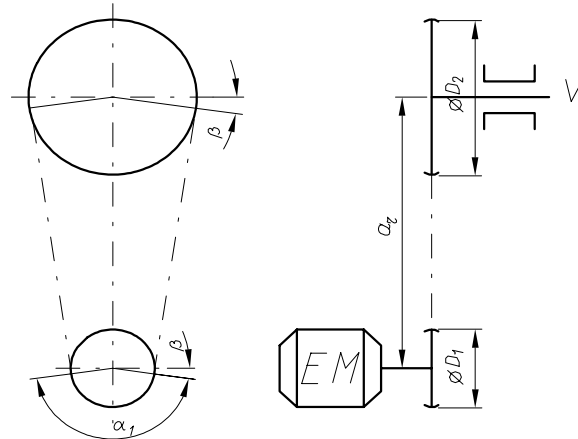


**Zad.30**

Na **sl.30-1** e { ematski prikaz eni ot kraja vratilo  $V$  { to preku a) pl oskat, odnosno b) klinest remen par  $D_1 / D_2$  prima silina  $P_V = 25 [kW]$ . Za~estenosta na vrte`ite na elektromotorot e  $n_{EM} = 12,4 [s^{-1}]$ , vrednosta na pre~nikot na pogonski ot remenik e  $D_1 = 200 [mm]$ , a prenosni ot odnos e  $i_r \approx 1,6$ . Me|uoski noto rastojani e treba da bi de  $a_r \approx 1,3 (D_1 + D_2)$ , a vrednosta na stepenot na i skori stuvawe na remeni ot prenosni k e  $\eta_r = 0,97$ .



Sl.30-1 Prost remen prenosni k

Potrebno e da se presmeta :

**30.1** vrednosta na silata { to go optovaruvato  $F_R$  za a) pl oskat i b) klinest remen,

**30.2** vi stinskata dol`ina na remenot  $L_s [mm]$ ,

**30.3** potrebni ot broj klinesti remeni od ti pot  $D$ .

**Re{ enie:****30.1 Presmetka na silata so koja { to e optovareno vratilo to**

Od **12.36** za silinata { to ja prima goneti ot remenik, odnosno vratilo to  $V$ , se dobi va

$$P_V = P_2 = \eta_r P_1 = \eta_r P_{EM} = 0,97 \cdot 25 = 24,25 [kW]$$

pa vrte`ni ot moment so koje optovareno vratilo to spored **1.03** e

$$T_V = T_2 = 159155 \frac{P_V}{n_V} = 159155 \cdot \frac{24,25}{7,75} \approx 498001,13 [Nmm]$$

pri { to za~estenosta na vrte`ite na vratilo to  $V$  e

$$n_V = n_2 = \frac{n_1}{i} = \frac{n_{EM}}{i_r} \approx \frac{12,4}{1,6} = 7,75 [s^{-1}]$$

Spored podatoci te na **str.147**, rezul tantnata sila { to go optovaruvato vratilo to e

$F_R = 3 F_t$  - za pl oskati remeni i  $F_R = 2 F_t$  - za klinesti remeni pa

a)  $F_R = 3 F_t = 3 \cdot 3162 = 9486 [N]$  - za pl oskati i

b)  $F_R = 2 F_t = 2 \cdot 3162 = 6324$  [N] - za kl i nesti remeni,

pri

$$F_t = F_{t2} = 318310 \frac{P_2}{d_{p2} n_2} = 318310 \cdot \frac{24,25}{315 \cdot 7,75} = 3161,9119 \approx 3162$$
 [N]

pri { to spored **12.28** pre~ni kot na goneti ot remeni k e

$$d_{p2} \approx i \xi_1 d_{p1} = 1,6 \cdot 0,98 \cdot 200 = 313,6$$
 [mm]

i standardno spored **t ab.12.5**

$$d_{p2s} = 315$$
 [mm]

so vi sti nska vrednost na prenosni ot odnos spored **12.02**

$$i_{rs} = \frac{d_{p2s}}{\xi d_{p1}} = \frac{315}{0,98 \cdot 200} = 1,6071429 \approx 1,6$$

i vi sti nska vrednost na za~estenosta na vrte` i te na vrati loto V

$$n_{Vs} = n_{2s} = \frac{n_{EM}}{i_{rs}} = \frac{12,4}{1,6071429} = 7,7155553 \approx 7,72$$
 [s<sup>-1</sup>]

### 30.2 Presmet ka na vist inskat a dol` i na na remenot $L_s$

Spored usl ovot vo zada~ata me|uoski noto rastojani e na remenasti ot prenosni k treba da bi de

$$a_r \approx 1,3(d_{p1} + d_{p2}) = 1,3 \cdot (200 + 315) = 669,5$$
 [mm]

pa spored **12.33** e

$$\beta \approx \arcsin \frac{d_{p2} - d_{p1}}{2a} = \arcsin \frac{315 - 200}{2 \cdot 669,5} = 4,9269171^\circ$$

taka { to zaradi pri bli` nata vrednost na  $\beta$ , pri bli` nata dol` i na na remenot spored **12.31** e

$$\begin{aligned} L_p &= \frac{d_{p1} + d_{p2}}{2} \pi + 2a \cos \beta + \frac{\beta \pi}{180} (d_{p2} - d_{p1}) \approx \\ &\approx \frac{200 + 315}{2} \pi + 2 \cdot 669,5 \cdot \cos 4,93^\circ + \frac{4,93 \cdot \pi}{180} \cdot (315 - 200) = \\ &= 808,96011 + 1334,0463 + 9,895142 = 2152,9015$$
 [mm]

pa spored **t ab.12.2** i **t ab.12.5** e

$$L_s = 2240$$
 [mm]

Spored **12.34** vi sti nskata vrednost na me|uoski noto rastojani e  $a_r$  } e bi de

$$a_r = p + \sqrt{p^2 - q} = 357,605 + \sqrt{357,605^2 - 1653,125} = 712,8911 \approx 712,9$$
 [mm]

pri

$$p = 0,25 L_s - 0,393 (d_{p1} + d_{p2}) = 0,25 \cdot 2240 - 0,393 \cdot (200 + 315) = 357,605 \text{ [mm]}$$

$$q = 0,125 (d_{p2} - d_{p1})^2 = 0,125 \cdot (315 - 200)^2 = 1653,125 \text{ [mm}^2\text{]}$$

### Proverka

Vi stinskata vrednost na  $\beta$  e

$$\beta_s \approx \arcsin \frac{d_{p2} - d_{p1}}{2a} = \arcsin \frac{315 - 200}{2 \cdot 712,8911} = 4,6263588^\circ$$

taka { to spored **12.31** vi stinskata dol`i na na remenot e

$$\begin{aligned} L_s &= \frac{d_{p1} + d_{p2}}{2} \pi + 2a_r \cos \beta_s + \frac{\beta_s \pi}{180} (d_{p2} - d_{p1}) = \\ &= \frac{100 + 315}{2} \cdot \pi + 2 \cdot 712,8911 \cdot \cos 4,6263588 + \frac{4,6263588 \cdot \pi}{180} \cdot (315 - 200) = \\ &= 808,96011 + 1421,1368 + 9,2856972 = 2239,3826 \approx 2240 \text{ [mm]} \end{aligned}$$

### 30.3 Presmetka na pot rebniot broj klinest i remeni

$$z = \frac{P_l}{P_k} = \frac{P_{EM} K_A}{K_\alpha K_\delta K_L P_{n1}} = \frac{25 \cdot 1}{0,97 \cdot 0,563 \cdot 1,0 \cdot 1,0 \cdot 6,77} \approx 6,76$$

i usvoeno  $z = 7 + 1 = 8$  klinest i remeni tip **D** so agol na `lebot od  $\varphi = 36^\circ$ .

Pri toa spored i zrazot { to e daden vo poglavje to **12.1.1.7.1**

$$- K_\alpha = 1 - 0,003 (180^\circ - \alpha_1) = 1 - 0,003 (180^\circ - 170,75^\circ) = 0,97225 \approx 0,97$$

- e faktor za popravka vo zavisnost od vrednosta na obvi vni ot agol na pogonski ot remeni  $k_A$ .

so

$$\alpha_1 = 180^\circ - 2\beta = 180 - 2 \cdot 4,6263588 = 170,74728 \approx 170,75^\circ$$

- obvi ven agol na mali ot remeni  $k$ ,

$$- k_\delta = \frac{d_{p1}}{d_{\min}} = \frac{200}{355} = 0,56$$

- f faktor za popravka vo zavisnost od gol emi nata na pre~ni kot na po-

gonski ot remeni  $k$  za klinest remen tip **D** i  $d_{\min} = 355 \text{ [mm]}$  za  $\varphi = 36^\circ$  spored **tab.12.8**

$$- k_A = 1,0$$

- f faktor za popravka vo zavisnost od o~ekuvanoto preoptovaruvawe na remenot spored **tab.4.1** (ramnomerno so elektromotor),

$$- k_L = 1,0$$

- f faktor za popravka vo zavisnost od dol`i nata i vi dot na remenot i

$$- P_{n1} = 6,77 \text{ [kW]}$$

- nosivost na eden klinest remen tip **D** za periferna brzina  $v_1 = d_{p1} \pi n_1 = 0,2 \cdot \pi \cdot 12,4 \approx 7,79 \text{ [m/s]}$  (**tab. 12.9**).