

**O'ZBEKISTON RESPUBLIKASI OLIIY VA
O'RTA MAXSUS TA'LIM VAZIRLIGI**

**TOSHKENT TO'QIMACHILIK VA YENGIL SANOAT
INSTITUTI**

Mashinalar mexanikasi kafedrası

KURS ISHI

Мавзй: Zanjirli konveyer yurtmasini hisoblash va loyihalash

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Kirish

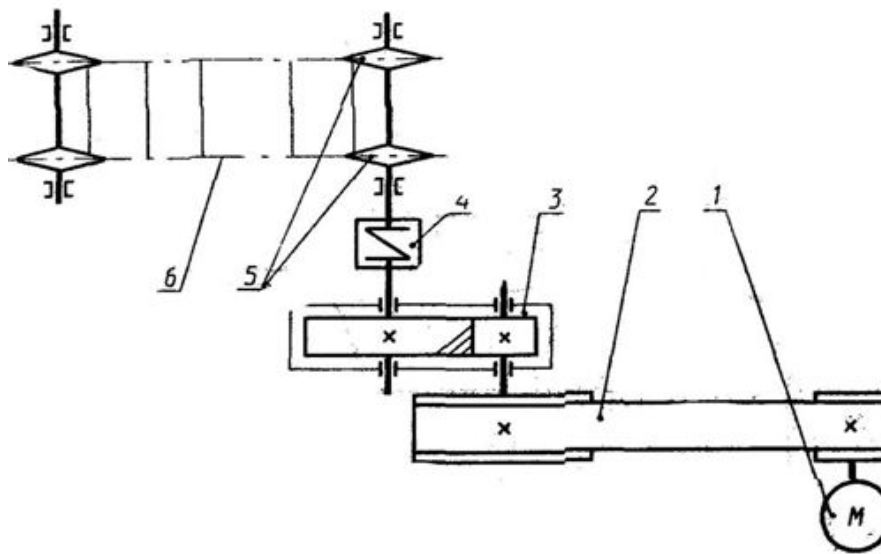
Yopiq korpus ichiga joylashgan, yetaklanuvchi val burchak tezligini kamaytirib uning aylantiruvchi momentini oshiradigan uzatma reduktor deb ataladi.

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 biriktirilgan 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.



1 – двигателъ; 2 – ясси тасмали узатма; 3 – кия тишли цилиндрсимон редуктор;
4 – муфта; 5 – конвейрни етакловчи юлдузчаси; 6 – конвейр занжири

$$P_{chiq} = 6.80kvt$$

$$v = 0,55m / s$$

$$pt = 80mm$$

$$J = 8$$

Yuritmani kinematik hisobi

1. Yuritmani umumiy Foydali Ish Koeffisientini hisoblash

$$\eta_{um} = \eta_{tu} \cdot \eta_{sr} = 0.95 \cdot 0.9 = 0.9215$$

2. Ishchi valdagi quvvatni aniqlash

$$N_{i.v} = F \cdot V = 6,8 \cdot 0,55 = 3,74kBt$$

3. El. dvigatelni tanlash uchun talab etiladigan quvvatni hisoblash

$$P_{tal} = \frac{P_{chiq}}{\eta_{um}} = \frac{3,74}{0.9215} = 4.05kvt$$

$$4. D_3 = \frac{pt}{\sin \frac{180}{8}} = \frac{80}{0,3826} = 0,209m$$

5. Ishchi valning burchak tezligini aniqlash

$$\omega = \frac{v_k}{D_3} = \frac{0,55}{0,205/2} = 5,26rad / s$$

6. . *Ishchi valning aylanish chastatasini aniqlash*

$$n_3 = \frac{30\omega_3}{\pi} = \frac{30 \cdot 5,26}{3,14} = 50,3 \text{ rad} / s$$

7. *El. dvigatelni markalarni tanlash*

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

8.

$$n_{dv} = 3000(1 - S) = 3000(1 - 0.043) = 2880 \text{ ayl} / \text{min}$$

$$n_{dv} = 1500(1 - S) = 1500(1 - 0.044) = 1445 \text{ ayl} / \text{min}$$

$$n_{dv} = 1000(1 - S) = 1000(1 - 0.047) = 965 \text{ ayl} / \text{min}$$

$$n_{dv} = 750(1 - S) = 750(1 - 0.058) = 720 \text{ ayl} / \text{min}$$

5. *Yuritmani umumiy uzatish sonini hisoblash*

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{2880}{50,3} = 57,2$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{1445}{50,3} = 28,7$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{965}{50,3} = 19,2$$

$$U_{um} = \frac{n_{dv}}{n_u} = \frac{720}{50,3} = 14,3$$

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

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

$$U_{red} = 5$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{57,2}{5} = 11,441$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{28,7}{5} = 5,745$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{19,2}{5} = 3,84$$

$$U_{II} = \frac{U_{um}}{U_{red}} = \frac{14,3}{5} = 2,87$$

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

I val:

$$P_1 = P_{tal} = 4,05 \text{ kvt}$$

$$n_1 = n_{dv} = 719 \text{ min}^{-1}$$

$$T_1 = 9550 \cdot \frac{P_1}{n_1} = 9550 \cdot \frac{4,05}{719} = 54.45 \text{ Nm}$$

$$\omega_1 = \frac{\pi \cdot n_1}{30} = \frac{3.14 \cdot 719}{30} = 75,3 \text{ s}^{-1}$$

II val:

$$P_2 = P_1 \cdot \eta_T \cdot \eta_n = 4,05 \cdot 0,95 = 3.896 \text{ kvt}$$

$$n_2 = \frac{n_1}{U_R} = \frac{719}{2,87} = 250 \text{ min}^{-1}$$

$$T_2 = T_1 \cdot U_R \cdot \eta_T \cdot \eta_n = 54.45 \cdot 5 \cdot 0,97 = 148 \text{ Nm}$$

$$\omega_2 = \frac{\omega_1}{U_R} = \frac{75,3}{5} = 26,16 \text{ s}^{-1}$$

III val:

$$P_3 = P_2 \cdot \eta_p \cdot \eta_{nod} = 3,89 \cdot 0,96 \cdot 0,99 = 3,77 \text{ kvt}$$

$$n_3 = \frac{n_2}{U_{II}} = \frac{250}{5} = 50 \text{ min}^{-1}$$

$$T_3 = T_2 \cdot U_{II} \cdot \eta_n = 148 \cdot 5 \cdot 0,96 = 720 \text{ Nm}$$

$$\omega_3 = \frac{\omega_2}{U_{II}} = \frac{26,16}{5} = 5,23 \text{ s}^{-1}$$

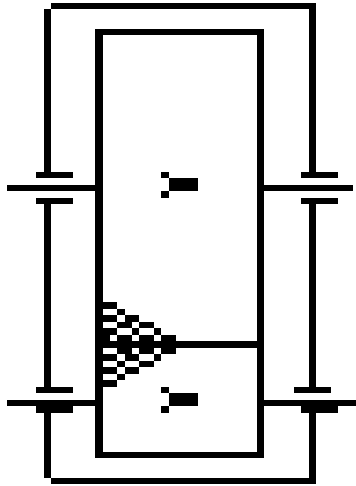
$$T_1 < T_2 < T_3$$

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

$$n_1 > n_2 > n_3$$

$$P_1 > P_2 > P_3$$

Bir pog'onali qiya tishli silindrsimon yopiq uzatmaning hisobi



Oldigi masalaning natijalaridan olingan qiymatlar:

$$T_2 = 148 Nm$$

$$T_3 = 720 Nm$$

$$n_2 = 250 \text{ min}^{-1}$$

$$n_3 = 40 \text{ min}^{-1}$$

$$U = 5$$

1. Tishli g'ildirak uchun material tanlash

Reduktorning tishli g'ildiraklariga material sifatida St 45 markali po'lat materialini tanlaymiz va uni qattiqligini oshirish uchun termik qayta ishlov berishni tanlaymiz.

2. 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

Materialning qattiqligi:

shesterni uchun HB=230

$$[\delta_{HO}] = \frac{2 \cdot HB + 70}{[S_H]} = \frac{2 \cdot 230 + 70}{1,1} = 482 \text{ MPa}$$

Tishli g'ildirak uchun HB=200

$$[\delta_{HO}] = \frac{2 \cdot HB + 70}{[S_H]} = \frac{2 \cdot 200 + 70}{1,1} = 428 \text{ MPa}$$

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

$$[\delta_H] = 0.45 \cdot ([\delta_H] + [\delta_H]_2) = 0.45 \cdot (482 + 428) = 410 \text{ MPa}$$

3. Uzatmaning o'qlararo masofasini aniqlash

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

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 $K_a = 43$ gat eng.

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 ψ_a va uzatma g'ildiraklarining tayanchi nuqtasiga joylashishiga nisbatan olinadi.

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

$$a_{\omega} = K \cdot (U + 1) \cdot \sqrt[3]{\frac{T_3 \cdot K_{H\beta}}{[\delta_H]^2 \cdot U^2 \cdot \psi_a}} = 43 \cdot 6 \cdot \sqrt[3]{\frac{720 \cdot 10^3 \cdot 1,25}{410^2 \cdot 5^2 \cdot 0,4}} = 209 \text{ mm}$$

Standart bo'yicha $a_{\omega} = 200 \text{ mm}$ ga teng.

4. Tishli g'ildiraklarning dastlabki o'lchamlari

4.1 G'ildirak bo'luvchi aylana diametrini hisoblash.

$$d_2 = \frac{2 \cdot a_w \cdot U}{U + 1} = \frac{2 \cdot 200 \cdot 5}{6} = 333,33 \text{ mm}$$

4.2 G'ildirak eni

$$b_2 = \psi_a \cdot a_w = 0.4 \cdot 200 = 80 \text{ mm} \quad b_1 = 85 \text{ mm}$$

5. Ilashish modulini aniqlash

$$m_n = (0,01-0,02)a_w = (0,01-0,02)200 = 2 \dots 4 \text{ mm}$$

Standart bo'yicha $m = 2.5 \text{ mm}$ deb qabul qilamiz.

6. Uzatma tishlarining qiyalik burchagi va umumiy tishlar soni

6.1 Qiyalik burchagining eng kichik qiymatini aniqlash

$$\beta_{\min} = \arcsin\left(\frac{4m}{b_2}\right) = \arcsin\left(\frac{4 \cdot 2.5}{80}\right) = 8^\circ$$

5.2 Uzatma umumiy tishlar soni

$$z_y = \frac{2 \cdot a_w \cdot \cos \beta_{\min}}{m} = \frac{2 \cdot 200 \cdot 0.98}{2.5} = 156,8 \approx 157$$

7. Yetaklovchi va yetaklanuvchi tishli g'ildirak tishlar soni

$$z_1 = z_y / (U + 1) = 157 / 6 = 26,17 = 26$$

$$z_2 = z_y - z_1 = 157 - 26 = 131$$

8. Uzatmaning geometrik o'lchamlari

a) Tish bo'luvchi aylana diametri

$$d_1 = \frac{m \cdot z_1}{\cos \beta} = \frac{2.5 \cdot 26}{0.98} = 66,3 \text{ mm}$$

$$d_2 = \frac{m \cdot z_2}{\cos \beta} = \frac{2.5 \cdot 131}{0.98} = 333,33 \text{ mm}$$

b) Tish ostidan o'tgan aylana diametri

$$d_{f1} = d_1 - 2.5m = 66,3 - 2.5 \cdot 2.5 = 60,05 \text{ mm}$$

$$d_{f2} = d_2 - 2.5m = 333,33 - 6.25 = 327,08 \text{ mm}$$

c) Tish ustidan o'tgan aylana diametri

$$d_{a_1} = d_1 + 2m = 66,3 + 5 = 71,3mm$$

$$d_{a_2} = d_2 + 2m = 333,33 + 5 = 338,33mm$$

9. O'qlararo masofani tekshirish

$$a_w = \frac{(d_1 + d_2)}{2} = \frac{66,3 + 333,33}{2} = 200mm$$

10. Ilashishda hosil bo'ladigan kuchlar

10.1 Aylanma kuch

$$F_t = \frac{2 \cdot T_3}{d_2} = \frac{2 \cdot 720 \cdot 10^3}{333,33} = 4320N$$

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

$$F_r = F_t \cdot \frac{\tan 20^\circ}{\cos \beta} = 4320 \cdot \frac{0.364}{0.98} = 1604N$$

10.3 Bo'ylama kuch

$$F_a = F_t \cdot \tan \beta = 432 \cdot 0 \tan 8^\circ = 607N$$

10. Kontakt kuchlanishni hisoblash

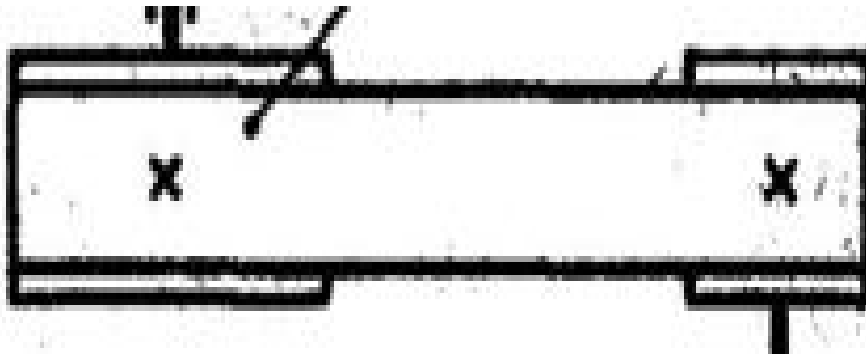
$$K = 376$$

$$\delta_H = K \cdot \sqrt{\frac{F_t(U+1)}{d_2 \cdot b_2} \cdot K_{H\beta} \cdot K_{H\alpha} \cdot K_{Hv}} = 376 \cdot \sqrt{\frac{4320 \cdot 6}{333,33 \cdot 80} \cdot 1.03 \cdot 1 \cdot 1.1} = 395MPa$$

Chiqqan qiymat quydagi oralig'da bo'lishi kerak

$$\delta_H = (0.9 - 1.05)[\delta_H] = 369 - 430,5MPa$$

Yassi tasmali uzatma hisobi



Oldigi masalani echimlaridan quyidagilarni olamiz:

$$T_1 = 54,45 Nm$$

$$n_1 = 719 \text{ min}^{-1}$$

$$T_2 = 148 Nm$$

$$n_2 = 250 \text{ min}^{-1}$$

$$U_{tu} = 2,87$$

$$P_1 = 4,05 \text{ kv}$$

1. Tasmalarning ko'ndalang kesmi yetaklovchi valning quvvati va ayla-nish soniga nisbatan nomogramma bo'yicha tanlanadi.

Tasma turi: Б

2. Uzatilayotgan burovchi momentga nisbatan yetaklovchi shkivning eng kichik diametri aniqlanadi. Bunda tasmaning ishlash muddatini uzaytirish uchun $d_1 > d_{\min}$ shart bajarilishi kerak.

$$d_{\min} = 100 \text{ mm}$$

3. Yetaklovchi va yetaklanuvchi shkiv diametrlari

$$d_1 = 125 \text{ mm}$$

$$d_2 = d_1 \cdot U_{tu} = 125 \cdot 2,87 = 358 \text{ mm}$$

4. Uzatish soning hisobiy qiymati

$$U_x = \frac{d_2}{d_1(1-\varepsilon)} = \frac{358}{125(1-0.01)} = 2,89$$

$$\Delta U = \frac{|U_x - U|}{U} \cdot 100\% = \frac{|2,89 - 2,87|}{2,87} \cdot 100\% = 0.7\% < [3\%]$$

5. O'qlararo masofaning tahminiy qiymati

$$a = 0.55(d_1 + d_2) + h = 0.55(125 + 358) + 8 = 274\text{mm}$$

6. Tasmaning uzunligi

$$L = 2a + 1.57(d_1 + d_2) + \frac{(d_2 - d_1)^2}{4a} = 2 \cdot 274 + 1.57(125 + 358) + \frac{(358 - 125)^2}{4 \cdot 274} = 1524\text{mm}$$

Standart bo'yicha $L = 1600\text{mm}$

7. O'qlararo masofaning hisobiy qiymati

$$a = \frac{2L - 3.14(d_2 + d_1) + \sqrt{[2L - 3.14(d_2 + d_1)]^2 - 8(d_2 - d_1)^2}}{8} = \frac{2 \cdot 1600 - 3.14(358 + 125) + \sqrt{[2 \cdot 1600 - 3.14(358 + 125)]^2 - 8(358 - 125)^2}}{8} = 280\text{mm}$$

8. Yetaklovchi shlivning qamrov burchagi

$$\alpha_1 = 180^\circ - 57^\circ \frac{d_2 - d_1}{a} = 180^\circ - 57^\circ \cdot \frac{358 - 125}{280} = 134^\circ$$

9. Tasmaning tezligi

$$V = \frac{\pi \cdot d_1 \cdot n_1}{60} = \frac{3.14 \cdot 125 \cdot 719}{60 \cdot 1000} = 4,7 \text{ m/s}$$

10. Tasmaning bir sekunda aylanib chiqishi

$$i = \frac{V}{L} = \frac{4,7}{1.600} = 3 \leq [i] = 10 \div 20 \text{ s}^{-1}$$

11. Bitta tasma yordamida uzatish mumkin bo'lgan quvvat

$$[P] = \frac{P_0 \cdot C_\alpha \cdot C_l \cdot C_u}{C_p} = \frac{1.39 \cdot 0.86 \cdot 1.03 \cdot 1.14}{1.1} = 1.27 \text{ kvt}$$

Bu yerda: P_0 - qamrov burchagi $\alpha_1 = 180^\circ$, $U = 1$ bo'lgan tasmali uzatmada, bitta tasma yordamida uzatish mumkin bo'lgan quvvat. $P_0 = 1.39 \text{ kvt}$

C_α - qamrov burchagini hisobga oluvchi koeffisient. $C_\alpha = 0.86$

C_l - tasma uzunligini hisobga oluvchi koeffisient. $C_l = 1.03$

C_u - uzatmaning uzatish sonini hisobga oluvchi koeffisient. $C_u = 1.14$

C_p - ish rejimini hisobga oluvchi koeffisient. $C_p = 1.1$

12. Quvvatni uzatish uchun kerakli tasmalar soni

$$Z = \frac{P}{[P] \cdot C_z} = \frac{4,05}{1.27 \cdot 0.95} = 3,35$$

13. Uzatma tarmoqlaridagi dastlabki taranglovchi kuch

$$F_0 = \frac{0.85 \cdot P \cdot C_p \cdot C_l}{Z \cdot V \cdot C_\alpha \cdot C_u} + F_v H = \frac{0.85 \cdot 4,05 \cdot 10^3 \cdot 1.1 \cdot 1.03}{4 \cdot 4,7 \cdot 0.89 \cdot 1.14} + 6.9 = 211 N$$

Bu yerda: $F_v = \rho \cdot A \cdot V^2 = 1250 \cdot 138 \cdot 10^{-6} \cdot 4,7^2 = 6.9 N$ -markazdan qochma kuch

A-tasmaning kesim yuzasi, mm

$\rho \approx 1250 k\Gamma / m^3$ -tasmaning zichligi

14. Valga ta'sir qiluvchi kuch

$$F_b = 2F_0 \sin\left(\frac{\alpha_1}{2}\right) = 2 \cdot 211 \cdot \sin\left(\frac{134}{2}\right) = 303 N$$

Vallarning tahminiy hisobi

1. Birinchi val uchi konsol qismining diametri quydagicha aniqlanadi:

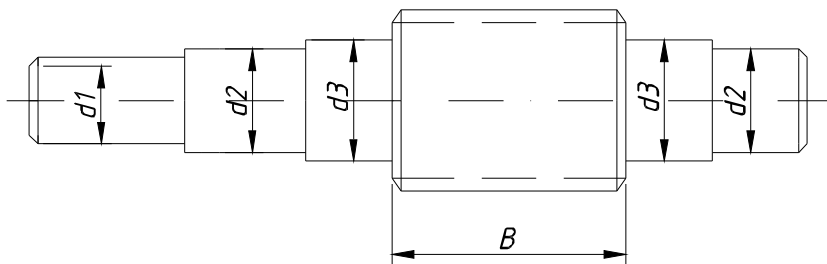
$$d_1 = \sqrt[3]{\frac{T_2}{0.2[\tau]}} = \sqrt[3]{\frac{148 \cdot 10^3}{0.2 \cdot 15}} = 50 \text{ mm}$$

Bu yerda:

T -burovchi moment, Nmm

$[\tau]$ -buralishdagi ruxsat etilgan kuchlanish

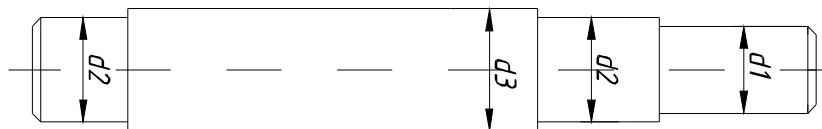
d_1 ning aniqlangan qiymati standart bo'yicha yaxlitlanib, val qolgan qismlarining diametri aniqlanib, valning eskizi chizib olinadi.



$$d_1 = 50 \text{ mm} \quad d_2 = 55 \text{ mm} \quad d_3 = 60 \text{ mm}$$

2. Ikkinchi val uchun konsol qismining diametri

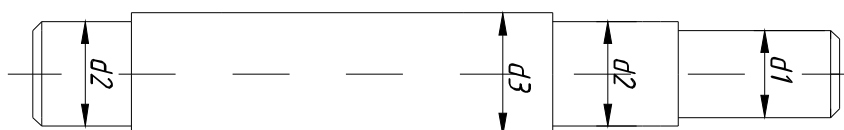
$$d_2 = \sqrt[3]{\frac{T_3}{0.2 \cdot [\tau]}} = \sqrt[3]{\frac{720 \cdot 10^3}{0.2 \cdot 15}} = 63 \text{ mm} \approx 65$$



$$d_1 = 65 \text{ mm} \quad d_2 = 70 \text{ mm} \quad d_p = 75 \text{ mm} \quad d_{g'} = 80 \text{ mm}$$

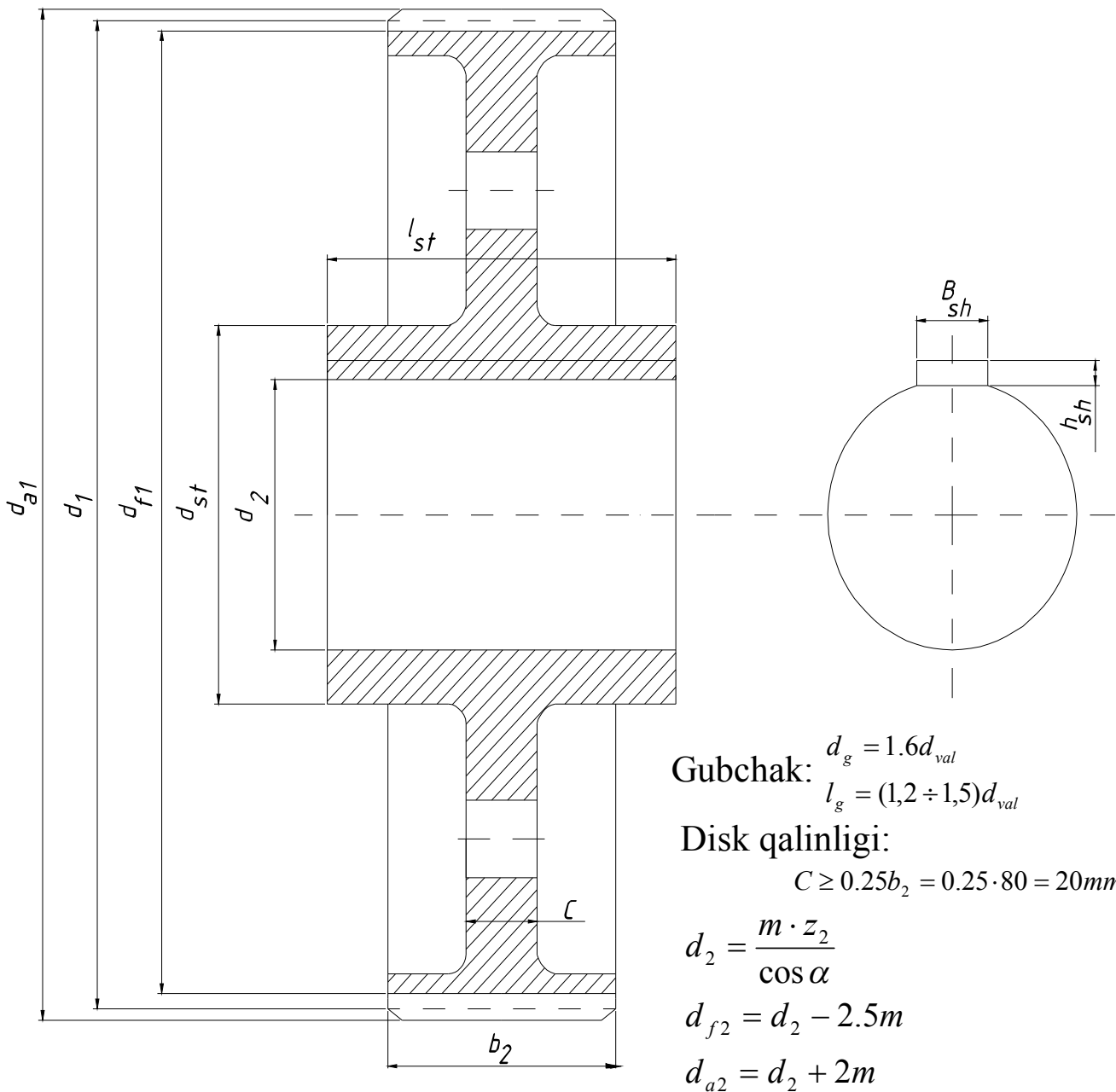
3. Uchinchi val uchun konsol qismining diametri

$$d_3 = \sqrt[3]{\frac{T_1}{0.2 \cdot [\tau]}} = \sqrt[3]{\frac{54,45 \cdot 10^3}{0.2 \cdot 20}} = 30 \text{ mm}$$



$$d_1 = 30 \text{ mm} \quad d_2 = 35 \text{ mm} \quad d_3 = 40 \text{ mm}$$

Gildirak konstruksiyasini o'lchamlari



Gubchak: $d_g = 1.6d_{val}$
 $l_g = (1.2 \div 1.5)d_{val}$

Disk qalinligi:

$$C \geq 0.25b_2 = 0.25 \cdot 80 = 20mm$$

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

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

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

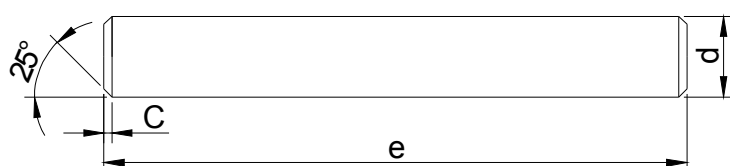
Tishli g'ildiraklar bu tishli gardish, gubchak va ularni biriktirib turadigan diskdan iborat bo'lib, bu elementlarning o'lchamlarini formulalar yordamida aniqlash mumkin. G'ildirakning tishli gardishi tashqi kuchga chidamli, ya'ni mustahkam, bikrligi yuqori bo'lishi kerak, buning uchun gardishning qalinligi 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 birikti-

radi, 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 ishlanadi. Shtivlarda ichki rezba bo'lishi mumkin, bu esa kerak paytda shtivni olib tashlashni osonlashtiradi. Shtivning o'lchamlari:

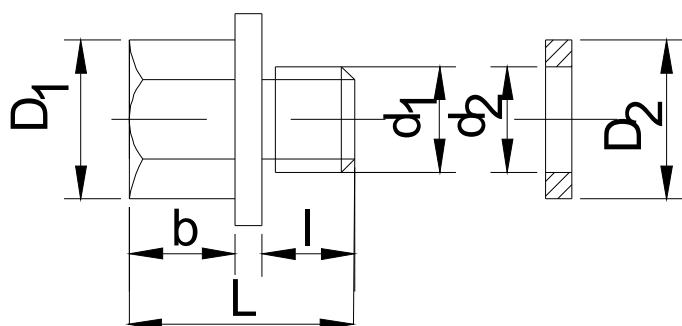


$$d = 10mm$$

$$c = 1,6mm$$

$$e = 30..60mm$$

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.



$$d_1 = M20 \times 1,5$$

$$b = 4mm$$

$$D_1 = 25.4mm$$

$$d_2 = 20mm$$

$$L = 28mm$$

$$D_2 = 32mm$$

$$l = 13mm$$

$$b_2 = 3mm$$

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.

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 g'ildirak valiga juda yengil seriyali bir qatorli zoldirli radialpodshipnik tanlaymiz.

$$d_1 = 65mm$$

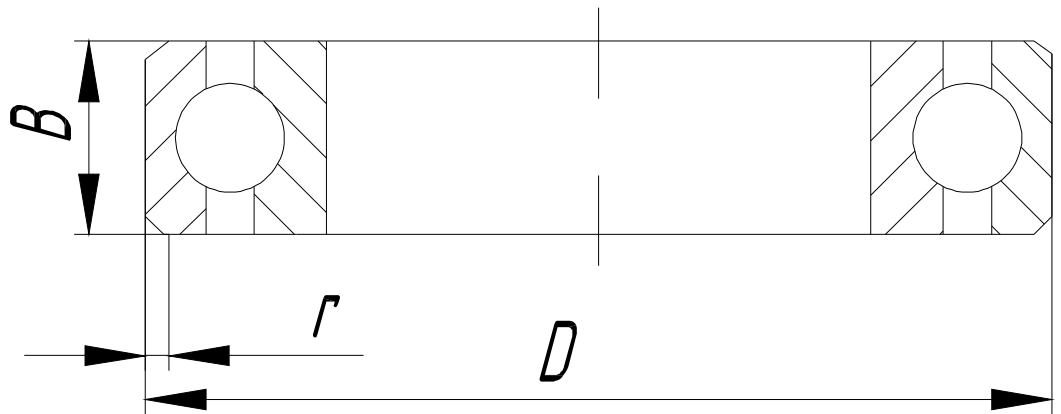
$$D = 140mm$$

$$B = 33mm$$

$$r = 3mm$$

$$C_r = 113kN$$

$$C_0 = 75kN$$



2. Yetaklanuvchi g'ildirak valiga o'rta seriyali konussimon rolikli radial-tirak podshipniklardan tanlaymiz.

$$d = 75mm$$

$$r = 2.5mm$$

$$D = 130mm$$

$$r_1 = 0.8mm$$

$$T = 27,25mm$$

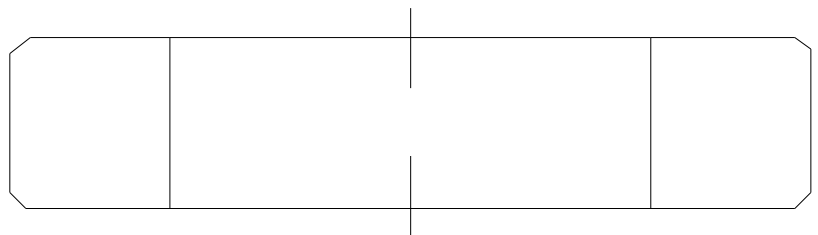
$$C_r = 119N$$

$$B = 26mm$$

$$C_0 = 98kN$$

$$C = 22mm$$

$$e = 0.369$$

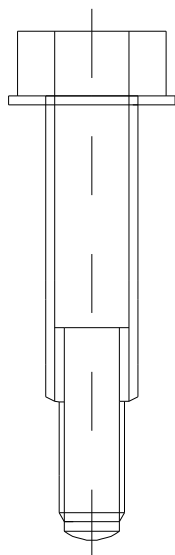


Boltlarni tanlash

Korpusni yig'ish uchun har xil diametrli boltlar ishlatiladi.

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

$$a_\omega = 200 \quad \text{M 14}$$



$$K = 38mm$$

$$C = 17mm$$

$$D_0 = 26mm$$

$$d_0 = 16mm$$

1. Fundament bolt o'rnatilgan o'yiqchanning 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 $h_3 = 1,5\delta$

$$K = 32mm$$

$$C = 14mm$$

$$\text{M12} \quad D_0 = 24mm$$

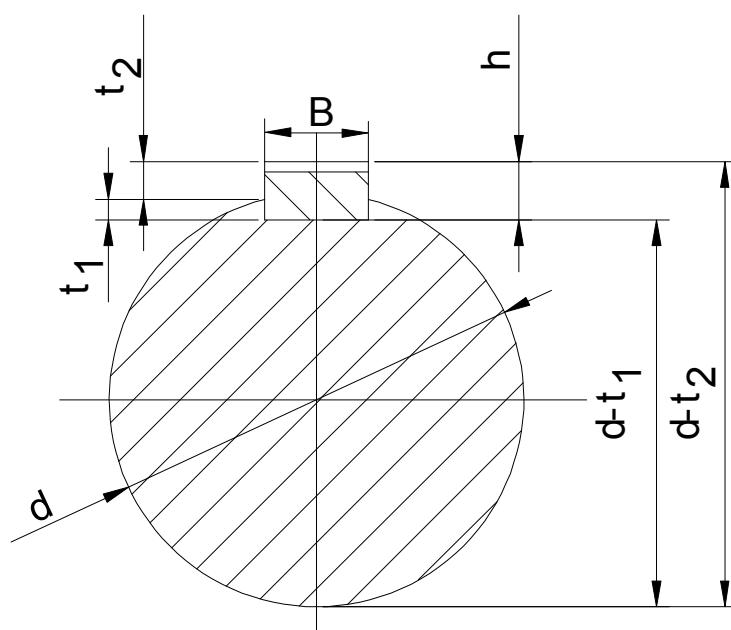
$$d_0 = 14mm$$

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

5. Korpus qopqog'idan moy quyish uchun hamda uzatmani ishlash jara-yonida kuzatish uchun maxsus darcha ochiladi. Bu darchani qopqoq yor-damida berkitib diametri d_5 bo'lgan bolt yordamida mahkamlanadi.

$$\text{M6} \quad K = 16mm \quad C = 7mm \quad d_0 = 7mm$$

Shponka tanlash



$$T_3 = 720 \cdot 10^3 \text{ Nm} \quad d = 80 \text{ mm} \quad l = 90 \text{ mm} \quad t_1 = 7.5 \text{ mm} \quad h = 18 \text{ mm} \\ b = 22 \text{ mm}$$

$$\delta_{ez} = \frac{2 \cdot T_2}{d(l-b)(h-t_1)} = \frac{2 \cdot 720 \cdot 10^3}{80(90-22)(18-7.5)} = 27 \text{ MPa} \leq [\delta_{ez}] = 100 \div 120 \text{ MPa}$$

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