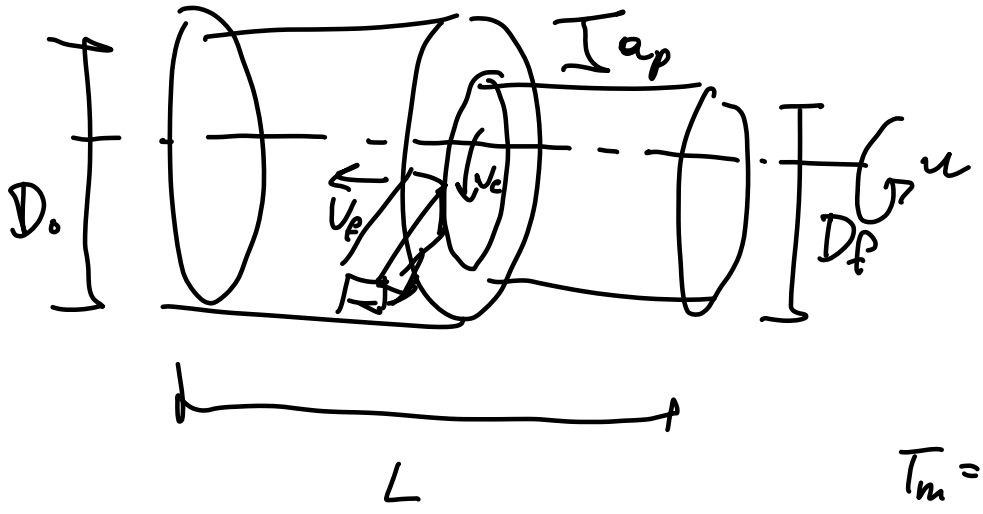


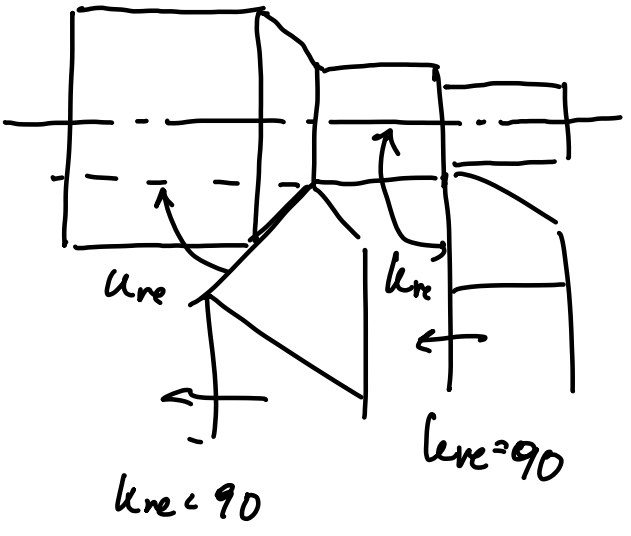
$$n = \frac{v_c}{\pi D_0}$$

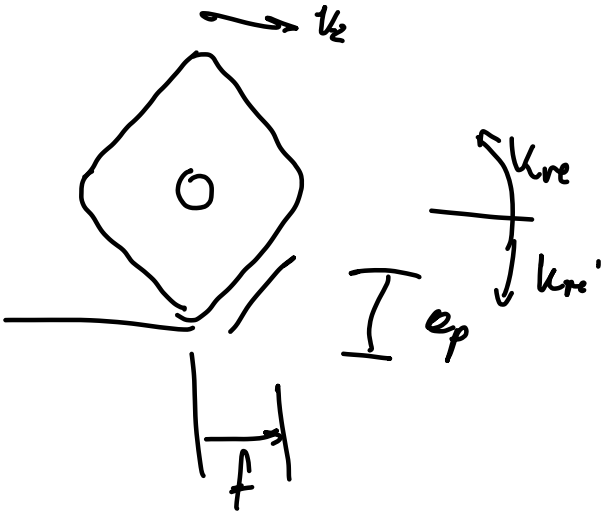
$$D_f = D_0 - 2a_p$$

$$v_f = n \cdot f$$

$$T_m = \frac{L}{v_f}$$

$$Q = v_c \cdot f \cdot a_p$$





$$A_D = f \cdot a_p = h_D \cdot b$$

$$h_D = f \cdot \sin\kappa_{re}$$

$$v_c = \frac{\pi D_0 A}{1000} \qquad v_f = nf$$

$k_c = \frac{F_c}{A_D}$ → Forza di taglio
→ Sezione truciolo indeformato

↓
Pressione di taglio

$k_c = \frac{k_{cs}}{h_D^x}$ → Pressione di taglio
→ esponente di taglio

$k_c = \frac{k_{cs}}{f^x \sin\kappa_r^x} = \frac{k_{cs}}{f^x}\left(\frac{1}{\sin\kappa_r}\right)^x$

$F_c = k_c f a_p$

$= k_{cs} f^{1-x} a_p \left(\frac{1}{\sin\kappa_r}\right)^x$

$k_{c0,4}$ → $f = 0,4$ mm/giro
$\kappa_r = 90°$

$k_{c0,4} = \frac{k_{cs}}{0,4^x}\left(\frac{1}{\sin(90)}\right)^x = \frac{k_{cs}}{0,4^x}$ → $k_{cs} = k_{c0,4} \cdot 0,4^x$

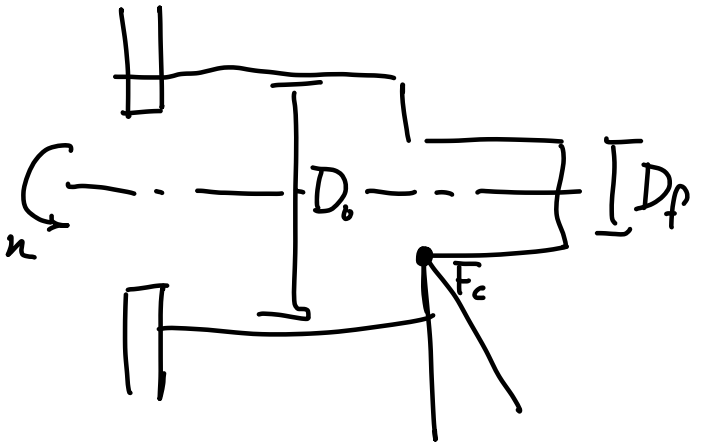
$F_c = k_{c0,4} \cdot 0,4^x f^{1-x} a_p \left(\frac{1}{\sin\kappa_r}\right)^x$

$P_c = F_c v_c = k_c \underbrace{f a_p v_c}_{Q} = k_c \cdot Q$

Verifica di mandrino

$M_c = F_c \cdot \frac{D_f}{2}$ ← Perché effettivamente è dove lavoriamo

↑
Momento di taglio



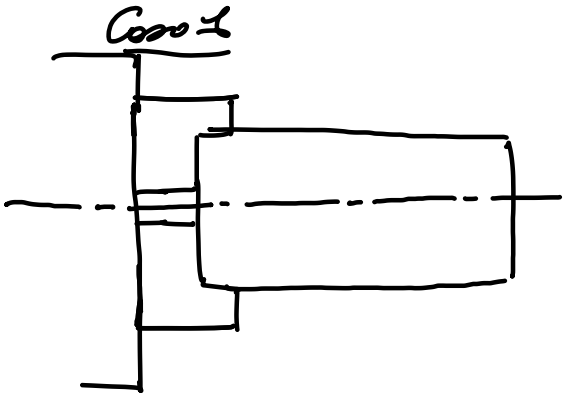
n° griffe Area di contatto Diametro di alberaggio

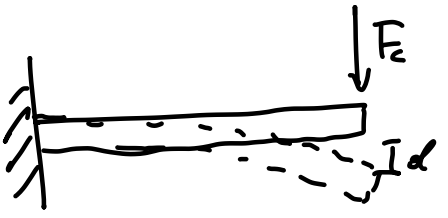
$M_r = \frac{1}{2} \mu p A D$

Coeff. attrito Pressione

Verifica di flessione

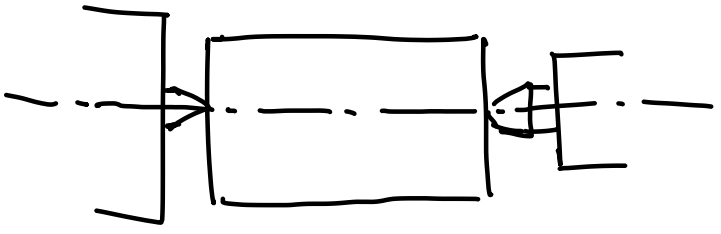
Caso 1

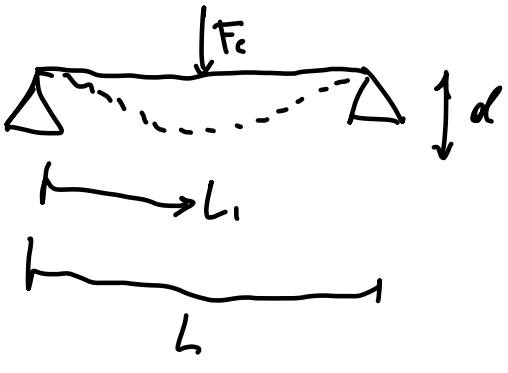




$$d = \frac{1}{3} \frac{F_c L}{E J} \qquad J = \frac{\pi D^4}{64}$$

Caso 2 → Puntone Contropunta

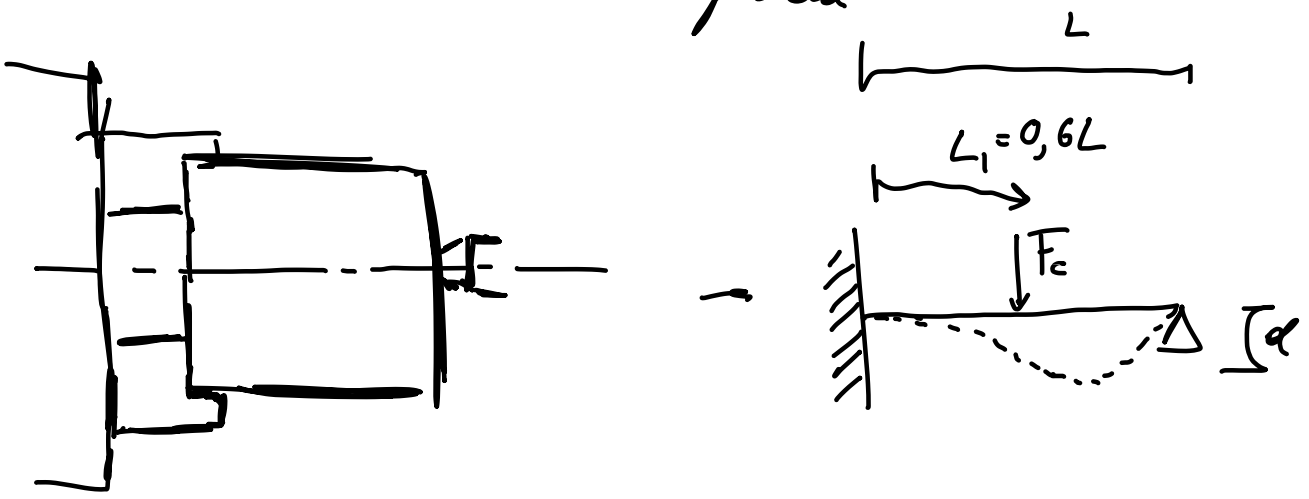




$$L_1 = \frac{L}{2}$$

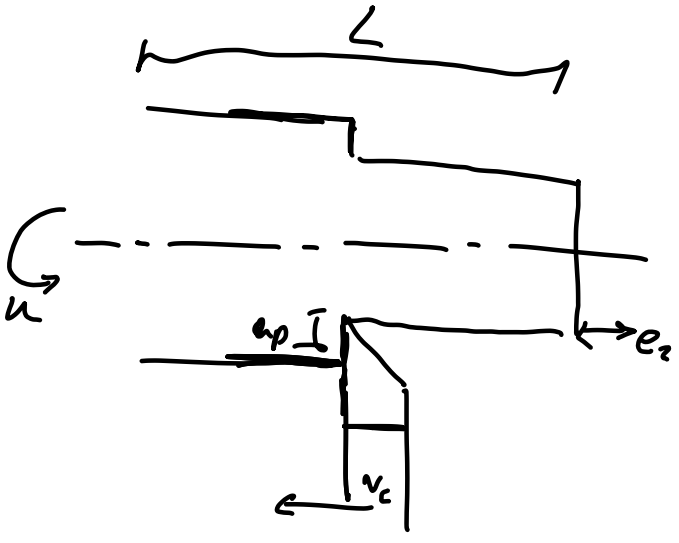
$$d = \frac{1}{48} \frac{F_c L}{E J}$$

Caso 3 → Autocentrate - Contropunta



$$d = \frac{1}{107}\frac{F_c L}{EJ}$$

Esercizio 1



	① Sgrossature	② Finiture
a_p	3 mm	0,5 mm
f	0,4 mm	0,8 mm/giro
k_{re}	45°	90°
v_c	290 m/min	420 m/min

$L_{TOT} = L + e_1 + e_2 + s$

$e = 2mm$

$P_c = F_c v_c$

① $k_c = \frac{k_{c0,4}}{f^{0,4}} \left(\frac{1}{\sin k_{re}}\right)^x = 2270\ MPa$

② $k_c = 2386\ MPa$

① $F_c = k_c b_1 a_{p_1} = 2664\,N$

② $F_c = k_c f_2 a_{p_2} = 215\,N$

① $P_c = \frac{F_c \cdot V_c}{60 \cdot 1000} = 12,9\,kW$

② $P_c = \frac{F_c \cdot V_c}{60 \cdot 1000} = 1,5\,kW$

$T_m = \frac{L + e'}{v_f} = \frac{L+e}{f \cdot n}$ (e' extracorsa)

$n = \frac{V_c}{\pi D_0}$

① $n = 4615 \frac{giri}{min}$

$D_f = D_0 - 2a_p$

② $n_2 = \frac{V_c}{\pi D_f} = 9549 \frac{giri}{min}$

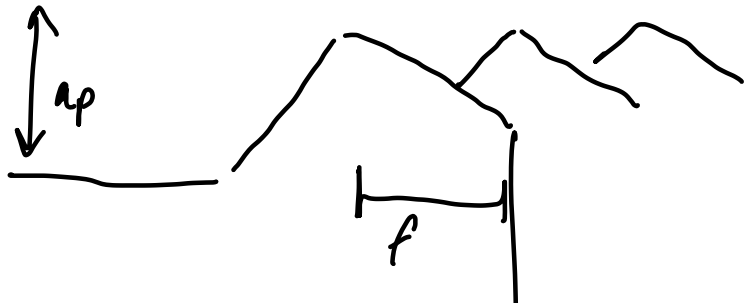
Perché il processo è di finitura, lavoro a D_f

$T_{m1} = \frac{L + s + e_2 + e_1}{f_1 n_1} = 0,025\,min = 1,5\,s$ ($s = a_p$, $s_2 = a_{p_2}$)

$T_{m2} = \frac{L + s_2 + e_{ingresso} - e_{uscita}}{}$

Richiamo rugosità

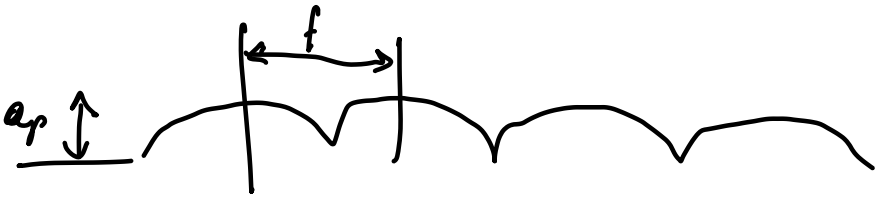
Utensile con raggio di punta nullo



$R_{MAX} = \frac{f \cdot 10^3}{\cot(k_{rc}) + \cot(k_{rc}')}$

Utensile $R_a = \frac{R_{MAX}}{4} =$

Utensile con raggio di punta r_ε



$$R_{MAX} = \frac{f^2}{8 r_\varepsilon} \cdot 10^3$$

$$R_{MEDIA} = \frac{f^2}{32 r_\varepsilon} \cdot 10^3$$

Esercizio 2

$D_0 = 20\,mm$ $\quad k_{c0,4} = 2100\,MPa$

$L = 150\,mm$ $\quad m = 0{,}16$

$v_c = 220\,m/min$ $\quad E = 206000\,MPa$

$F = 0{,}12\,mm/giro$ $\quad A = 150\,mm$

$k_{re} = 35°$

$r_\varepsilon = 0{,}4\,mm$

$$k_c = \frac{k_{c0,4}\, 0{,}4^x}{f^m} \left(\frac{1}{\sin k_{re}}\right)^m = 2783\,MPa$$

$$F_c = k_c \cdot f \cdot a_p = 167$$

$$P_c = \frac{F_c \cdot v_c}{60 \cdot 1000} = 0{,}6\,kW$$

$$R_a = \frac{f^2}{32 r_\varepsilon} = 1{,}12\ \mu m$$

$$D_f = D_0 - 2a_p$$

$$M_c = \frac{F_c D_f}{2} = 1587\ Nm$$

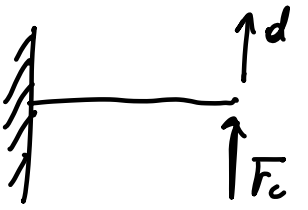
$$M_r = 3\mu p A D_0 =$$

$$M_r > M_c$$

$$p > \frac{M_c}{3\mu A D}$$

$$p > 2{,}3 \frac{N}{mm^2}$$

$$F = pA = 352$$



$$J = \frac{\pi D_0^4}{64} = 7854\ mm^4$$

$$d = \frac{1}{3}\frac{FL}{EJ} = 0{,}12\ mm$$

Per la tornitura è alto quindi si dovrebbe cambiò ad un sistema con meno deflessione

Esercizio 3

Sgrossatura Finitura

$D_0 = 36\ mm$ f $0{,}2\ mm/giro$

$D_p = 31\ mm$

$R_a = 1{,}6\ \mu m$

$P = 4{,}5\ kW$ $\eta = 80\%$

$n_{max} = 2500\ giri/min$

$r_\varepsilon = 0{,}4\ mm$

$\psi_R = 90°$