

O'ZBEKISTON RESPUBLIKASI OLIY VA O'RTA  
MAXSUS TA'LIM VAZIRLIGI

TOSHKENT TO'QIMACHILIK VA YENGIL SANOAT  
INSTITUTI

TEXNOLOGIK MASHINALAR VA JIHOZLAR KAFEDRASI

# HISOBOT

MAVZU: *Lentali konveyer yuritmasini loyihalash*

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## *Kirish*

*Yopiq korpus ichiga joylashgan, yetaklanuvchi val burchak tezligini kamaytirib uning aylantiruvchi momentini oshiradigan uzatma reduktor deb ataladi.*

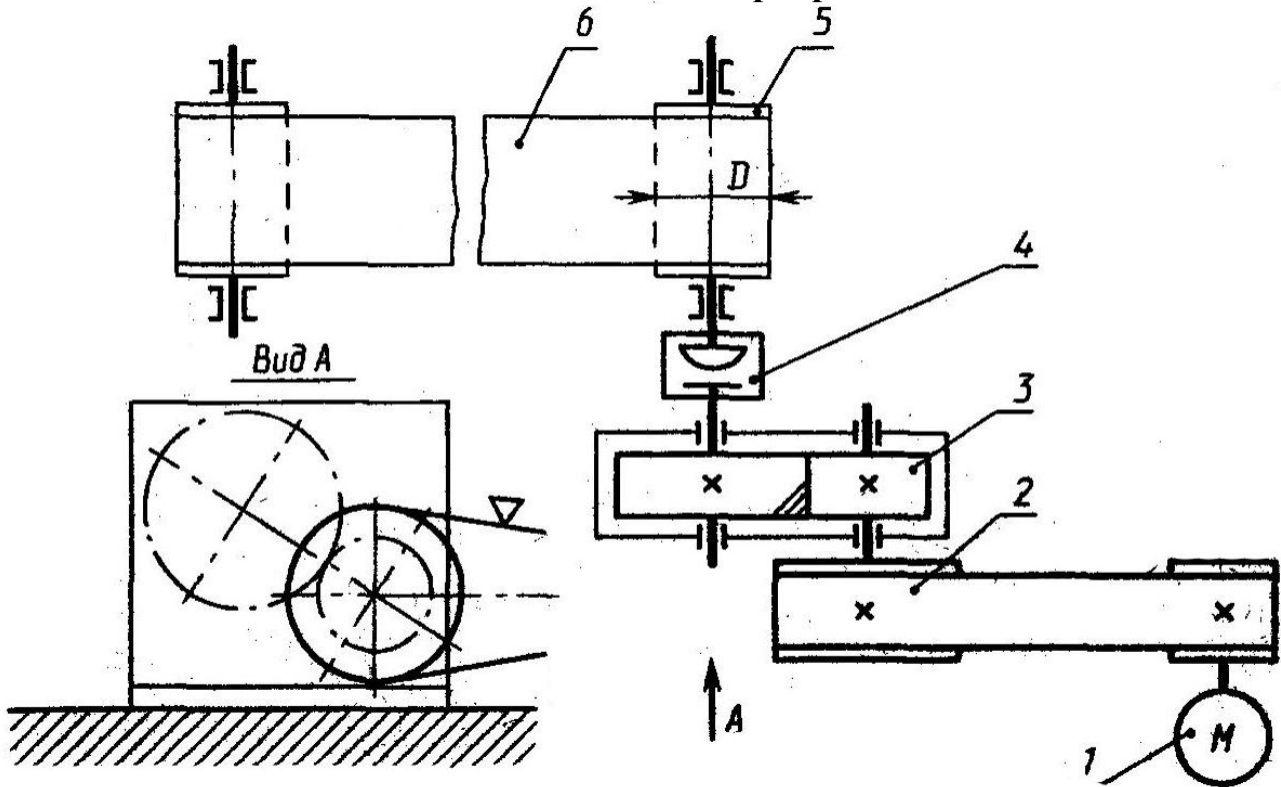
*Uzatmani alohida yopiq korpus ichiga joylashtirish yig'ish aniqligini oshiradi hamda uni yaxshi moylanishini, FIK oshishini, yeyilishini kamayishini taminlaydi, chang va namlikdan muxofaza qiladi.*

*Reduktor tugallangan mexanizm bo'lib, mashinalar yuritmalarining tartibiga kiradi. U dvigatel va mashina ishchi organlariga turli xil muftalar, ochiq uzatmalar yoki boshqa ajraluvchi qurilmalar yordamida ulanadi.*

*Reduktor korpusida vallarga qo'zg'almas qilib birlashtirilgan tishli g'ildiraklar joylashtirilgan. Vallar esakorpusdagi maxsus urindiqlarda joylashtirilgan podshipniklarga tayanadi. Reduktorlarda asosan dumalash podshipniklari qo'llaniladi. Podshipnik o'rindiqlari podshipnik qopqoqlari bilan berkitiladi.*

*Sanoatda keng qo'llaniladigan silindrsimon g'ildirakli reduktorlar bir pog'onali, ikki pog'onali va uch pog'onali qilib yasaladi. Ularning asosiy parametrlari, masalan, uzatish nisbati, o'qlararo masofasi, reduktor ostidan vallar o'qigacha bo'lgan masofa standart qiymatga ega bo'ladi. Reduktorlarning belgisiga (markasiga) asosan ularni konstruksiyasi va asosiy parametrlaridan biri aks etgan bo'ladi.*

## Лентали конвейёр юритмасы



Berilgan:  
 $F = 2,2 \text{ kH}$   
 $V = 1.1 \text{ m/c}$   
 $D = 250 \text{ mm}$

$$P_U = F \cdot V = 2,2 \cdot 1.1 = 2.4 \text{ kvt}$$

$$n_u = \frac{60V}{\pi D} = \frac{60 \cdot 1.1}{3.14 \cdot 0.250} = 84 \text{ ayl / min}$$

## Yuritmani kinematik hisobi

### 1. Yuritmani umumiy Foydali Ish Koeffisientini hisoblash

$$\eta_{um} = \eta_{\tau} \cdot \eta_{nod} \cdot \eta_{ped} = 0,97 \cdot 0,98 \cdot 0,99 = 0.913$$

### 2. El. dvigatelni tanlash uchun talab etiladigan quvvatni hisoblash

$$P_{tal} = \frac{P_{chiq}}{\eta_{um}} = \frac{2,4}{0.913} = 2,6 \text{ kvt} \quad P_{dv} > P_{tal} \quad P_{dv} = 3 \text{ kvt}$$

### 3. El. dvigatelni markalarni tanlash

|              |             |             |             |
|--------------|-------------|-------------|-------------|
| $n_c = 3000$ | 1500        | 1000        | 750         |
| 4A90L2       | 4A100S4     | 112MA6      | 4A112M8     |
| $S = 4.3\%$  | $S = 4.4\%$ | $S = 4.7\%$ | $S = 5.8\%$ |

4.

$$n_{dv} = 3000(1 - S) = 3000(1 - 0.043) = 2871 \text{ ayl / min}$$

$$n_{dv} = 1500(1 - S) = 1500(1 - 0.044) = 1434 \text{ ayl / min}$$

$$n_{dv} = 1000(1 - S) = 1000(1 - 0.047) = 953 \text{ ayl / min}$$

$$n_{dv} = 750(1 - S) = 750(1 - 0.058) = 706 \text{ ayl / min}$$

### 5. Yuritmani umumiy uzatish sonini hisoblash

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{2871}{84} = 37.1$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{1434}{84} = 17$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{953}{84} = 11.3$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{706}{84} = 8.1$$

### 6. Umumiy uzatish sonini aniq pog'onalarga taqsimlash

$$U_{um} = U_T \cdot U_{red} \quad U_{red} = 5$$

$$U_T = \frac{U_{um}}{U_{red}} = \frac{37.1}{5} = 6.8$$

$$U_T = \frac{U_{um}}{U_{red}} = \frac{17}{5} = 3.4$$

$$U_T = \frac{U_{um}}{U_{red}} = \frac{11.3}{5} = 2.2$$

$$U_T = \frac{U_{um}}{U_{red}} = \frac{8.1}{5} = 1.6$$

**7. Har bir val uchun quvvat ( $P$ ), aylanishlar soni ( $n$ ), burovchi moment ( $T$ ), burchak tezligi ( $\omega$ ) hisoblanadi**

I val:

$$P_1 = P_{tal} = 2,6 \text{ kvt}$$

$$n_1 = n_{dv} = 953 \text{ min}^{-1}$$

$$T_1 = 9550 \cdot \frac{P_1}{n_1} = 9550 \cdot \frac{2,6}{953} = 26 \text{ Nm}$$

$$\omega_1 = \frac{\pi \cdot n_1}{30} = \frac{3,14 \cdot 953}{30} = 99,7 \text{ s}^{-1}$$

II val:

$$P_2 = P_1 \cdot \eta_T \cdot \eta_n = 2,6 \cdot 0,97 \cdot 0,99 = 2,49 \text{ kvt}$$

$$n_2 = \frac{n_1}{U_T} = \frac{953}{2,2} = 421,6 \text{ min}^{-1}$$

$$T_2 = T_1 \cdot U_T \cdot \eta_T \cdot \eta_n = 26 \cdot 2,2 \cdot 0,97 \cdot 0,99 = 54,9 \text{ Nm}$$

$$\omega_2 = \frac{\omega_1}{U_T} = \frac{99,7}{2,2} = 45,3 \text{ s}^{-1}$$

III val:

$$P_3 = P_2 \cdot \eta_p \cdot \eta_{nod} = 2,49 \cdot 0,98 \cdot 0,99 = 2,4 \text{ kvt}$$

$$n_3 = \frac{n_2}{U_p} = \frac{421,6}{5} = 84 \text{ min}^{-1}$$

$$T_3 = T_2 \cdot U_p \cdot \eta_n = 54,9 \cdot 5 \cdot 0,9 = 247,1 \text{ Nm}$$

$$\omega_3 = \frac{\omega_2}{U_p} = \frac{45,3}{5} = 9,06 \text{ s}^{-1}$$

$$T_1 < T_2 < T_3$$

$$n_1 > n_2 > n_3$$

$$\omega_1 > \omega_2 > \omega_3$$

$$P_1 > P_2 > P_3$$

## ***Bir pog'onali qiya tishli silindrsimon yopiq uzatmaning hisobi***

Berilgan

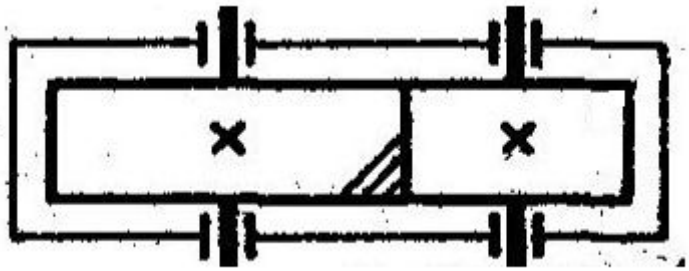
$$T_2 = 54.9 \text{ Nm}$$

$$T_3 = 247.1 \text{ Nm}$$

$$n_2 = 421.6 \text{ min}^{-1}$$

$$n_3 = 84 \text{ min}^{-1}$$

$$U = 5$$



### ***1. Ruxsat etilgan kuchlanishlarni aniqlash***

#### ***1.1 Ruxsat etilgan kontakt kuchlanishni aniqlash***

$$[\delta_H] = K_{HL} \cdot [\delta_{HO}]$$

bu yerda:

$K_{HL}$  -uzatmani ishlash muddatini hisobga oluvchi koeffisient bo'lib, uning qiymatini 1 ga teng deb olamiz

$[\delta_{HO}]$  -ruxsat etilgan kontakt kuchlanishning oquvchanlik chegarasi

$$[\delta_{HO}] = 1.8 \cdot HB_{o'r} + 67 = 1.8 \cdot 285.5 + 67 = 581 \text{ MPa}$$

$$HB_{o'r} = \frac{269 + 302}{2} = 285.5$$

$$[\delta_H] = K_{HL} \cdot [\delta_{HO}] = 1 \cdot 581 = 581 \text{ MPa}$$

Keyingi hisoblarda kontakt kuchlanishning hisobiy qiymati ishlatilib, uning qiymatini quyidagicha aniqlaymiz

$$[\delta_H] = 0.45 \cdot ([\delta_H] + [\delta_H]_2) = 0.45 \cdot (581 + 294) = 656 \text{ MPa}$$

#### ***1.2 Ruxsat etilgan egilishdagi kuchlanishni aniqlash***

$$[\delta_F] = K_{FL} \cdot [\delta_{FO}]$$

$$\text{G'ildirak uchun } [\delta_{FO}]_2 = 1.03 \cdot HB_{o'r} = 1.03 \cdot 285.5 = 294 \text{ MPa}$$

$$[\delta_F]_2 = K_{FL} \cdot [\delta_{FO}]_2 = 1 \cdot 294 = 294 \text{ MPa}$$

$$\text{Shesternya uchun } [\delta_{FO}]_1 = 310 \text{ MPa}$$

### ***2. Uzatmaning o'qlararo masofasini aniqlash***

$$a_w = K \cdot (U + 1) \cdot \sqrt[3]{\frac{T_3 \cdot K_{H\beta}}{[\delta_H]^2 \cdot U^2 \cdot \psi_a}}$$

bu yerda:

$K_a$  -hisobiy koeffisient bo'lib, to'g'ri tishli uzatma uchun  $K_a = 49.5$  ga

teng, qiya tishli uzatma uchun esa  $K_a = 43$  ga teng.

U-uzatmaning uzatish soni

$[\delta_H]$  -ruxsat etilgan kontakt kuchlanishning MPa hisobida

$T_3$  -sekin aylanuvchi g'ildirak valining burovchi momenti

$K_{HB}$  -yuklanishni tish yuzasiga notekis taqsimlanishni hisobga oluvchi koeffisienti tish yuzasining notekisligi HBga, tish eni koeffisienti  $\psi_a$  va uzatma g'ildiraklarining tayanchi nuqtasiga joylashishiga nisbatan olinadi.

$\psi_a$  -tish eni koeffisienti bo'lib, uzatma g'ildiraklarini tayanchga nisbatan joylashishiga qarab tanlanadi.

$$a_\omega = K \cdot (U + 1) \cdot \sqrt[3]{\frac{T_3 \cdot K_{HB}}{[\delta_H]^2 \cdot U^2 \cdot \psi_a}} = 43 \cdot 6 \cdot \sqrt[3]{\frac{247,1 \cdot 10^3 \cdot 1}{656^2 \cdot 5^2 \cdot 0.4}} =$$
$$= 258 \cdot \sqrt[3]{\frac{247100}{4303360}} = 100,6 \text{ mm}$$

Standart bo'yicha  $a_\omega = 100 \text{ mm}$  ga teng.

### **3. Tishli g'ildiraklarning dastlabki o'lchamlari**

3.1 G'ildirak bo'lurvchi aylana diametrini hisoblash.

$$d_2 = \frac{2 \cdot a_\omega \cdot U}{U + 1} = \frac{2 \cdot 100 \cdot 5}{6} = 166,6 \text{ mm}$$

3.2 G'ildirak eni

$$b_2 = \psi_a \cdot a_\omega = 0.4 \cdot 100 = 40 \text{ mm} \qquad b_1 = 40 + 5 = 45 \text{ mm}$$

### **4. Uzatma modulini aniqlash**

$$m_n = (0.01 \div 0.02) a_\omega = (1 \div 2) = 1.25 \text{ mm}$$

Standart bo'yicha  $m = 1.25 \text{ mm}$  deb qabul qilamiz.

bu yerda:

$K_m$  -hisobiy koeffisient bo'lib, to'g'ri tishli uzatma uchun 6,8ga teng, qiya tishli uzatma uchun 5,8 ga teng bo'ladi.

### **5. Uzatma tishlarining qiyalik burchagi va umumiy tishlar soni**

5.1 Qiyalik burchagining eng kichik qiymatini aniqlash

$$\beta_{\min} = \arcsin\left(\frac{4m}{b_2}\right) = \arcsin\left(\frac{4 \cdot 1.25}{40}\right) = 8^\circ$$

## 5.2 Uzatma umumiy tishlar soni

$$z_y = \frac{2 \cdot a_\omega \cdot \cos \beta_{\min}}{m} = \frac{2 \cdot 100 \cdot 0.99}{1.25} = 158$$

### 6. Yetaklovchi va yetaklanuvchi tishli g'ildirak tishlar soni

$$z_1 = z_y / (U + 1) = 158 / 6 = 26.3 = 26$$

$$z_2 = z_y - z_1 = 158 - 26 = 132$$

### 7. Uzatmaning geometrik o'lchamlari

a) Tish bo'luvchi aylana diametri

$$d_1 = \frac{m \cdot z_1}{\cos \beta} = \frac{1.25 \cdot 26}{0.99} = 32.8 \text{ mm}$$

$$d_2 = \frac{m \cdot z_2}{\cos \beta} = \frac{1.25 \cdot 132}{0.99} = 166.6 \text{ mm}$$

b) Tish ostidan o'tgan aylana diametri

$$d_{f1} = d_1 - 2.5m = 32.8 - 3.125 = 29.67 \text{ mm}$$

$$d_{f2} = d_2 - 2.5m = 166.6 - 3.125 = 163.47 \text{ mm}$$

c) Tish ustidan o'tgan aylana diametri

$$d_{a1} = d_1 + 2m = 32.8 + 2.5 = 35.3 \text{ mm}$$

$$d_{a2} = d_2 + 2m = 166.6 + 2.5 = 169.1 \text{ mm}$$

### 8. O'qlararo masofani tekshirish

$$a_\omega = \frac{(d_1 + d_2)}{2} = \frac{32.8 + 166.6}{2} = 99.7 \text{ mm}$$

$$a_\omega = 100 \text{ mm}$$

$$\psi_{bd} = \frac{b_1}{d_1} = \frac{45}{32.8} = 1.371$$

$$v = \frac{\omega_1 d_1}{2} = \frac{99.7 \cdot 32.8}{2000} = 1.63$$

### 9. Ilashishda hosil bo'ladigan kuchlar

9.1 Aylanma kuch

$$F_t = \frac{2 \cdot T_3}{d_2} = \frac{2 \cdot 210.8 \cdot 10^3}{166.6} = 2530 \text{ N}$$

9.2 Radial kuch  $\alpha = 20^\circ$

$$F_r = F_t \cdot \frac{\tan 20^\circ}{\cos \beta} = 2530 \cdot \frac{0.36}{0.99} = 920 \text{ N}$$

9.3 Bo'ylama kuch

$$F_a = F_t \cdot \tan \beta = 2530 \cdot \tan 8^\circ = 354 \text{ N}$$

### 10. Kontakt kuchlanishni hisoblash

$$K = 376$$

$$\delta_H = K \cdot \sqrt{\frac{F_t(U+1)}{d_2 \cdot b_2} \cdot K_{H\beta} \cdot K_{H\alpha} \cdot K_{Hv}} = 376 \cdot \sqrt{\frac{2530 \cdot 6}{166.6 \cdot 40} \cdot 1.07 \cdot 1.09 \cdot 1} = 609.1 \text{ MPa}$$

Chiqqan qiymat quydagi oralig'da bo'lishi kerak

$$\delta_H = (0.9 - 1.05)[\delta_H] = 590.4 - 688.8 \text{ MPa}$$

### Yassi tasmali uzatma hisobi

1. Yetaklovchi shkivning aylanishlar soni

$$n_1 = n_c (1 - \varepsilon) = 1000(1 - 0.047) = 953$$

2. Yetaklovchi val momenti

$$T_1 = \frac{P}{\omega} = \frac{30P}{\pi n_1} = \frac{30 \cdot 2.6 \cdot 10^3}{3.14 \cdot 953} = \frac{78000}{2992.42} = 26$$

3. Yetaklovchi shkiv diametri

$$d_1 = 6\sqrt[3]{T_1} = 6 \cdot 2.97 \cdot 10 = 178,2 \text{ mm}$$

$$d_1 = 180 \text{ mm}$$

4. Yetaklovchi shkiv diametri

$$d_2 = d_1 \cdot i(1 - \varepsilon) = 160 \cdot 2.2(1 - 0.015) = 390 \text{ mm}$$

$$d_2 = 400 \text{ mm}$$

5. Uzatish nisbati

$$i = \frac{d_2}{d_1(1 - \varepsilon)} = \frac{400}{180(1 - 0.015)} = \frac{400}{177.3} = 2,25 \%$$

6. O'qlararo masofa

$$a = 2(d_1 + d_2) = 2(180 + 400) = 1160$$

7. Kichik shkivning qoplanish burchagi

$$\alpha_1^0 = 180 - 60 \frac{d_2 - d_1}{a} = 180 - 60 \frac{400 - 180}{1160} = 180 - 11.37 = 168,6$$

8. Tasma uzunligi, mm

$$L = 2a + 0.5\pi(d_1 + d_2) + \frac{(d_2 - d_1)^2}{4a} = 2 \cdot 1160 + 0.5 \cdot 3.14(180 + 400) + \frac{(400 - 180)^2}{4 \cdot 1160} = 2320 + 910.6 + 0.047 = 3230.6 \text{ mm}$$

9. Tasmaning chiziqiy tezligi

$$V = \frac{\pi d_1 n_1}{60} = \frac{3.14 \cdot 0.18 \cdot 953}{60} = 8.9 \text{ m/s}$$

10. Aylana kuch, N

$$F_t = \frac{P}{V} = \frac{2.6 \cdot 10^3}{8.9} = 292,1$$



11. 7.1 jadvalda  $\delta$  ni tanlaymiz.  $z = 3$   $\delta_0 = 1.5 \text{ mm}$   $P_0 = 3 \text{ N/mm}$

$$\delta \leq 0.025 \cdot d_1$$

$$\delta = \delta_0 \cdot z = 1.5 \cdot 3 = 4.5 \text{ mm}$$

$$0.025 \cdot 180 = 4.5 \text{ mm}$$

12. Qoplanish burchagi koefitsiyenti.

$$C_\alpha = 1 - 0.003(180 - \alpha_1^0) = 1 - 0.003(180 - 168.6) =$$

$$= 1 - 0.034 = 0.96$$

13. Tasmaning tezligiga ta'sir qiluvchi koefitsiyenti.

$$C_v = 1.04 - 0.0004 V^2 = 1.04 - 0.0004 \cdot 8.9^2 =$$

$$= 1.04 - 0.031 = 1.01$$

14. Ish davomiyligini hisobga oluvchi koefitsiyenti 7.5 jadvaldan  $C_p$  ni aniqlaymiz.  $C_p = 1.0$

15. Burchak koefitsiyentini hisobga oluvchi koefitsiyenti.  $C_0 = 1$

16. Ruxsat etilgan yuklama

$$[p] = \rho_0 C_\alpha C_v C_p C_0 = 3 \cdot 0.96 \cdot 1.01 \cdot 1.0 \cdot 1 = 2.9 \text{ N/mm}$$

17. Tasmaning eni

$$b \geq \frac{F_t}{z[p]} = \frac{292.1}{3 \cdot 2.9} = 33.5 \text{ mm}$$

$$b = 40 \text{ mm}$$

18. Tasmaning dastlabki tortilish kuchi

$$F_0 = \sigma_0 b \delta = 1.8 \cdot 40 \cdot 4.5 = 324 \text{ N}$$

19. Tarmoqlardagi tortilishi

Yetaklovchi uchun

$$F_1 = F_0 + 0.5 F_t = 324 + 0.5 \cdot 292.1 = 470 \text{ N}$$

Yetaklanuvchi uchun

$$F_2 = F_0 - 0.5 F_t = 324 - 0.5 \cdot 292.1 = 178 \text{ N}$$

20.  $F_1$  kuchdan hosil bo'lgan kuchlanish

$$\sigma_1 = \frac{F_1}{b \delta} = \frac{470}{40 \cdot 4.5} = \frac{470}{180} = 2.6 \text{ MPa}$$

21. Egilishdagi kuchlanish

$$\sigma_i = E_i \frac{\delta}{d_1} = 150 \cdot \frac{4.5}{180} = 3.75 \text{ MPa}$$

22. Markazdan qochma kuch hosil bo'lgan kuchlanish

$$\sigma_v = \rho v^2 10^{-6} = 1100 \cdot 8.9^2 \cdot 10^{-6} = 0.08 \text{ MPa}$$

**23. Maksimal kuchlanish**

$$\sigma_{\max} = \sigma_1 + \sigma_i + \sigma_v = 2.6 + 3.75 + 0.08 = 6.43 \text{ MPa}$$

**24. Tasmaning uzoq muddat ishlashini tekshirish.**

$$\lambda = \frac{V}{L} = \frac{8.9}{3.23} = 2.7 c^{-1}$$

$$C_i = 1.5 \sqrt[3]{i} - 0.5 = 1.5 \sqrt[3]{2.2} - 0.5 = 1.5 \cdot 1.31 - 0.5 = 1.46$$

$$C_H = 1$$

$$H_0 = \frac{\sigma_{-1}^6 10^7 C_i C_H}{\sigma_{\max}^6 2 \cdot 3600 \lambda} = \frac{7^6 \cdot 10^7 \cdot 1.46 \cdot 1}{6.43^6 \cdot 2 \cdot 3600 \cdot 2.7} = \frac{1717675400000}{1373922064.48} = 1250 ch$$

**25. Uzatma validagi yuklama**

$$F_B = 3F_0 \sin \frac{\alpha_1}{2} = 3 \cdot 324 \sin \frac{168.6}{2} = 967 N$$

## *Vallarning tahminiy hisobi*

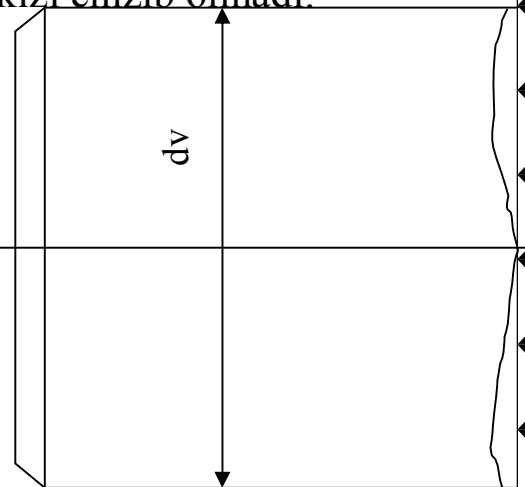
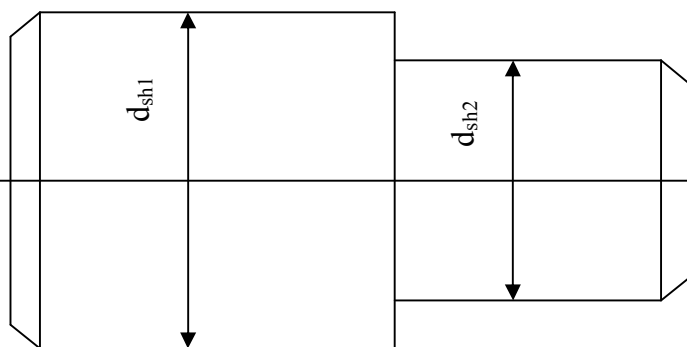
**1. Birinchi val uchi konsol qismining diametri quydagicha aniqlanadi:**

$$d_1 = \sqrt[3]{\frac{T_1}{0.2[\tau]}} = \sqrt[3]{\frac{26 \cdot 10^3}{0.2 \cdot 20}} = 19 \text{ mm}$$

Bu yerda:  $T$  -burovchi moment, Nmm

$[\tau]$  -buralishdagi ruxsat etilgan kuchlanish

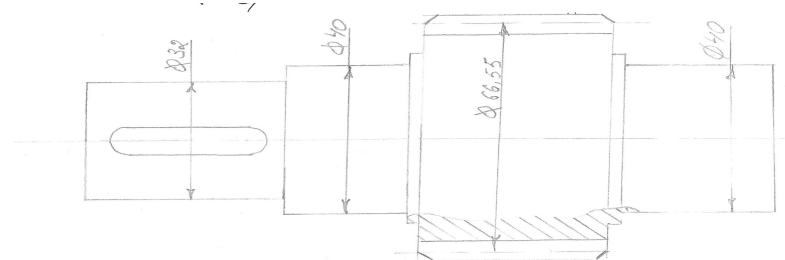
$d_1$  ning aniqlangan qiymati standart bo'yicha yaxlitlanib, val qolgan qismlarining diametri aniqlanib, valning eskizi chizib olinadi.



$$d_1 = 19 \text{ mm}$$

**2. Ikkinchi val uchun konsol qismining diametri**

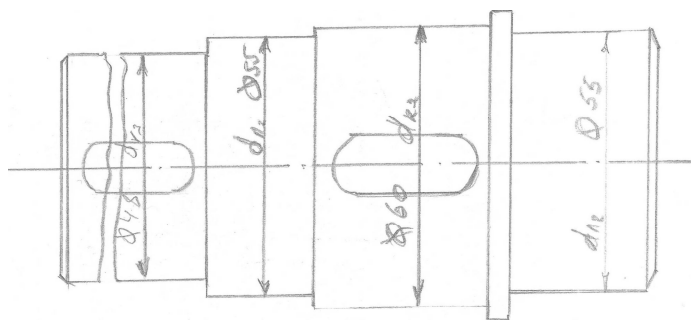
$$d_2 = \sqrt[3]{\frac{T_2}{0.2 \cdot [\tau]}} = \sqrt[3]{\frac{54,6 \cdot 10^3}{0.2 \cdot 20}} = 25 \text{ mm}$$



$$d_1 = 25 \text{ mm}$$

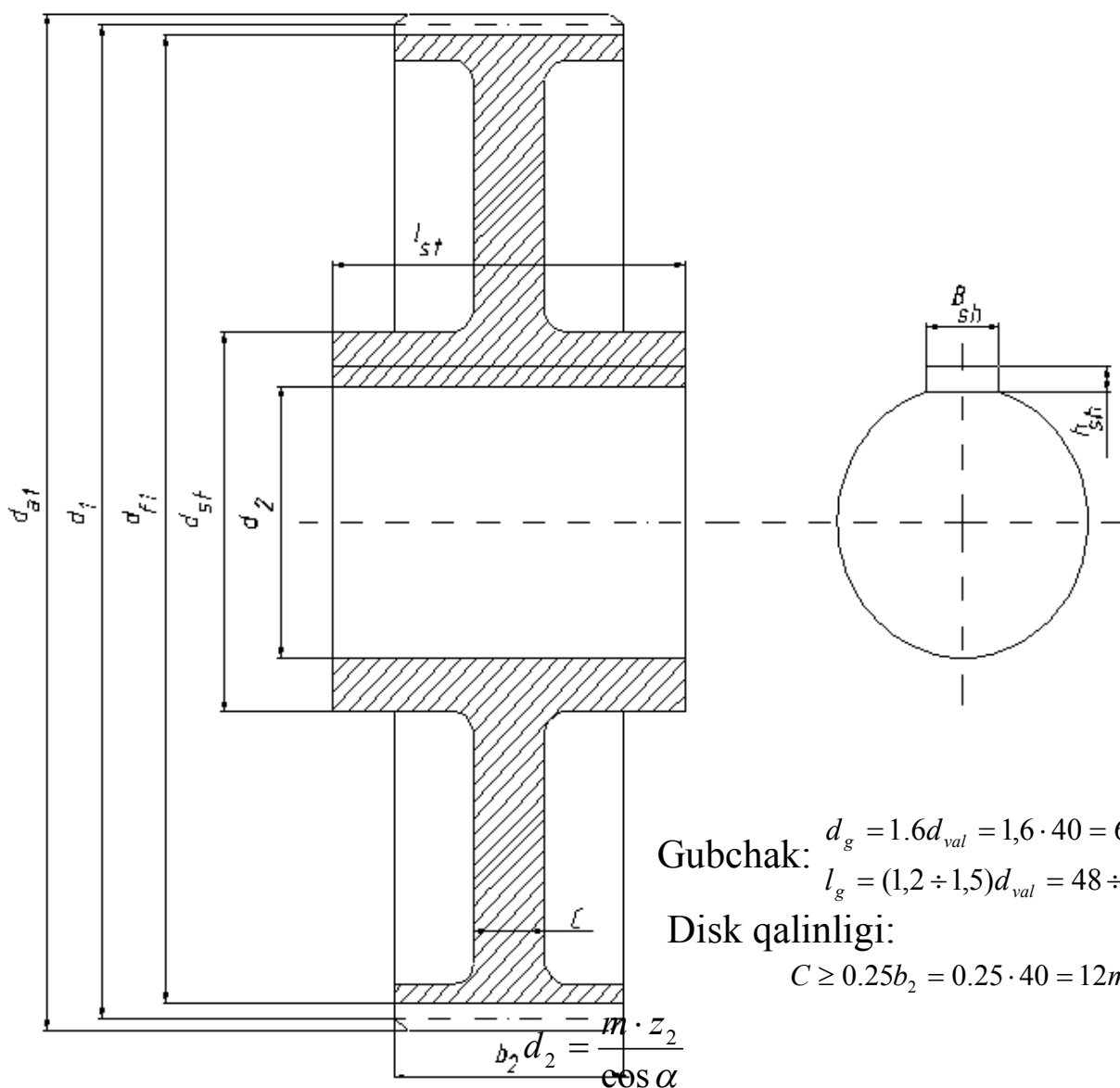
**3. Uchinchi val uchun konsol qismining diametri**

$$d_3 = \sqrt[3]{\frac{T_3}{0.2 \cdot [\tau]}} = \sqrt[3]{\frac{247,1 \cdot 10^3}{0.2 \cdot 20}} = 30 \text{ mm}$$



$$d_1 = 30mm$$

### *Gildirak konstruksiyasini o'lchamlari*



Gubchak:  $d_g = 1.6d_{val} = 1,6 \cdot 40 = 64$   
 $l_g = (1,2 \div 1,5)d_{val} = 48 \div 60$

Disk qalinligi:

$$C \geq 0.25b_2 = 0.25 \cdot 40 = 12mm$$

$$b_2 d_2 = \frac{m \cdot z_2}{\cos \alpha}$$

$$d_{f2} = d_2 - 2.5m$$

$$d_{a2} = d_2 + 2m$$

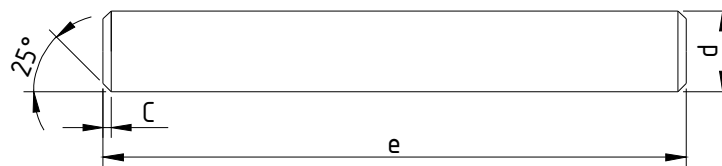
Tishli g'ildiraklar bu tishli gardish, gubchak va ularni biriktirib turadigan diskdan iborat bo'lib, bu elementlarning o'lchamlarini formulalar yordamida aniqlash mumkin. G'ildirakning tishli gardishi

tashqi kuchga chidamli, ya'ni mustahkam, bikrligi yuqori bo'lishi kerak, buning uchun gardishning qalinligi silindrsimon tishli g'ildiraklar uchun  $S > 2.5m$  olinadi.

Tishli g'ildiraklarning gubchagi g'ildirakning valiga o'tqazilib ko'rinishi simmetrik yoki nosimmetrik bo'lishi mumkin. Gubchakning uzunligi valning diametriga hamda g'ildirakning materialiga bog'liq bo'ladi. G'ildirakning diski gubchakni gardish bilan biriktiradi, qalinligi g'ildirakni qanday yo' bilan tayyorlanishiga bog'liq.

### ***Korpus elementlari o'lchamlari***

Korpusda podshipnik uchun mo'ljallangan uyalarni ochishda o'qdoshligini ta'minlash uchun qutining asosi bilan qutining qopqog'i o'zaro konussimon yoki silindrsimon shtiv bilan biriktirilib, uyalar qayta ishlana-di. Shtivlarda ichki rezba bo'lishi mumkin, bu esa kerak paytda shtivni olib tashlashni osonlashtiradi. Shtivning o'lchamlari:



$$d = 10mm$$

$$c = 1,6mm$$

$$e = 30..60mm$$

Reduktor korpusi va qopqog'i devorining qalinligi

$$\delta = 0,025a_w + 1 = 0.025 \cdot 100 + 1 = 3.5 \text{ mm} \quad \delta = 8 \text{ mm}$$

$$\delta_1 = 0.02a_w + 1 = 0.02 \cdot 100 + 1 = 3 \text{ mm} \quad \delta_1 = 8 \text{ mm}$$

Yuqori korpus va qopqog'ining belbog'ining qalinligi.

$$b = 1.5\delta = 1.5 \cdot 8 = 12 \text{ mm}$$

$$b_1 = 1.5\delta_1 = 1.5 \cdot 8 = 12 \text{ mm}$$

Pastki korpus qalinligi.

$$\rho = 2.35\delta = 2.35 \cdot 8 = 19 \text{ mm} \quad \rho = 18 \text{ mm}$$

Uzatmalar ishlash jarayonida g'ildiraklarni yog'lash uchun ishlatilgan moylar asta-sekin ifloslanib, o'zining moylash xususiyatini yoqotadi. Shuning uchun bu moylarni vaqti-vaqti bilan almashtirib turish kerak. Korpusning qopqog'idagi darchadan moy quyiladi. Moy hajmini tek-shirish uchun hamda ishlatilgan moyni to'kish uchun korpus asosining yon tomonida teshik ochiladi. Moyni to'kish uchun ochilgan teshik si-lindrsimon yoki konussimon bo'lishi mumkin. Silindrsimon

probka ish-latilsa moylar tirqishdan chiqib ketmasligi uchun rezinali moslama ish-latiladi, konussimon probkalarda bu moslamalar ishlatilmaydi.

$$\begin{array}{ll} d_1 = M16 \times 1,5 & b = 4mm \\ D_1 = 25.4mm & d_2 = 20mm \\ L = 28mm & D_2 = 32mm \\ l = 13mm & b_2 = 3mm \end{array}$$

Moyni to'kishni tezlashtirish uchun teshiklar korpus asosining yuziga nisbatan 1-2 gradus qiyalik bilan ochiladi.

Moy hajmini o'lchagich moslamalar har xil ko'rinishda bo'ladi.

### ***Boltlarni tanlash***

Korpusni yig'ish uchun har xil diametrli boltlar ishlatiladi.

1. Yopiq uzatmalarni fundamentga mahkamlash uchun ishlatiladigan fundament boltlar diametri  $d_1$  ni  $a_\omega$ ,  $d_{e_2}$  qiymatlariga nisbatan tanlanadi.

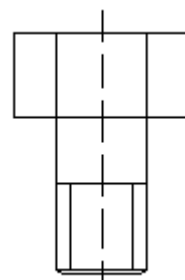
$$a_\omega = 100 \quad M 16$$

$$K = 28mm$$

$$C = 16mm$$

$$D_0 = 26mm$$

$$d_0 = 16mm$$



1. Fundament bolt o'rnatilgan o'yoqchanning o'lchamlari  $d_1$  ga bog'liq bo'lib; bolt bilan mahkamlansa  $h_{01} = 2,5(d_1 + \delta)$ . Bolt o'rnatilgan teshikchanning balandligi  $h_1 = 2,5\delta$  olinadi.

2. Yopiq uzatma qopqog'ining asosi bilan mahkamlash uchun diametri  $d_3$  bo'lgan bolt ishlatiladi. Boltlar orasidagi masofa  $L_3 = (8 \div 10)d_3$  olinadi, bolt o'rnatilgan teshukchanning balandligi  $h_3 = 1,5\delta$  M12

3. Podshipnik qopqoqlarni mahkamlash uchun diametri  $d_4$  bo'lgan bolt ishlatiladi. Boltning diametri va soni podshipnik tashqi diametriga nisbatan tanlanadi.

4. Korpus qopqog'idan moy quyish uchun hamda uzatmani ishlash jarayonida kuzatish uchun maxsus darcha ochiladi. Bu darchani qopqoq yordamida berkitib diametri  $d_5$  bo'lgan bolt yordamida mahkamlanadi. M10

### ***Podshipnik tanlash***

Podshipniklar val hamda o'qlarning shiplariga o'rnatilib, tayanch vazifasini o'taydi. O'q yoki val orqali tayanchga tushadigan kuchni bevosita podshipnik qabul qiladi. Mashinaning ishlash sifati podshipniklarga ko'p jihatdan bog'liq. Shuning uchun podshipniklarni tanlash, loyihalash va ish jarayonida ularni kuzatib turish masalalariga alohida e'tibor berish lozim.

1. Yetaklovchi va yetaklanuvchi g'ildirak vallariga juda yengil seriyali bir qatorli zoldirli radialpodshipnik tanlaymiz.

$$d_1 = 35mm$$

$$d_2 = 25mm$$

$$D = 80mm$$

$$D = 62mm$$

$$B = 21mm$$

$$B = 17mm$$

$$r = 2,5mm$$

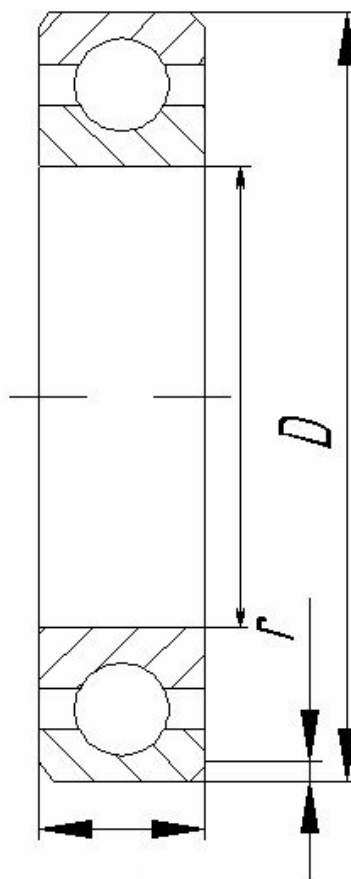
$$r = 2mm$$

$$C_r = 33.2kN$$

$$C_r = 22,5kN$$

$$C_0 = 18.0kN$$

$$C_0 = 11,4kN$$



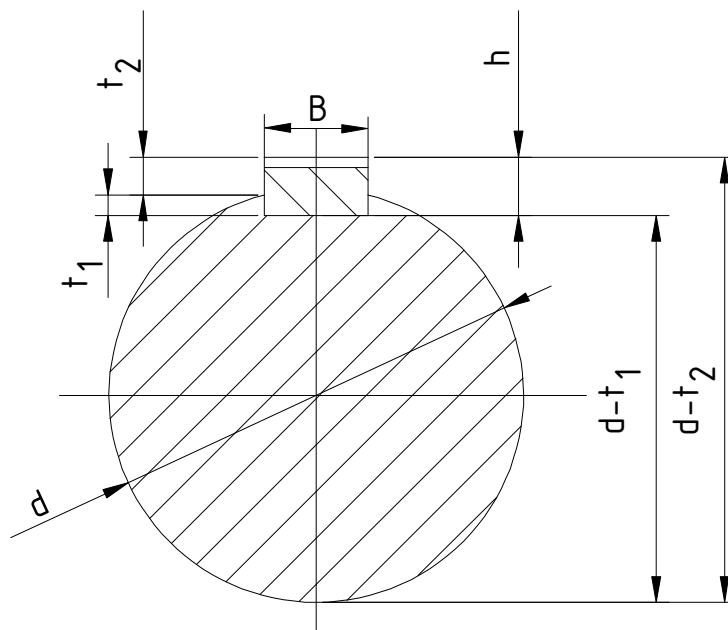
### ***Shponka tanlash***

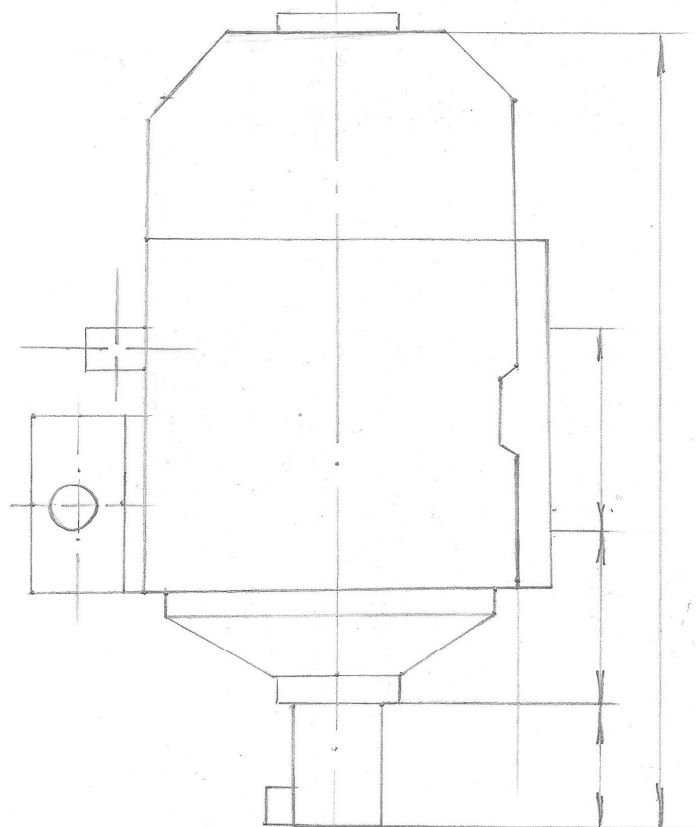
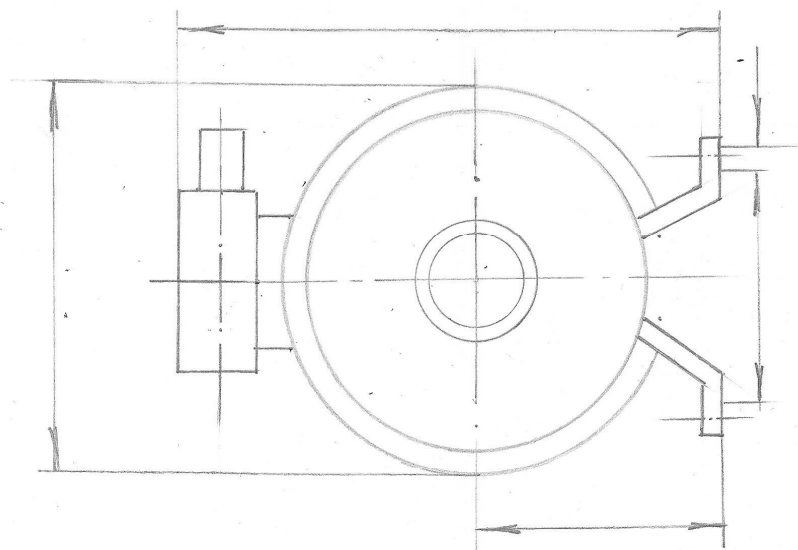
**I val**  $T_2 = 54,9 \cdot 10^3$      $d = 25mm$      $l = 50mm$      $t_1 = 4mm$      $h = 7mm$   
 $b = 8mm$

$$\delta_{ez} = \frac{2 \cdot T_2}{d(l-b)(h-t_1)} = \frac{2 \cdot 54,9 \cdot 10^3}{25(50-8)(7-4)} = 35 MPa \leq [\delta_{ez}] = 100 \div 120 MPa$$

**II val**  $T_3 = 247,18 \cdot 10^3$      $d = 30mm$      $l = 60mm$      $t_1 = 3,3mm$   
 $h = 8mm$      $b = 10mm$

$$\delta_{ez} = \frac{2 \cdot T_3}{d(l-b)(h-t_1)} = \frac{2 \cdot 247,1 \cdot 10^3}{30(60-10)(8-3,3)} = 70 MPa \leq [\delta_{ez}] = 100 \div 120 MPa$$





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