Solution exercice 1

a) $v = \frac{U \bullet n}{60} = \frac{d \bullet \pi \bullet 5}{60} = \frac{1.65m \bullet \pi \bullet 450}{60} = \mathbf{38.9}\,\frac{\mathbf{m}}{\mathbf{s}}$

b) $n = \frac{v \bullet 60}{d \bullet \pi} = \frac{60\frac{m}{s} \bullet 60}{1.65m \bullet \pi} = \mathbf{694.5\ mal}$

694.5 mal = 694.5 fois

Solution exercice 2

Volumen pro Sekunde $V = \frac{160'000dm^3}{3'600} = 44.44dm^3$

Rohrfläche $A = \frac{V}{\ell} = \frac{44.44dm^3}{11dm} = 4.04dm^2$

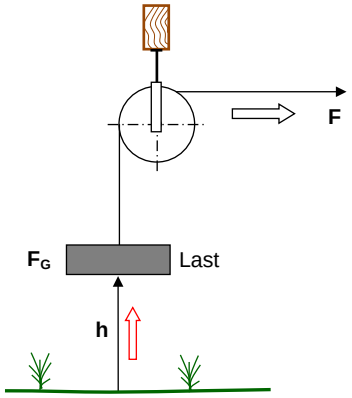
Rohrdurchmesser $d = \sqrt{\frac{4A}{\pi}} = \sqrt{\frac{4 \bullet 4.04dm^2}{\pi}} = \mathbf{2.268dm} = \mathbf{226.8mm}$

Volume par seconde V=
Section de la conduite A=
Diamètre de la conduite d=

Solution exercice 3

$W = F_G \bullet h = m \bullet g \bullet h = 140kg \bullet 9.81\frac{m}{s^2} \bullet 3.2m = \mathbf{4'394.9N}$

Last= Charge



Solution exercice 4

$\Delta v = v_{PKW} - v_{LKW} = 116\frac{km}{h} - 78\frac{km}{h} = 38\frac{km}{h} \longrightarrow 10.55\frac{m}{s}$

$\text{Überholstrecke} = 100m + 16m + 80m = 196m$

$t = \frac{s}{\Delta v} = \frac{196m}{10.55\frac{m}{s}} = \mathbf{18.6s}$

$s = v \bullet t \longrightarrow 116\frac{km}{h} = 32.22\frac{m}{s} \longrightarrow 32.22\frac{m}{s} \bullet 18.6s = \mathbf{598.6m}$

$\mathbf{v}_{pkw} = v_{voit}$
$v_{LKW} = v_{cam}$
überholstecke = distance de dépassement

Solution exercice 5

$$\cos\alpha = \frac{4.5\text{m}}{5.2\text{m}} = 0.865 \longrightarrow \alpha = 30°$$

$$\beta = 90° - 30° = 60° \longrightarrow \cos\beta = 0.5$$

$$\text{Strebe schräg} = \frac{3.2\text{kN}}{0.5} = \mathbf{6.4kN} \qquad \text{Strebe horizontal} = 6.4\text{kN} \bullet 0.865 = \mathbf{5.53kN}$$

Strebe schräg = Jambe de force inclinée
Strebe hor = Jambe de force horizontale

Solution exercice 6

$$\eta_R = \frac{E \bullet A}{n \bullet \eta_{LB} \bullet v \bullet \Phi_{LP}} = \frac{200\ell\text{x} \bullet (52\text{m} \bullet 22\text{m})}{76 \bullet 0.95 \bullet 0.8 \bullet 6'200\ell\text{m}} = \mathbf{0.639}$$

Solution exercice 7

$$t = \frac{v}{a} \longrightarrow v \text{ in } m/s = \frac{100'000\frac{m}{h}}{3600} = 27.77\frac{m}{s} \qquad t = \frac{27.77\frac{m}{s}}{8.17\frac{m}{s^2}} = \mathbf{3.4s}$$

Solution exercice 8

$$M = \frac{P \bullet 60}{2 \bullet \pi \bullet n} = \frac{7'500\text{W} \bullet 60}{2 \bullet \pi \bullet 1'430\frac{U}{\text{min.}}} = \mathbf{50Nm}$$

Solution exercice 9

$$n_4 = \frac{d_1 \bullet d_3 \bullet n_1}{d_2 \bullet d_4} = \frac{210\text{mm} \bullet 240\text{mm} \bullet 1'500\frac{U}{\text{min.}}}{580\text{mm} \bullet 660\text{mm}} = \mathbf{197.5}\frac{\mathbf{U}}{\mathbf{min.}}$$

$$i = \frac{n_1}{n_4} = \frac{1'500\frac{U}{\text{min.}}}{197.5\frac{U}{\text{min.}}} = \mathbf{7.6}$$

Solution exercice 10

$$V = \ell \bullet A = 320\text{cm} \bullet (2 \bullet 0.5\text{cm}) = 320\text{cm}^3$$

$$m = V \bullet \rho = 0.32\text{dm}^3 \bullet 8.9\frac{\text{kg}}{\text{dm}^3} = 2.848\text{kg} \longrightarrow m_{\text{Total}} = 5 \bullet 2.848\text{kg} = \mathbf{14.24kg}$$

Solution exercice 11

$$P_{\text{ab Pumpe}} = P_{\text{ab Motor}} \bullet \eta_{\text{Pumpe}} = 5\text{kW} \bullet 0.68 = 3.4\text{kW}$$

$$P = \frac{m \bullet g \bullet h}{t} \longrightarrow m = \frac{P \bullet t}{g \bullet h} = \frac{3'400\text{W} \bullet 3'600\text{s}}{9.81\frac{m}{s^2} \bullet 18\text{m}} = \mathbf{69'317}\ell$$

$P_{\text{ab Pumpe}} = P_{\text{dep. pompe}}$
$P_{\text{ab Motor}} = P_{\text{dep. moteur}}$
$n_{\text{Pumpe}} = n_{\text{pompe}}$

Solution exercice 12

$$Q = m \bullet c_{Stahl} \bullet \Delta\vartheta = 1'250kg \bullet 0.482\frac{kJ}{kgK} \bullet 820K = \mathbf{494'050kJ} = \mathbf{137.236kWh}$$

$$\Delta\vartheta = \frac{Q}{m \bullet c_{Wasser}} = \frac{494'050kJ}{1'250kg \bullet 4.187\frac{kJ}{kgK}} = 94.4K \longrightarrow \vartheta_2 = \vartheta_1 + \Delta\vartheta = 5°C + 94.4K = \mathbf{99.4°C}$$

$c_{Stahl} = c_{acier}$ $c_{Wasser} = c_{eau}$

Solution exercice 13

$$z_2 = i \bullet z_1 = 8 \bullet 16 = \mathbf{128}$$

$$n_2 = \frac{n_1}{i} = \frac{1'400\frac{U}{min.}}{8} = 175\frac{U}{min.}$$

Solution exercice 14

$$W = m \bullet g \bullet h = 280kg \bullet 9.81\frac{m}{s^2} \bullet (4 \bullet 3.2m) = \mathbf{35'159Nm} = \mathbf{9.766Wh}$$

$$P = \frac{W}{t} = \frac{35'159Nm}{2'700s} = \mathbf{13W}$$

Solution exercice 15

$$a)\ F = \frac{M}{r} = \frac{55Nm}{0.11m} = \mathbf{500N}$$

$$b)\ F = \frac{M}{r} = \frac{55Nm}{0.22m} = \mathbf{250N}$$

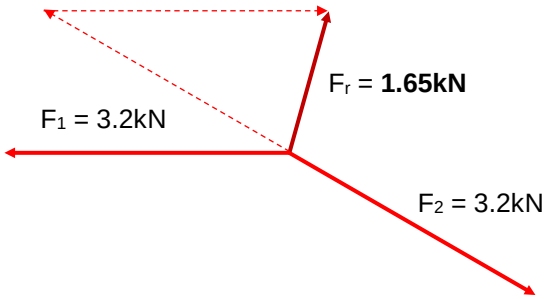
Solution exercice 16

$$V = A \bullet \ell = 250dm \bullet 1.5 \bullet 10^{-4} dm^2 = 0.0375dm^3 \qquad m = V \bullet \rho = 0.0375dm^3 \bullet 8.9\frac{kg}{dm^3} = 333.75g$$

$$W = I^2 \bullet R \bullet t = \frac{I^2 \bullet \rho \bullet \ell \bullet t}{A} = \frac{(160A)^2 \bullet 0.0175\frac{\Omega mm^2}{m} \bullet 25m \bullet 2.2s}{1.5mm^2} = 16'426.67Ws$$

$$\Delta\vartheta = \frac{W}{m \bullet c_{Cu}} = \frac{16'426.67Ws}{0.33375kg \bullet 390\frac{J}{kgK}} = 126.2K \longrightarrow \vartheta_2 = \vartheta_1 + \Delta\vartheta = 20°C + 126.2K = \mathbf{146.2°C}$$

Solution exercice 17



Solution calculée:

$$F_r = \sqrt{\left(3.2\text{kN} - \left(3.2\text{kN} \bullet 0.866\right)\right)^2 + \left(3.2\text{kN} \bullet 0.5\right)^2} = \mathbf{1.656kN}$$