

22/06/09

Ex m1

$$P_m = 690 \text{ N/mm}^2$$

$$\frac{1}{m} = 0,187$$

$$\alpha = 5^\circ \parallel \rightarrow \beta = 90^\circ$$

$$\gamma = -5^\circ$$

$$P_H = 8 \text{ KW} \quad \eta = 0,9$$

$$F_{t \max} = 1500 \text{ N}$$

$$D_i = 800 \text{ mm}$$

$$d_f = 90 \text{ mm}$$

numero punte?

$$F_t? \quad P_m?$$

$$m = 860 \text{ gr/mm}$$

$$e = 0,2 \text{ mm/gru}$$

$$K_s = 2,4 P_m^{0,454} \beta^{0,96} \text{ da N/mm}^2$$

$$S = 5 \text{ mm}$$

$$P_m(\max) = \cancel{1500} 7,2 \text{ KW}$$

$$K_s = 2812,5 \text{ N/mm}^2$$

Calcolo la max prof. di punte reale

$$\text{con } F_{t \max} \Rightarrow P_m = \frac{F_{t \max}^{1,1}}{K_s} \cdot \pi D_i m = \underline{6,75 \text{ KW}}$$

(Il vincolo sulle $P_m(\max)$ è sempre rispettato, quello con $F_{t \max}$).

Il vincolo da rispettare è quello sulle forze di taglio

$$F_{t \max} = K_s (e P_m)^{\frac{1}{m}} \Rightarrow P_m = \left(\frac{F_{t \max}}{e K_s} \right)^{\frac{1}{1-m}} \cdot \frac{1}{e} = 2,29 \text{ mm}$$

Imponendo la $P_{FIN} = 0,5 \text{ mm}$

$$\text{numero punte} \quad \frac{(S - P_{FIN})}{P_{m \max}} = 1,96 \Rightarrow 2 \text{ punte di spessore da } P = \underline{2,25 \text{ mm}}$$

① Sytoss. $P = 2,25 \text{ mm}$
 $e = 0,2 \text{ mm/gru}$
 $m = 860 \text{ gr/mm}$

$$F_{t①} = K_s (e P)^{0,903} = \underline{1481 \text{ N}}$$

$$P_{m①} = F_{t①} \cdot \pi D_i \cdot m = \underline{6,67 \text{ KW}}$$

② Sytoss. $P = 2,25 \text{ mm}$
 $e = 0,2 \text{ mm/gru}$
 $m = 860 \text{ gr/mm}$

$$F_{t②} = 1481 \text{ N}$$

$$P_{m②} = F_{t②} \cdot \pi (D_i - 2P_i) \cdot m = \underline{6,37 \text{ KW}}$$

③ finitree $P = 0,5 \text{ mm}$
 $e = 0,2 \text{ mm/gru}$
 $m = 860 \text{ gr/mm}$

$$F_{t③} = 443 \text{ N}$$

$$P_{m③} = F_{t③} \cdot \pi (D_i - 4P_i) \cdot m = \underline{1,82 \text{ KW}}$$

Ex m 2 Molo e semplice effetto

$$E = 45 (700^\circ) \Rightarrow \rho = 25 \text{ kg/mm}^3$$

$$A = 28000 \text{ mm}^2$$

$$s = 5 \text{ mm}$$

$$P_i = 30000 \text{ kg}$$

$$P_e = 1500 \text{ kg}$$

$$h = ?$$

$$\left\{ \begin{array}{l} L_f (\text{spinta}) = ? \\ L_i = ? \\ s_i = ? \\ F_{d, \max} = ? \\ F_d = ? \end{array} \right.$$

$$L_m = \frac{\rho A s}{1000} = 3500 \text{ kgm}$$

$$L_d = P_e h \left(1 - \frac{P_e}{P_i} \right) = L_m$$

$$P_e h \left(1 - \frac{P_e}{P_i} \right) = 3500 \text{ kgm}$$

$$h = \frac{3500}{P_e \left(1 - \frac{P_e}{P_i} \right)} = 2,46 \text{ m}$$

$$L_f = P_e h = 3690 \text{ kgm} \quad (\text{lavoro fornito ad ogni colpo})$$

$$L_i = \frac{P_e^2}{P_i} h = 185 \text{ kgm} = P_e h \left(\frac{P_e}{P_i} \right) = L_f \frac{P_e}{P_i} \rightarrow (\text{lavoro assorbito dall'incudine})$$

$$s_i = \left(\frac{P_e}{P_i} \right)^2 h = 6,15 \text{ mm} = \frac{L_i}{P_i} \rightarrow (\text{spostamento nominale dell'incudine})$$

$$F_d = \frac{L_d}{s} = 700 \text{ tn} = 700000 \text{ kg} \quad (\text{forza di deformazione})$$

$$F_{d, \max} = \frac{L_f - L_i}{s_i} = 570000 \text{ kg} \quad (\text{forza disponibile al termine della lavorazione})$$

$$s_i > s ??$$

forza
simple
effetto

19/07/08 (2)

m 1

$$P_H = 6 \text{ Kw}$$

$$\eta = 0,9$$

$$\left(\frac{1}{m} = 0,177 \right)$$

$$P_m = ? \quad R_m = 250 \text{ N/mm}^2 \quad l = 30 \text{ mm} \quad D = 60 \text{ mm}$$

$$z = 8 \quad m = 650 \text{ g-zi/min} \quad e = 0,5 \text{ mm/zi} \quad P = 4 \text{ mm}$$

$$\beta = 84^\circ \quad K_S = 2,4 R_m^{0,454} \beta^{0,666} \text{ da N/mm}^2$$

$$K_S = 1979 \text{ N/mm}^2$$

$$P_m = K_S \left(z \sqrt{\frac{P}{D}} l \cdot \frac{e}{z} \right)^{\left(\frac{1-1}{m} \right)} \cdot \frac{\pi D m}{60 \cdot 1000} = 3,9 \text{ Kw}$$

$v_t = 206 \text{ m/s}$

$$P_m \leq \eta P_H \quad \boxed{\text{OK}}$$

m 2

$$P_F = ?$$

$$F_{\text{res}} 800^\circ\text{C} \rightarrow \rho = 30 \text{ Kg/mm}^3$$

$$A = 25 \cdot 1000 \text{ mm}^2$$

$$s = 5 \text{ mm}$$

$$P_i = 60 \cdot 1000 \text{ Kg}$$

$$P_c = 2000 \text{ Kg}$$

$$h = 9,5 \text{ m} \rightarrow \eta = 0,9$$

$$\text{Il lavoro nec. } L_m = \frac{\rho A \cdot s}{1000} = 3750 \text{ Kg.m}$$

$$L_d = (P_c + F) \left(1 - \frac{P_c}{P_i} \right) \eta h = L_m ; \text{ da cui } F = \frac{L_d}{\left(1 - \frac{P_c}{P_i} \right) \eta h} - P_c = 6772 \text{ Kg}$$

(minore il diametro!)

$$L_f \text{ (lavoro ad ogni colpo)} = (F + P_c) h \eta = 3747 \text{ Kg.m}$$

$$L_i \text{ (onirito dell'incudine)} = L_f \left(\frac{P_c}{P_i} \right) = 197 \text{ Kg.m}$$

$$S_i = \frac{L_i}{P_i} = 4,98 \text{ mm} \quad (\text{spostamento nominale dell'incudine})$$

$$F = \frac{L_d}{s} = 750 \cdot 1000 \text{ Kg} \quad (\text{forza di deformazione})$$

$$F_{\text{max}} \text{ (al termine della deformazione)} = \frac{L_f - L_i}{S_i} = 760650 \text{ Kg}$$

forza
maggiore
doppio effetto?

M2

14/07/09

$$HB = 650 \text{ N/mm}^2 \quad K_s = 550 \text{ N/mm}^2 \quad \frac{1}{n} = 0,06$$

de $200 \times 100 \times 15 \rightarrow 200 \times 100 \times 12$ (spessore)

$$D_{fuor} = 20 \text{ mm} \quad z = 4 \quad P_H = 4 \text{ kW} \quad \eta = 0,9 \quad F_{t,max} = 160 \text{ N/mm}^2$$

$P_{max} = ?$ $n_{punte} = ?$

$$n = 600 \text{ giri/min}$$

$$v_t = 0,1 \text{ mm/pro}$$

$$F_t = K_s z_i \left(\frac{v}{v_0} \right)^{\frac{1}{n}} = K_s z_i (0,2 P)^{\frac{1}{n}}$$

Numero di denti in presa

$$D < L$$

$$360: z = \varphi_i = z_i$$

$$\text{con } l_i = p_c + d$$

$$\text{con } d = 0,0001 \left(\frac{2I}{D} \right)$$

$$\text{con } I \leq \frac{L}{3}, \quad L = \frac{D}{2} + I$$

$$I_{max} = \frac{L}{3} = \frac{1}{3} \left(\frac{D}{2} + I \right) = \frac{D}{4} \Rightarrow I_{max} = 5 \text{ mm}$$

$$L = \frac{D}{2} + I = 15 \text{ mm}$$

$$\alpha = 30^\circ$$

$$\varphi_i = 120^\circ$$

⇓

$$z_i = \frac{4}{3}$$

Calcolo la max $P \Rightarrow P_{max} = \left(\frac{F_{t,max}}{K_s z_i} \right)^{\frac{1}{1-\frac{1}{n}}} \cdot \frac{1}{0,2} = 1,98 \text{ mm}$
~~Severo e punte de $P = 1,5 \text{ mm}$ l'una.~~

$$\textcircled{1} F_t = K_s z_i (0,2 P_1)^{\frac{1}{n}} = 128 \text{ N} \Rightarrow P_{max} = 516 \text{ W}$$

$$\textcircled{2} F_t = 128 \text{ N} \Rightarrow P_{max} = 516 \text{ W}$$

$$P_{in} \text{ con } F_{t,max} = F_{t,max} \cdot \pi D m = 670 \text{ W} \quad (\text{il vincolo sulla pot e sempre rispettato})$$

Con il vincolo sulla forza calcolo:

$$P_{max} = \left(\frac{F_{t,max}}{K_s z_i} \right)^{\frac{1}{1-\frac{1}{n}}} \cdot \frac{1}{0,2} = 1,98 \text{ mm} \Rightarrow \text{punte de } 1,5 \text{ mm l'una.}$$

$$\textcircled{1} F_{t_1} = K_s z_i (0,2 P_1)^{\frac{1}{n}} = 128 \text{ N} \Rightarrow P_{max} = 536 \text{ W}$$

$$\textcircled{2} F_{t_2} = K_s z_i (0,2 P_2)^{\frac{1}{n}} = 128 \text{ N} \Rightarrow P_{max} = 536 \text{ W}$$

14/07/09

M2 maglio doppio effetto

$$Fe\ 60 \rightarrow 1000^\circ C \rightarrow \mu = 18\ Kg/mm^2$$

$$P_i = 18000\ Kg \quad P_c = 700\ Kg$$

$$h = 0,8 \rightarrow \eta = 1$$

$$D_s = 150\ mm$$

$$A = 16000\ mm^2 \quad s = 5\ mm$$

$$P_F = ? \quad L_f, L_i, S_i, F_d, F_{max} = ?$$

$$L_m = \frac{(\mu A) s}{1000} = 1460\ Kg\ m$$

$$L_d = (P_c + F) \left(1 - \frac{P_c}{P_i}\right) \eta h = L_m$$

$$F = \frac{L_d}{\left(1 - \frac{P_c}{P_i}\right) \eta h} - P_c = 1173\ Kg$$

$$P_F = \frac{F}{A_s} = \frac{4F}{\pi D_s^2} = 6,64\ Kg/cm^2$$

$$\bullet L_f = (P_c + F) \eta h = 1498,4\ Kg\ m$$

$$\bullet L_i = L_f \frac{P_c}{P_i} = 58,3\ Kg\ m$$

$$\bullet S_i = \frac{L_i}{P_i} = 3,24\ mm$$

$$\bullet F_d = \frac{L_d}{s} = 288000\ Kg$$

$$\bullet F_{max} = \frac{L_f - L_i}{S_i} = 444475\ Kg$$

$$D_i = 140 \text{ mm}$$

$$D_f = 120 \text{ mm}$$

$$P_H = 8 \text{ kW} \quad \eta = 0,18 \quad \left(\frac{1}{m} = 0,137 \right)$$

$$HB = 260 \text{ N/mm}^2$$

$$n = 800 \text{ giri/min}$$

$$N = 430 \text{ mm/min}$$

$$\alpha = 2^\circ$$

$$\beta = 91^\circ$$

$$\gamma = -8^\circ$$

$$K_S = 0,9 HB^{0,4} \beta^{0,4} \text{ daN/mm}^2$$

$$K_S = 669,3 \text{ N/mm}^2$$

$$n \text{ passate min} = ? \quad P_{max} = P_{m2} = ?$$

$$\text{Vincolo sulla potenza} \quad P_{m \text{ max}} = 6,4 \text{ kW}$$

$$P_{m \text{ max}} = F_{t \text{ max}} \cdot v_t \Rightarrow F_{t \text{ max}} = \frac{P_{m \text{ max}}}{v_t / \pi D m} \quad \text{dove } v_t = \pi D m = 5,86 \text{ m/s}$$

$$F_{t \text{ max}} = 1092 \text{ N}$$

$$F_t = K_S (a_p)^{1,1} \Rightarrow P_{max} = \left(\frac{F_{t \text{ max}}}{K_S} \right)^{\frac{1}{1,1}} \cdot \frac{1}{a} \neq \text{dove } a = \frac{u}{m}$$

$$P_{max} = 3,29 \text{ mm}$$

$$n \text{ passate} = \frac{S_{avv.}}{P_{max}} = 3,03$$

Con le fontane ($P_f = 0,25 \text{ mm}$), ottengo

$$3 \text{ passate da } 3,25 \text{ mm} \text{ ed una passata da } 0,25 \text{ mm}$$

$$(1) \text{ spz. } P_1 = 3,25 \text{ mm} \quad P_{m(1)} = K_S (a_{P_1})^{1,1} \cdot v_t = 6,13 \text{ kW}$$

$$(2) \text{ spz. } P_2 = 3,25 \text{ mm} \quad P_{m(2)} = K_S (a_{P_2})^{1,1} \cdot \pi (D_i - 2P_1) \cdot m = 6,05 \text{ kW}$$

$$(3) \text{ spz. } P_3 = 3,25 \text{ mm} \quad P_{m(3)} = K_S (a_{P_3})^{1,1} \cdot \pi (D_i - 2P_3 - 2P_2) \cdot m = 5,75 \text{ kW}$$

$$(4) \text{ fm } P_4 = 0,25 \text{ mm} \quad P_{m(4)} = K_S (a_{P_4})^{1,1} \cdot \pi (D_i - 2P_1 - 2P_2 - 2P_3) \cdot m = 5,97 \text{ kW}$$

exm 2

$$\begin{cases} F_t = ? \\ M_t = ? \\ P_m = ? \end{cases}$$

$$D = 10 \text{ mm}$$

$$K_{S,11} = 827 \text{ N/mm}^2$$

$$\eta = 120^\circ$$

$$Q = 0,58 \text{ mm/s}^2$$

$$M = 600 \text{ g}^2/\text{min}$$

$$Z = 0,137$$

~~$$F_t = 2 K_S$$~~

$$F_t = K_S b h^{1.7} \Rightarrow$$

$$b = \frac{D}{2.5 \sin \frac{\eta}{2}} = \frac{10 \text{ mm}}{2.5 \sin \frac{120^\circ}{2}} = 5,77 \text{ mm}$$

$$F_t = 1448 \text{ N}$$

$$h = \left(\underbrace{Q}_{\frac{Q}{2}} \sin \frac{\eta}{2} \right)^{1.7} = 0,3035 \text{ mm}$$

$$P_m = 2 F_t \pi \frac{D}{2} m = 303 \text{ W}$$

$$M_t = F_t \frac{D}{2} = 7,24 \text{ N} \cdot \text{m}$$

7/06/07

Fur. performance

$$HB = 250 \text{ N/mm}^2$$

$$L = 50 \text{ mm}$$

$$D = 60 \text{ mm} \quad z = 8 \quad n = 250 \text{ rev/min}$$

$$a = 2,8 \text{ mm/rev}$$

$$f = 6 \text{ mm}$$

$$\beta = 80^\circ$$

$$P_H = 6 \text{ kW} \quad \eta = 0,9$$

$$K_s = 0,9 \cdot HB^{0,4} \cdot f^{0,2} \cdot 604 \text{ N/mm}^2$$

$$P_{m, \text{max}} = 3,6 \text{ kW}$$

$$P_m = K_s \left(2 \sqrt{\frac{P}{D}} \cdot a \cdot f \right)^{0,75} \cdot \pi D n, \text{ where } V_f = \pi D n = 0,785 \text{ m/s}$$

$$P_m = 2164,5 \text{ W}$$

$$P_m \leq P_H \cdot \eta \rightarrow \underline{\text{OK}} \quad \text{Le condition est remplie}$$

esame 23/06/2005

esame (A)

m1) Fresa perfora

$$HB = 251 \text{ N/mm}^2$$

$$P = 3 \text{ mm}$$

$$D = 48 \text{ mm}$$

$$\beta = 79^\circ$$

$$\left(\frac{1}{m} = 0,137 \right)$$

$$L = h = 32 \text{ mm}$$

$$z = 6$$

$$(P_{m \max}) = ?$$

$$n = 200 \text{ rev/min}$$

$$u = 300 \text{ mm/min}$$

$$K_s = 0,9 HB^{0,4} \beta^{0,66} = 600 \text{ N/mm}^2$$

$$P_m = K_s (q_{\max})^{1-\frac{1}{m}} \pi D m$$

$$= K_s \left(z \sqrt{\frac{P}{D}} L q_t \right)^{1-\frac{1}{m}} \pi D m \quad \text{dove} \quad q_t = \frac{q}{z} = \frac{u}{zm} = 0,25 \text{ mm/rev}$$

$$P_m = 997 \text{ W}$$

m2 Trapezoidal

$$\eta = 120^\circ$$

$$D = 45 \text{ mm}$$

$$K_{S,1,1} = 827 \text{ N/mm}^2$$

$$Q = 0,58 \text{ mm/g-zo}$$

$$(z = 0,137)$$

$$\begin{cases} F_t = ? \\ M_t = ? \end{cases}$$

$$F_t = K_S b h^{1-z}$$

$$F_t = K_S \left(\frac{D}{2 \sin \frac{\eta}{2}} \right) \left(\frac{Q}{2} \frac{\sin \eta}{\frac{1}{2}} \right)^{1-z} = 6521 \text{ N}$$

$$M_t = F_t \cdot \frac{D}{2} = 147 \text{ N} \cdot \text{m}$$

M1

23/06/05

home (B)

$$P_H = 4 \text{ kW} \quad \eta = 0,9$$

$$D_i = 80 \text{ mm}$$

$$D_f = 70 \text{ mm}$$

$$m = 863 \text{ g-c/mm}$$

$$\mu = 215,65 \text{ mm/} \cancel{\text{mm}} \text{ min}$$

$$K_s = 6280 \text{ N/mm}^2$$

$$\left(\frac{1}{m} = 0,137\right)$$

$$1 \text{ penetra} \Rightarrow P = 5 \text{ mm}$$

se pune forca,

$$P_m = F_t \cdot v_t, \quad \text{unde}$$

$$F_t = K_s (eP)^{\frac{1}{1-m}} = 751 \text{ N}$$

$$v_t = \pi D m = 3,61 \text{ m/s}$$

$$P_m = 2715 \text{ W}$$

$$P_m \leq P_H \eta ? \quad \boxed{\text{OK}}$$

1012/ Stens data (Sgrosseture + funtune)

$$1) \text{ Sgrosseture } P_1 = 4 \text{ mm} \Rightarrow P_m = K_s (eP_1)^{\frac{1}{1-m}} \cdot \frac{1}{v_t} = 2240 \text{ W}$$

$$2) \text{ funtune } P_2 = 1 \text{ mm} \Rightarrow P_m = K_s (eP_2)^{\frac{1}{1-m}} \cdot \pi (D - 2P_2) \cdot m = 609 \text{ W}$$