Formulario tecnologie meccaniche

Gianluca Rubino

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1 Fonderia

$$M = \frac{V}{S} \tag{1}$$

$$t_s = k \cdot M^n \tag{2}$$

Con n=2 e $0.8 < k < 1$

$$\begin{cases} M_{materozza} = 1,2 \cdot M_{pezzoadiacente} \\ 0,2V_{materozza} = \alpha \left(V_{materozza} + V_{getto}\right) \end{cases} \tag{3}$$

$$t_r = 3,2\sqrt{massa\,[kg]} \tag{4}$$

oppure

$$t_r = 6,4 \cdot (spessore\,medio\,[cm])\,(massa\,[kg])^{0,4} \tag{5}$$

$$Q = \frac{V_{getto}}{t_{riempimento}} \tag{6}$$

$$v = \sqrt{2\,g\,He} \tag{7}$$

$$v = 0,65 \cdot \sqrt{2\,g\,He} \tag{8}$$

Con $He = \left(\frac{\sqrt{h_i}+\sqrt{h_f}}{2}\right)^2$

$$S_{attacchi} = \frac{Q}{V} \tag{9}$$

2 Deformazione plastica

2.1 Forgiatura

$$P_x = P_y = \frac{2}{\sqrt{3}}\sigma_0 \left[e^{\frac{2\mu}{h}\left(\frac{L}{2}-x\right)} - 1\right] \tag{10}$$

$$\overline{P} = \frac{2}{\sqrt{3}}\sigma_0 \left(\frac{e^{\frac{\mu L}{h}} - 1}{\frac{\mu L}{h}}\right) \tag{11}$$

$$F = \overline{P}Lb \tag{12}$$

2.2 Stampaggio

$$F_{chiusura} = C_s \sigma A \tag{13}$$

2.3 Laminazione

$$\Delta h_{max} = \mu^2 R \tag{14}$$

$$\alpha_n = \frac{\alpha_0}{2} - \frac{1}{\mu}\left(\frac{\alpha_0}{2}\right)^2 \tag{15}$$

$$\Delta H = 2R\left(1 - cos\alpha_n\right) \tag{16}$$

$$h_n = h_u + R\left(1 - cos\alpha_n\right) \tag{17}$$

$$L = \sqrt{R\Delta h - \left(\frac{\Delta h}{2}\right)^2} \tag{18}$$

oppure

$$L = \sqrt{R\Delta h} \tag{19}$$

$$\alpha_0 = arctan\left(\sqrt{\frac{\Delta h}{R}}\right) \tag{20}$$

$$\overline{P} = \frac{2}{\sqrt{3}}\sigma_{flusso\,plastico}\left(1 + \mu\frac{L}{2\overline{h}}\right) \tag{21}$$

$$\overline{\sigma}_{flusso\,plastico} = \frac{\int_0^n C\epsilon_{totale}^n \, d\epsilon}{n+1} \qquad in\ cui \qquad \epsilon_{totale} = ln\left(\frac{h_i}{h_u}\right) \tag{22}$$

$$F_{rulli} = \overline{P}Lb \tag{23}$$

$$M_t = F * \frac{L}{2} \tag{24}$$

$$W = \frac{M2\pi n}{60} \tag{25}$$

2.4 Estrusione

$$p_{x0} = \overline{\sigma}_{flusso\,plastico}\,(0,8 + 1,2\epsilon_{totale}) \tag{26}$$

$$\overline{\sigma}_{flusso\,plastico} = \frac{\int\limits_0^n C\epsilon_{totale}^n\ d\epsilon}{n+1} \qquad in\ cui \qquad \epsilon_{totale} = ln\left(\frac{D_i^2}{D_u^2}\right) = 2ln\left(\frac{D_i}{D_u}\right) \tag{27}$$

$$\overline{P}_{x0} = \sigma_{flusso\,plastico}\frac{1+\mu cotg\alpha}{\mu cotg\alpha}\left(\left(\frac{D_0}{D_f}\right)^{2\mu cotg\alpha} - 1\right) \tag{28}$$

$$F = \overline{P}_{x0}A \tag{29}$$

$$W = Fv_{spintore} \tag{30}$$

$$L_{parallelepipedo} = s_0 l_0 \sigma_0 ln\left(\frac{l_f}{l_i}\right) \tag{31}$$

$$L_{reale} = \frac{L_{ideale}}{\prod\limits_i^n \eta_i} \tag{32}$$

2.5 Trafilatura

$$F = \sigma_{xf}A_f \tag{33}$$

$$\sigma_{xf} = \overline{\sigma}_{flusso\ plastico}\,(1+\mu cotg\,\alpha)\,\epsilon_{totale} \tag{34}$$

$$\overline{\sigma}_{flusso\,plastico} = \frac{\int\limits_0^n C\epsilon_{totale}^n\ d\epsilon}{n+1} \qquad in\ cui \qquad \epsilon_{totale} = ln\left(\frac{D_i^2}{D_u^2}\right) = 2ln\left(\frac{D_i}{D_u}\right) \tag{35}$$

$$\sigma_{xf} = \sigma_0\frac{(1+\mu cotg\,\alpha)}{\mu cotg\,\alpha}\cdot\left[1-\left(\frac{D_f}{D_i}\right)^{2\mu cotg\,\alpha}\right] \tag{36}$$

$$\left(\frac{S_0}{S_f}\right)_{max} = \left[\frac{1-\mu cotg\,\alpha\cdot n}{1+\mu cotg\,\alpha}\right]^{\frac{-1}{\mu cotg\alpha}} \tag{37}$$

$$L_{parallelepipedo} = s_f l_f \sigma_0 ln\left(\frac{l_f}{l_0}\right) \tag{38}$$

$$F_{trafilatura} = 1,2\sigma_s\epsilon S_f + \mu\,p\,cos\,\alpha S_{laterale} + p\,sin\alpha S_{laterale} \tag{39}$$

$$M_t = \sigma_{xf}\cdot A_{trafilatura}\cdot\frac{d}{2} \tag{40}$$

3 Asportazione di truciolo

$$C = \frac{s}{s_1} = \frac{L_1}{L} \tag{41}$$

$$tan\Phi = \frac{c\ cos\gamma}{1 - c\ cos\gamma} \tag{42}$$

$$\gamma_s = cot\,\Phi\ +\ tan\,(\Phi - \gamma) \tag{43}$$

$$2\Phi - \gamma = \frac{\pi}{2} \tag{44}$$

$$v_s = v_t \cdot r_c cotg\Phi \tag{45}$$

$$\begin{cases} F_s = R\,cos\,(\Phi + \rho - \gamma) \\ N_s = R\,sin\,(\Phi + \rho - \gamma) \\ F_t = R\,cos\,(\rho - \gamma) \\ F_n = R\,sin\,(\rho - \gamma) \\ F = R\,sin\ \rho \\ N = R\,cos\ \rho \end{cases} \tag{46}$$

$$F_s = A_s \cdot\ \tau_{=} \frac{A_0\,\tau_s}{sin\,\Phi} \quad \Rightarrow \quad R = \frac{\tau_s\,A_0}{sin\,\Phi\ cos\ (\Phi + \rho - \gamma)} \tag{47}$$

$$F_t = \tau_s \cdot \frac{A_0 \cdot cos\,(\rho - \gamma)}{sin\,\Phi \cdot cos\,(\Phi + \rho - \gamma)} \tag{48}$$

$$F_n = \tau_s \cdot \frac{A_0 \cdot sin\,(\rho - \gamma)}{sin\,\Phi \cdot cos\,(\Phi + \rho - \gamma)} \tag{49}$$

$$2\Phi + \rho - \gamma = C \tag{50}$$

$$F_t = \tau_s \cdot \frac{A_0 \cdot cos\,(C - 2\Phi)}{sin\,\Phi \cdot cos\,(C - \Phi)} \tag{51}$$

$$F_t = \tau_s \cdot \frac{A_0 \cdot sin\,(C - 2\Phi)}{sin\,\Phi \cdot cos\,(C - \Phi)} \tag{52}$$

$$F = F_t sin\gamma\ +\ F_n\,cos\,\gamma \tag{53}$$

$$F = F_n sin\gamma\ +\ F_t\,cos\,\gamma \tag{54}$$

$$tan\,(\rho) = \frac{F}{N} \tag{55}$$

$$K_s = K_{s0} = A^{-\frac{1}{n}} \quad dove\ \ K_{s0} = 2,4R_m^{0,454} \cdot \rho^{0,666} \tag{56}$$

$$F_t = K_s \cdot A \tag{57}$$

$$vT^n = V_1 \tag{58}$$

$$vT^n a^m p^r = V_1^* \tag{59}$$