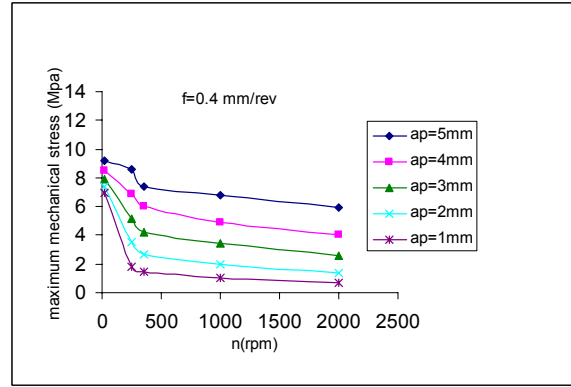
(a)

(b)

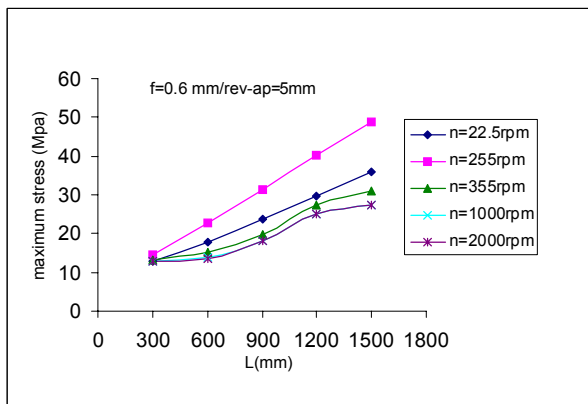
(a)



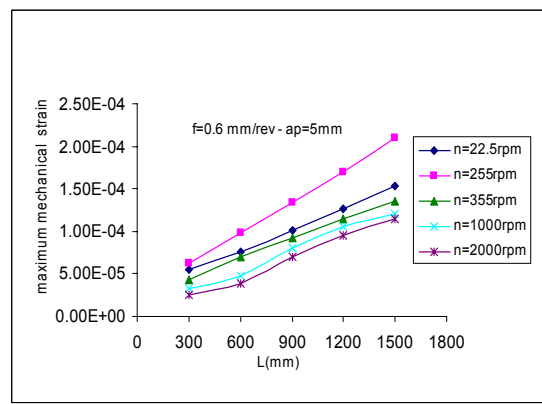
(b)



(a)



(b)



(a)

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