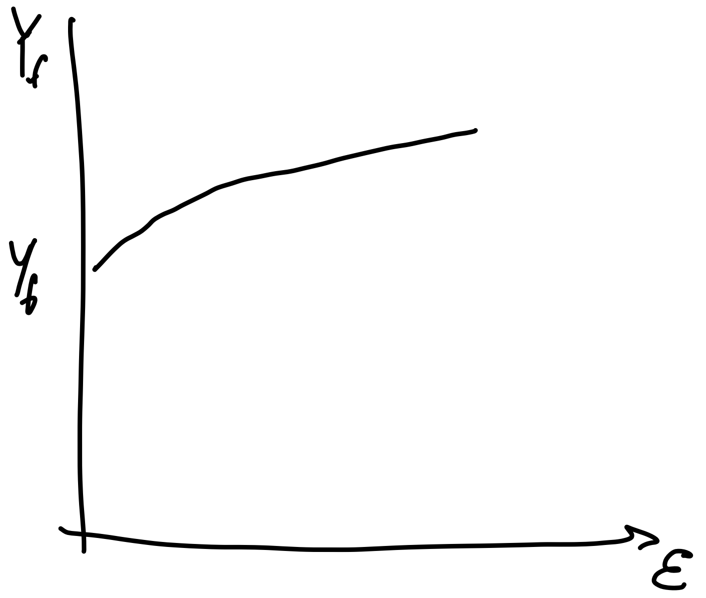
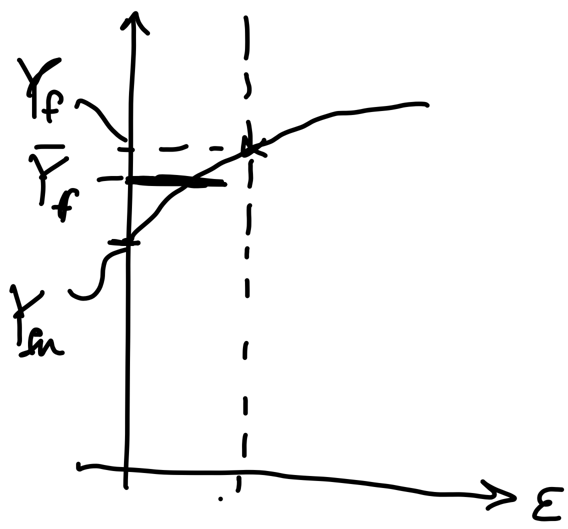
Esercitazione 5 -



$$Y_f = k\,\varepsilon_f^{\,n}$$

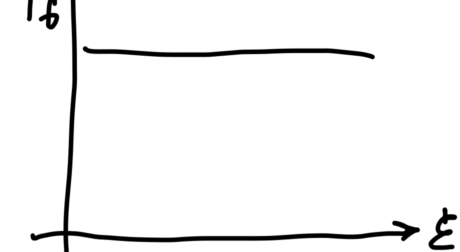
$Y_f \rightarrow$ tensione
$n \rightarrow$ coeff. incrudimento
$k \rightarrow$ fattore di resistenza

$$\bar{Y}_f = \frac{k\varepsilon_f^{\,n}}{n+1}$$



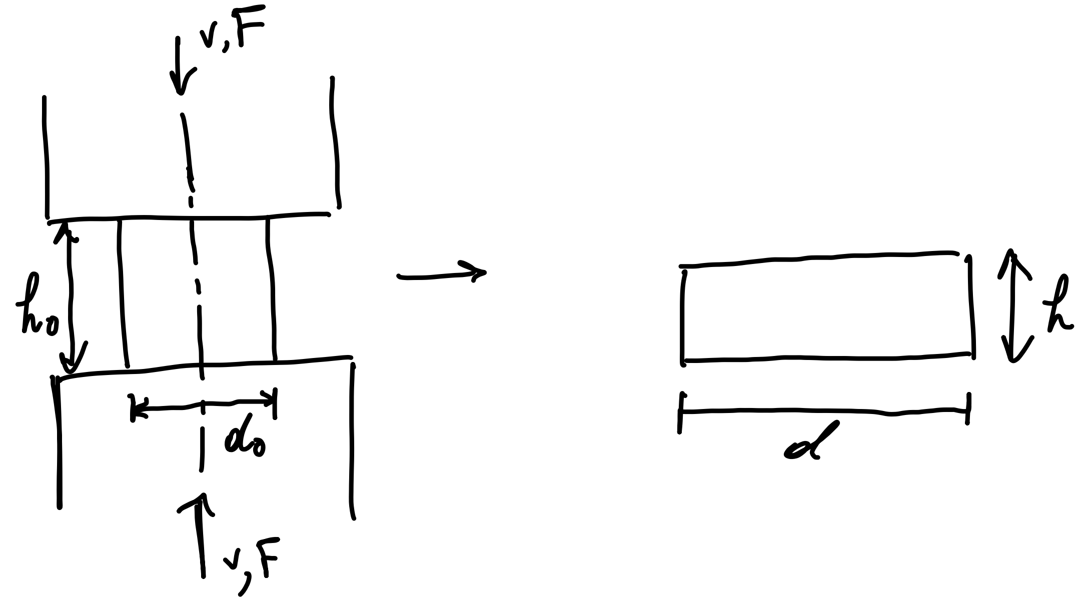
Deformazione a caldo con $\dot{\varepsilon}$ bassi

$\Longrightarrow$



Y_f = cost nel tempo

Forgiatura in stampo aperto



Volume è costante per def. plastica

$$h_0 A_0 = h A$$

$$\varepsilon_f = \ln\left(\frac{h_0}{h}\right) = \ln\left(\frac{A}{A_0}\right) = 2\ln\left(\frac{D}{D_0}\right)$$

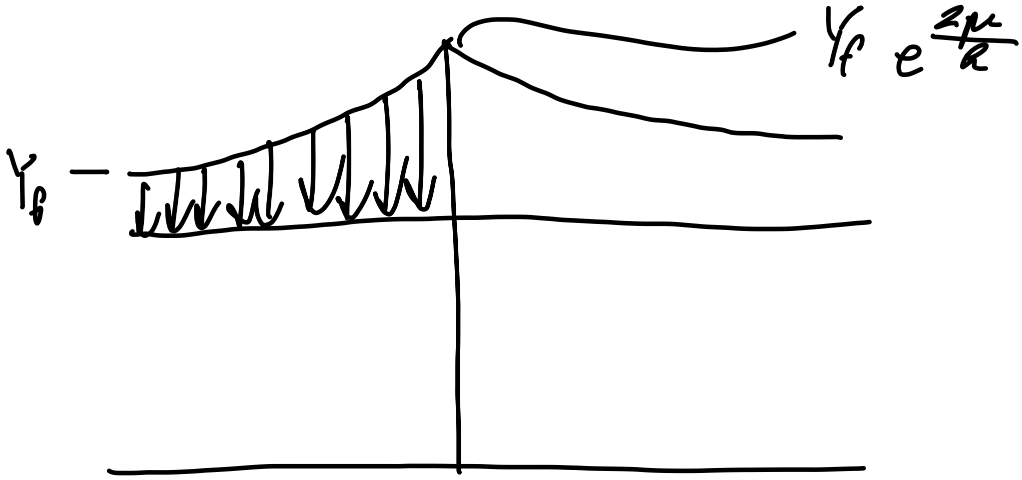
$$A = \frac{\pi D^2}{4}$$

Di solito $Y_f = p_z$ ← Pressione

Ideale $F = Y_f A$

In realtà: $F = k_p Y_f A$

Calcolo delle Pressioni



} Non mi ricordo era in una lezione però

$$p_z(r) = \gamma_f e^{\frac{2\mu}{h}\cdot(R-r)}$$

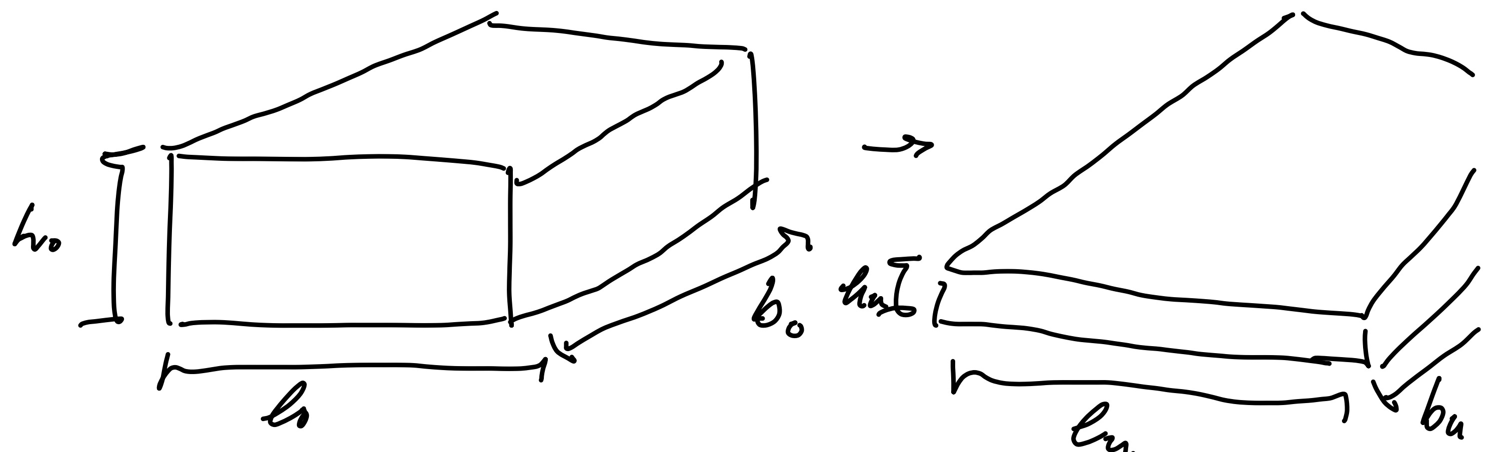
$$F = \int_0^{2\pi}\int_0^R p_z(r)\, r\, dr$$

$$= 2\pi \int_0^R \gamma_f\, e^{\frac{2\mu}{h}(R-r)}\, r\, dr$$

$$=$$

F = equazione nel formulario H 0,4 ....

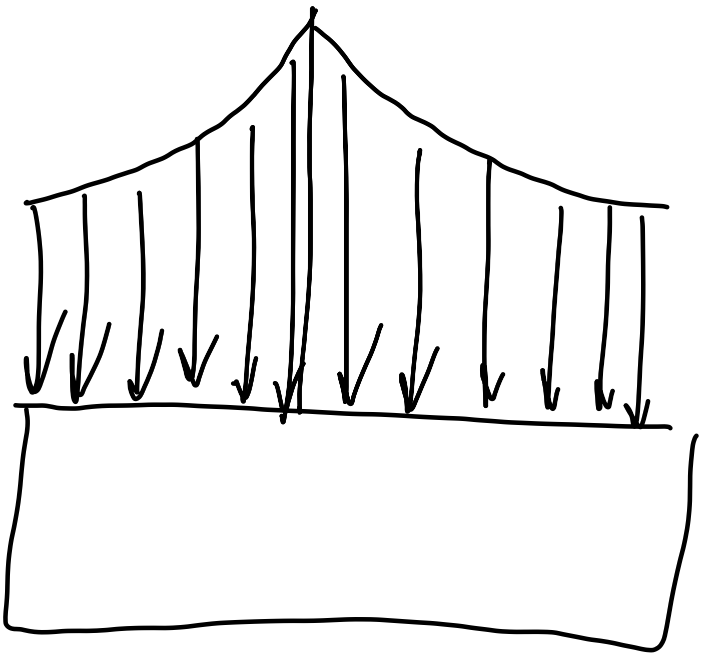
Mastello Rettangolare



Ipotesi di Deformazione piana $\rightarrow b_0 = b_u$

$\Rightarrow$ Dato che volume è costante

$\Rightarrow h_0 l_0 = h_u l_u$



$$p_z = \frac{2}{\sqrt{3}} Y_f e^{\frac{2\mu}{h}\left(\frac{L}{2} - x\right)}$$

F = su tondulonio

$= \bar{p}_z L b$

Esercizio 2

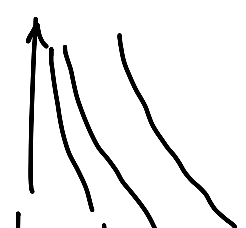
$R_e = 50mm$

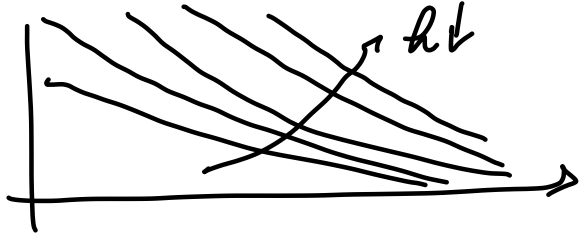
$h_e = 30mm$

$h_u = 24mm$

$$p_z = Y_f e^{\frac{2\mu}{h}(R-r)}$$

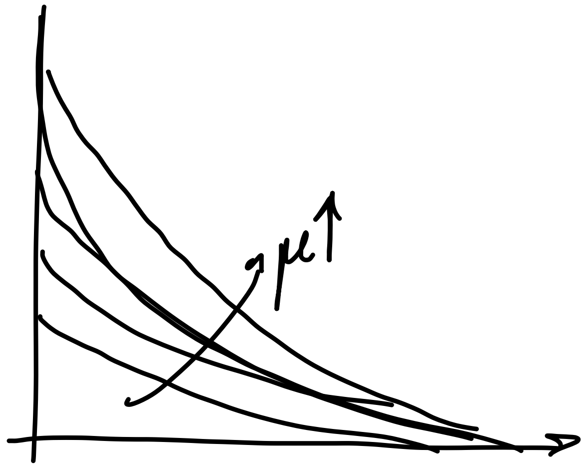
$$p_z(h) = Y_f e^{\frac{2\mu}{h}\left(\sqrt{\frac{R_e h_e}{h}} r\right)}$$



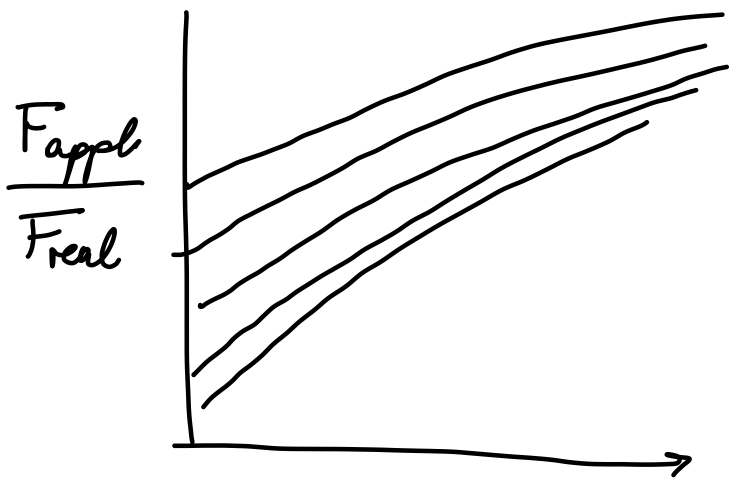


Maggiore la deformazione maggiore la forza

Effetto su F di μ pg. 5



Rapporto tra forza approssimata e forza teorica



Bisogna calcolare il volume di deformazione istante per istante.

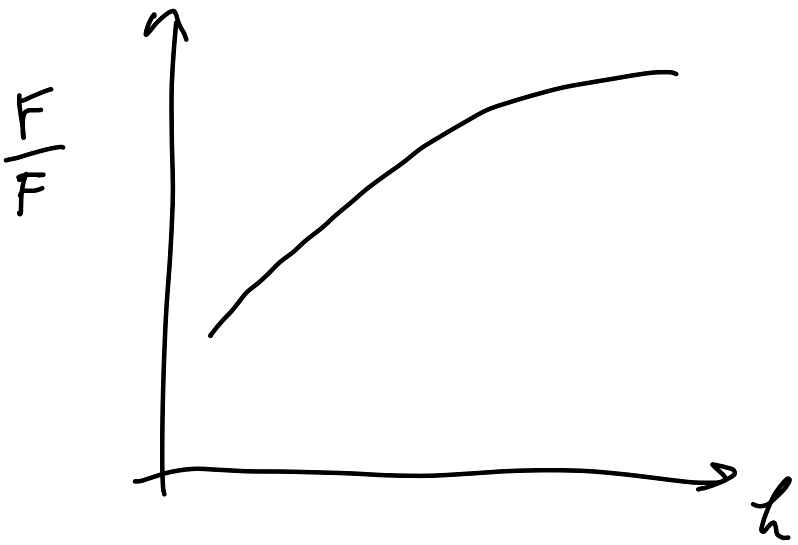
$$\varepsilon_f = \ln \frac{h_0}{h}$$

$$\Rightarrow Y_f = k \ln \left(\frac{h_0}{h}\right)^n$$

$$p_z = Y_f \, e^{\frac{2\mu}{h}\left(\sqrt{\frac{R^2 h_0}{h}} - r\right)}$$

pg. 10

Non esiste dipendenza da Y_f quindi è indipendente dal materiale



Esercizio 2

$R_0 = 50\,mm$ $h_0 = 30\,mm$

$F = 5\,MN$ $\Delta h = 2{,}5\,mm$

$Y_i = 300 MPa$

μ? μ se AISI 304?
a freddo

$h_f = h_0 - \Delta h = 27,5 mm$

$$R = \sqrt{\frac{R_e^2 h_e}{h}} = 52,5 mm$$

$$F = \left(1 + 0,4\, \mu \frac{2\mu}{h}\right) Y_f \ldots$$

$Y_f = 300 MPa$

$$\mu = \frac{h}{0,4 \cdot 2R}\left(\frac{F}{Y_f \pi R^2} - 1\right) = 0,62$$

A freddo acciaio AISI 304

$k = 1275 MPa$ $\quad n = 0,45$
da pg. 9

$$\varepsilon_f = \ln \frac{A_0}{A}$$

$$Y_f = k\, \varepsilon_f^n = k \left[\ln \frac{A_0}{A}\right]^n = 424,9 MPa$$

$$\mu = \frac{h}{0,42R}\left(\frac{F}{Y_f \cdot \pi R^2} - 1\right) = 0,25$$

Esercizio 3

$P = 25\,kW$

$rpm = 40$

$\Delta h_{max} = 150\,mm$

A) $F_{max} = ?$

b) $h_0, d_0?$

$$t = \frac{1}{40} = 2\underbrace{\Delta h}_{0,3} \cdot rpm = 0,2\,m/s$$

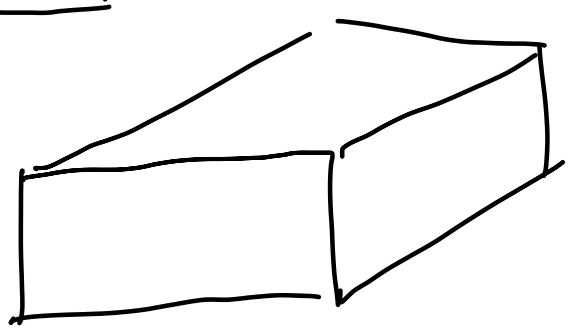
$$P = F \cdot v$$

$$F = \frac{P}{v} = \frac{25000}{0,2} = 125000\,N = 125\,kN$$

$D_0 = 15\,mm \quad h_0 = 7,5\,mm$

$h_u = 7,12\,mm$ ← soluzione numerica pg. 20

Esercizio 4



$$p_z = \frac{2}{\sqrt{3}} Y_f \, e^{\frac{2\mu}{h_m}\left(\frac{l}{2} - x\right)}$$

$F = 1,522 \text{ MN}$ discrepanza questo è approssimativo

$$\bar{p}_z = \frac{2}{\sqrt{3}} \cdot Y_f (1+\mu) \frac{l}{2} h_m = 1,317 \text{ MN}$$

? riscritta quella che ha detto

Per esame è quella che usiamo

Esercizio 5

$Y_f = 50 \text{ MPa}$ Geometria di Barra

$t = 100 \text{ mm}$?

$\Delta h - 1,5 t$

$F_{MAX} = k_p Y_f A$

$\S$ 1.1 Tabella pg. 277

$S = 200000 \ mm^2$ (Trovato con quadrati)

$p = 2550 \ mm$ (Dato

$\ell = 0{,}07 \frac{S}{p} = 5{,}5 \ mm$ o $\ell = 0{,}0175 \sqrt{S} = 7{,}8 \ mm$

Dimensioni da pg. 27

$A = S + p(m+n) = 322400 \ mm^2$

$F = 178{,}96 \ MN$

$E = \lambda \Delta h \ F_{MAX} = \lambda \cdot 1{,}5 t \ F_{MAX}$

$= 3868800 \ J = 3868 \ kJ$