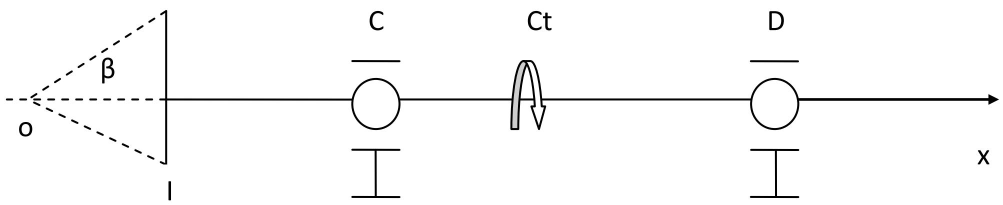


Soit P la puissance de moteur

P = M_t. ω = 307.35 W

N= 100 tr/ mn

r= 45 mm

IC = a ≈ 1100 mm

CD= b = 1000 mm

Acier C35 (Re = 430 N/ mm^2)

$\propto$ =20°

β = 45°

$F_t \tan \propto$: Projection de la force de pression sur le plan $(\overrightarrow{X}, \overrightarrow{Y})$

On a :

$\{\tau\}$I = $\begin{cases} \vec{R} \\ \vec{M} \end{cases}$; $\vec{R} \begin{cases} Fa = -F_t.\tan\alpha\cos\beta \\ Fr = F_t.\tan\propto\sin\beta \\ F_t \end{cases}$; $\vec{M} \begin{cases} 0 \\ 0 \\ 0 \end{cases}$

P=c.ω=c.$\frac{N2\pi}{60}$=F_t.r. $\frac{N2\pi}{60}$

F_t=$\frac{60P}{2\pi Nr}$

D'où $\{\tau_t\}_I$= $\begin{cases} \vec{R} \\ \vec{M} \end{cases}$ avec $\vec{R} \begin{cases} Fa = -F_t.\tan\alpha\cos\beta \\ Fr = F_t.\tan\propto\sin\beta \\ F_t = \frac{60P}{N2\pi r} \end{cases}$

$$\begin{cases}\sum \vec{F} = 0 \\ \sum \vec{M} = 0\end{cases} \Rightarrow \overrightarrow{R_I} + \overrightarrow{R_C} + \overrightarrow{R_D} = \vec{0} \quad (1)$$

$$\overrightarrow{R_I} \wedge \overrightarrow{I_c} + \overrightarrow{R_D} \wedge \overrightarrow{DC} - \overrightarrow{C_t} = \vec{0} \quad (2)$$

$$(1) \quad \begin{cases}F_a \\ F_r \\ F_t\end{cases} + \begin{cases}X_C \\ Y_C \\ Z_C\end{cases} + \begin{cases}0 \\ Y_D \\ Z_D\end{cases} = \begin{cases}0 \\ 0 \\ 0\end{cases}$$

$$(2) \quad \begin{cases}0 \\ y_D \\ z_D\end{cases} \wedge \begin{cases}-b \\ 0 \\ 0\end{cases} + \begin{cases}F_a \\ F_r \\ F_t\end{cases} \wedge \begin{cases}0 \\ r \\ 0\end{cases} - \begin{cases}C_t \\ 0 \\ 0\end{cases} = \begin{cases}0 \\ 0 \\ 0\end{cases}$$

$$\left\| \begin{aligned} Z_D &= \frac{F_t . a}{b} = 717{,}2N \\ Y_D &= -\frac{F_a}{b} = -0{,}168N \\ X_C &= -F_a = -0{,}168N \\ Y_C &= -F_r + \frac{r}{b}.F_a = -160{,}4N \\ Z_C &= -F_t - \frac{a}{b}.F_t = -1369{,}2N \end{aligned} \right. \qquad \left\| \begin{aligned} F_a &= 0{,}168kN \\ F_r &= 0{,}168kN \\ F_t &= 0{,}652kN \end{aligned} \right.$$

Efforts intérieurs

On néglige les efforts normal et tranchant N et T

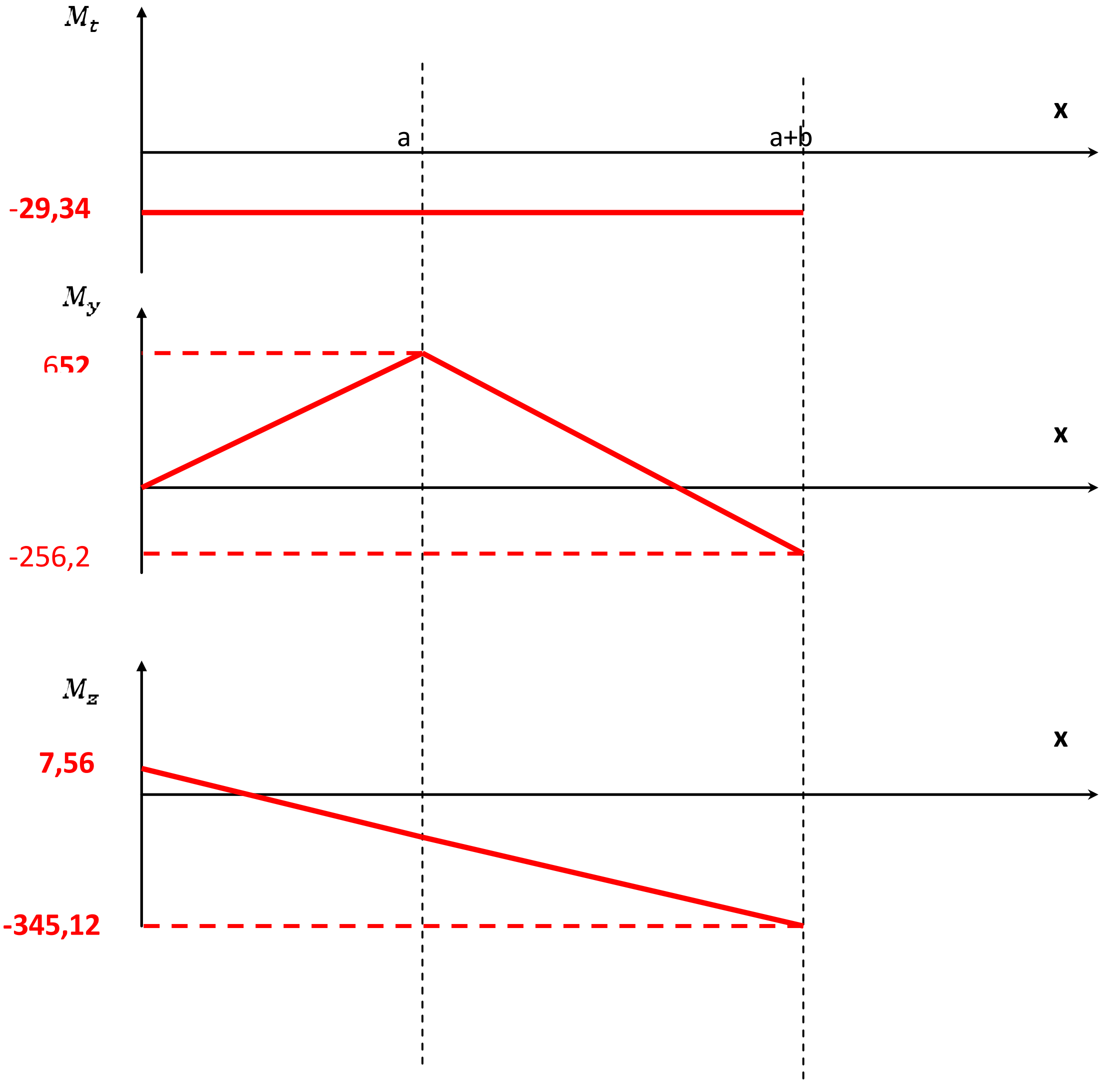
. Pour 0≤x≤a :

$$\overrightarrow{M_I} = \overrightarrow{R_I} \wedge \overrightarrow{IM} = \begin{cases}F_a \\ F_r \\ F_t\end{cases} \wedge \begin{cases}x \\ r \\ 0\end{cases} = \begin{cases}-F_t . r \\ F_t . x \\ F_a . r - F_r . x\end{cases}$$

$$= \begin{cases}-29{,}34 \\ 652.x \\ 7{,}56 - 168.x\end{cases}$$

.Pour a≤x≤b+a :

$$\overrightarrow{M_I}(M) = \overrightarrow{R_I} \wedge \overrightarrow{IM} + \overrightarrow{RC} \wedge \overrightarrow{CM} = \left\| \begin{aligned} M_x &= -29{,}34 \\ M_y &= -772x + 1365 \\ M_z &= 7{,}68 - 168.x \end{aligned} \right.$$



On néglige les concentrations des contraintes

On va vérifier la résistance de l'arbre au sens de VAN MISES

$$\sigma_{eq} = \sqrt{\sigma_N^2 + 3\tau^2}$$

$$\sigma_{eq} = \left[\left(\frac{M_{fy}}{\frac{\pi D^4}{64}} \cdot \frac{D}{2} + \frac{M_{fz}}{\frac{\pi D^4}{64}} \cdot D/2\right)^2 + 3 \cdot \left(\frac{M_t}{\frac{\pi D^4}{64}}\right)^2\right]^{1/2} < \sigma_{ad} = Re$$