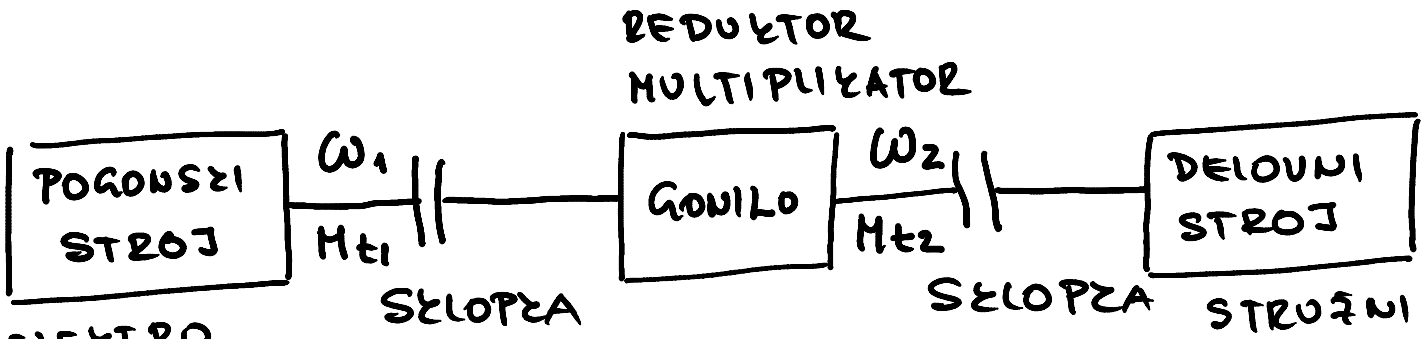
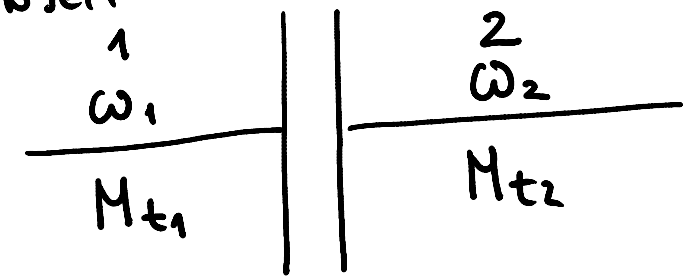
SKLOPKE



SKLOPKA



$\omega_1 = \omega_2$

$\omega_1 \neq \omega_2$

$M_{t1} = M_{t2}$

$M_{t1} \neq M_{t2}$

SKLOPKE

ZA STALNO ZVEZO
- TOGE – Z VUFO, KOLUTNO
- IZRAVNALNE – ELASTIČNE / NEELASTIČNE

OLDHAMOVA
ZOBATA
KARDANSKI ZGLOB
HOMOKINETIČNI ZGLOB

ZA VKLAPLJANJE
- OBLIKOVNE
- TORNE
  - LAMELNA

MOMENTNE
- ZAGONSKE — CENTRIFUGALNA
- VARNOSTNE

ZA PROSTI TEK
- ZAPORE — ZAPORA Z ZASUČKO
- ENOSMERNE

HIDRODINAMIČNE
- NEZRMILJENE
- ZRMILJENE

NI ZA IZPIT

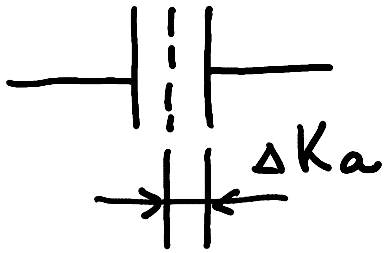
FUNKCIJA SKLOPK

ZA STALNO ZVEZO TOGE : POVEZOVANJE GREDI 1 IN 2

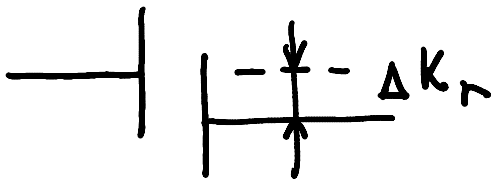
$\omega_1 = \omega_2$, $M_{t1} = M_{t2}$

GREDI 1 IN 2 STA KOLINEARNI

ZA STALNO ZVEZO IZRAVNALNE : POVEZOVANJE GREDI 1 IN 2 TER SOČASNO ODPRAVLJANJE NEPRAVILNOSTI LEGE GREDI 1 IN 2



AKSIALNA NEPRAVILNOST



RADIALNA NEPRAVILNOST

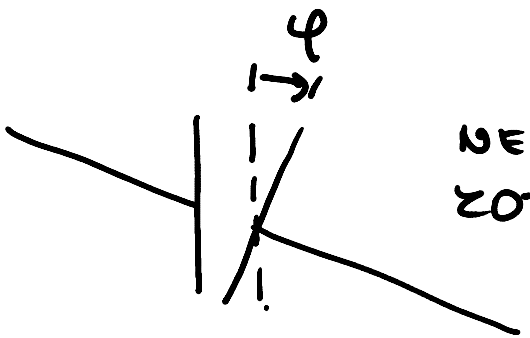
KOTNA NEPRAVILNOST

$\omega_1 = \omega_2$ $M_{t1} = M_{t2}$

$\omega_1 \neq \omega_2$ $M_{t1} \neq M_{t2}$

NI ZA IZPIT

ΔK_a, ΔK_r IN ΔK_w KOMPENZIRAMO Z NEELASTIČNIMI IN ELAST. IZRAVNALNIMI SKLOPKAMI



NEPRAVILNOST KOTA ZASUKA — KOMPENZIRAMO Z ELASTIČNIMI IZRAVNALNIMI SKLOPKAMI

SKLOPKE ZA VKLAPLJANJE: POVEZOVANJE GREDI 1 IN 2

IZENAČENJE URTILNIH HITROSTI GREDI 1 IN 2

VKLAPLJANJE V MIROVANJU ALI V GIBANJU

VČASIH ZAHTEVAMO SINHRONIZACIJO URTILNIH HITROSTI ω_1 IN ω_2 PRED VKLOPOM

NI ZA IZPIT

MOMENTNE SKLOPKE :

VARNOSTNE VARUJEJO PRED PREOBREMENITVIJO
PREOBREMENITEV LAHKO RAZUMEMO KOT MAKSIMALNI DOPUSTNI MOMENT ALI KOT MAKSIMALNA DOPUSTNA KOTNA HITROST
ZAGONSKE OMOGOČAJO POSTOPNO IZENAČITEV KOTNE HITROSTI GREDI 2 S KOTNO HITROSTJO GREDI 1 IN S TEM ZNIŽANJE MOMENTOV POSPEŠEVANJA
POVEZOVANJE GREDI 1 IN 2

ZA PROSTI TEK :

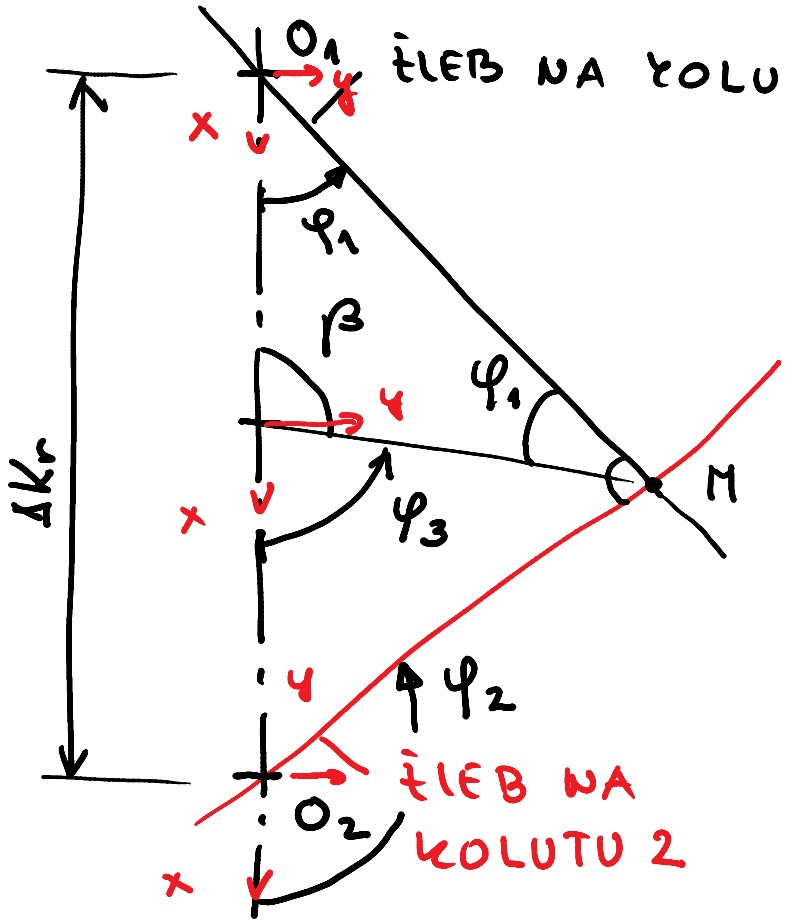
VRTILNI MOMENT PRENAŠAJO PRI VRTENJU V ENO SMER, V DRUGO SMER PA TEČEJO PROSTO
POVEZOVANJE GREDI 1 IN 2

NI ZA IZPIT

HIDRODINAMIČNE SKLOPKE : OMOGOČAJO PRENOS VRTILNIH MOMENTOV IN KOTNIH HITROSTI PREKO FLUIDA

POVEZOVANJE GREDI 1 IN 2 LAHKO ZELO ENOSTAVNO

OLDHAMOVA SKLOPKA



$$\omega_1 = \text{const}$$

$$\omega_1 = \frac{d\varphi_1}{dt}$$

$$\omega_2 = \frac{d\varphi_2}{dt}$$

$$\pi = \varphi_1 + \frac{\pi}{2} + (\pi - \varphi_2)$$

$$\varphi_2 = \varphi_1 + \frac{\pi}{2}$$

$$\omega_2 = \frac{d\varphi_2}{dt} = \frac{d\varphi_1}{dt} = \omega_1$$

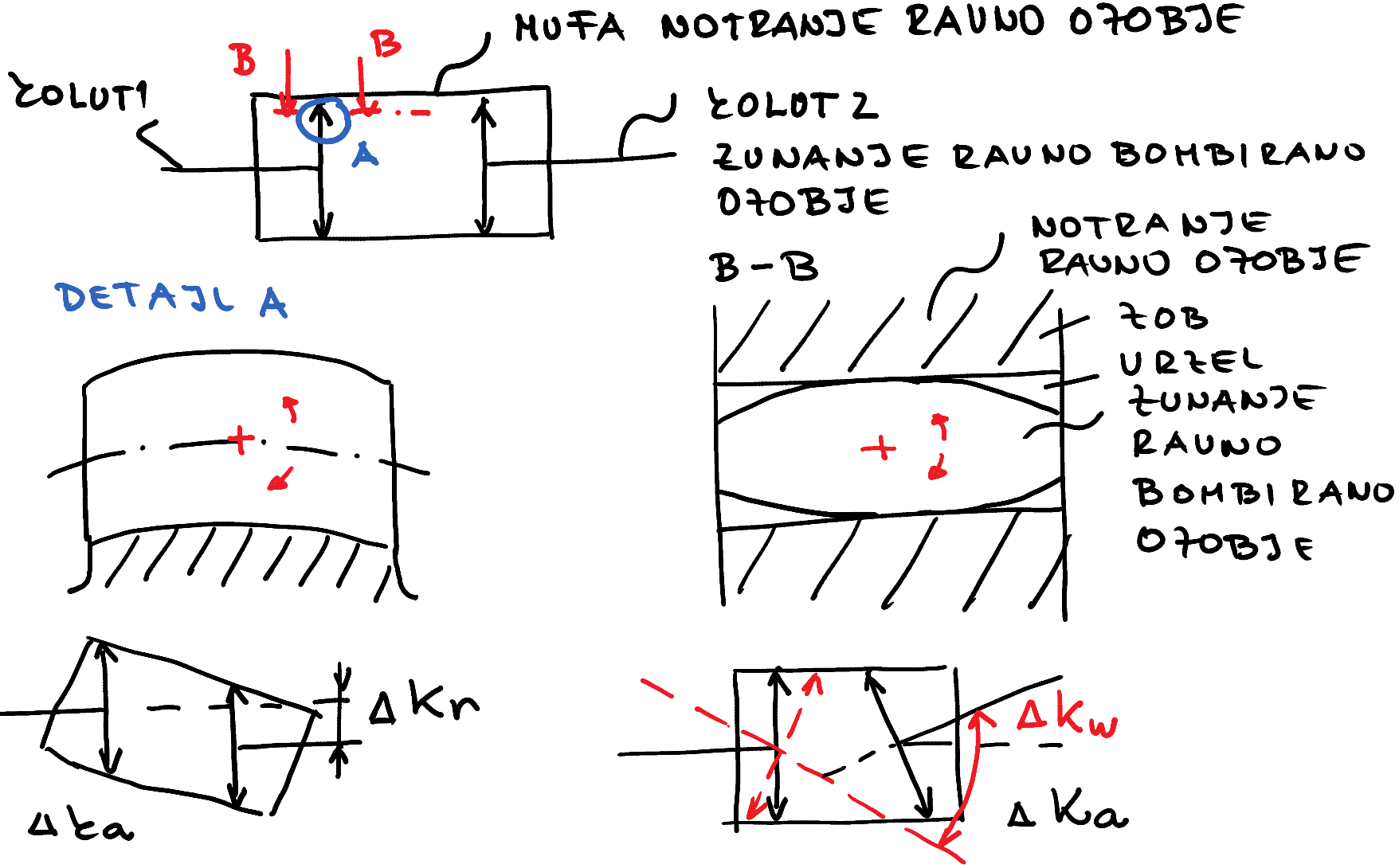
$$\beta = \pi - 2\varphi_1 = \pi - \varphi_3$$

$$\varphi_3 = 2\varphi_1$$

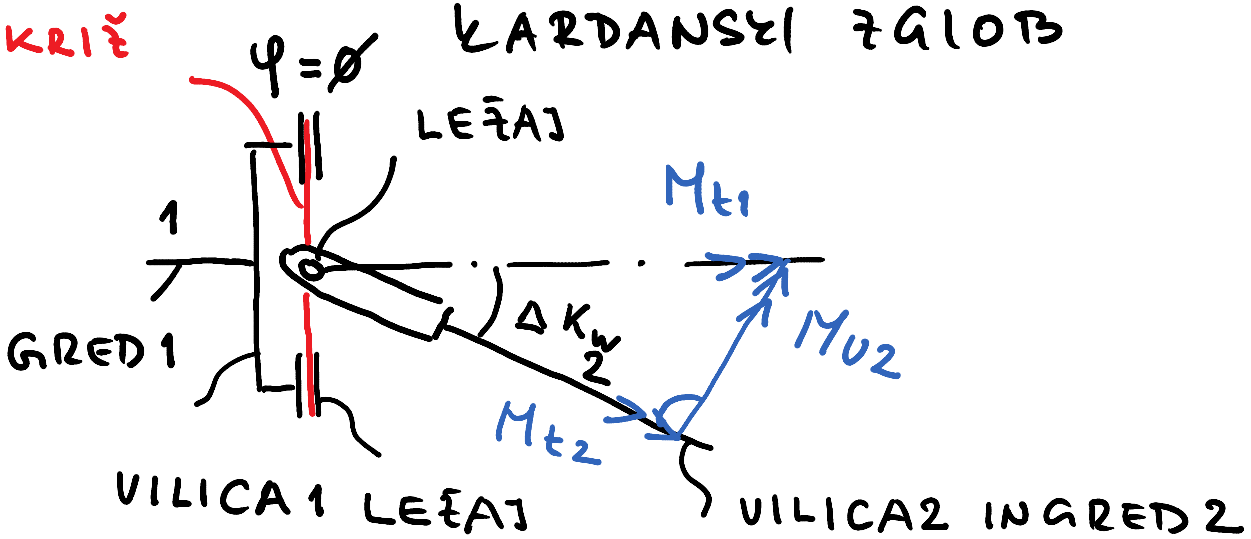
M - CENTER KRIŽNE PLOŠČE $\quad \omega_3 = \frac{d\varphi_3}{dt} = 2\frac{d\varphi_1}{dt} = 2\omega_1$

DO TU SNOU ŤA K1

ZOBATA SKLOPKA



KARDANSKI ZGLOB



$\omega_1 = const$

$M_{t1} = const$

$P_1 = P_2$ ← PREDPOSTAVIMO, DA NI IZGUB

$M_{t1} \cdot \omega_1 = M_{t2} \cdot \omega_2$

$\cos \Delta K_w = \frac{M_{t2}}{M_{t1}} \rightarrow M_{t2} = M_{t1} \cdot \cos \Delta K_w$

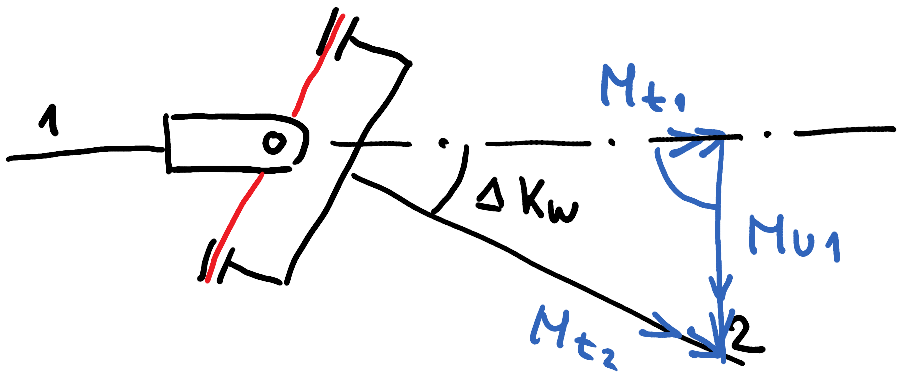
$$\cancel{M_{t_1}} \cdot \omega_1 = \cancel{M_{t_1}} \cdot \cos \Delta K_W \cdot \omega_2$$

$$\omega_2 = \frac{\omega_1}{\cos \Delta K_W}$$

$$\sin \Delta K_W = \frac{M_{U2}}{M_{t_1}} \rightarrow M_{U2} = M_{t_1} \cdot \sin \Delta K_W$$

$$M_{U1} = \cancel{0}$$

$$\varphi = \frac{\pi}{2}$$



$$P_1 = P_2$$

$$M_{t1} \cdot \omega_1 = M_{t2}\, \omega_2$$

$$\cos \Delta K_w = \frac{M_{t1}}{M_{t2}}$$

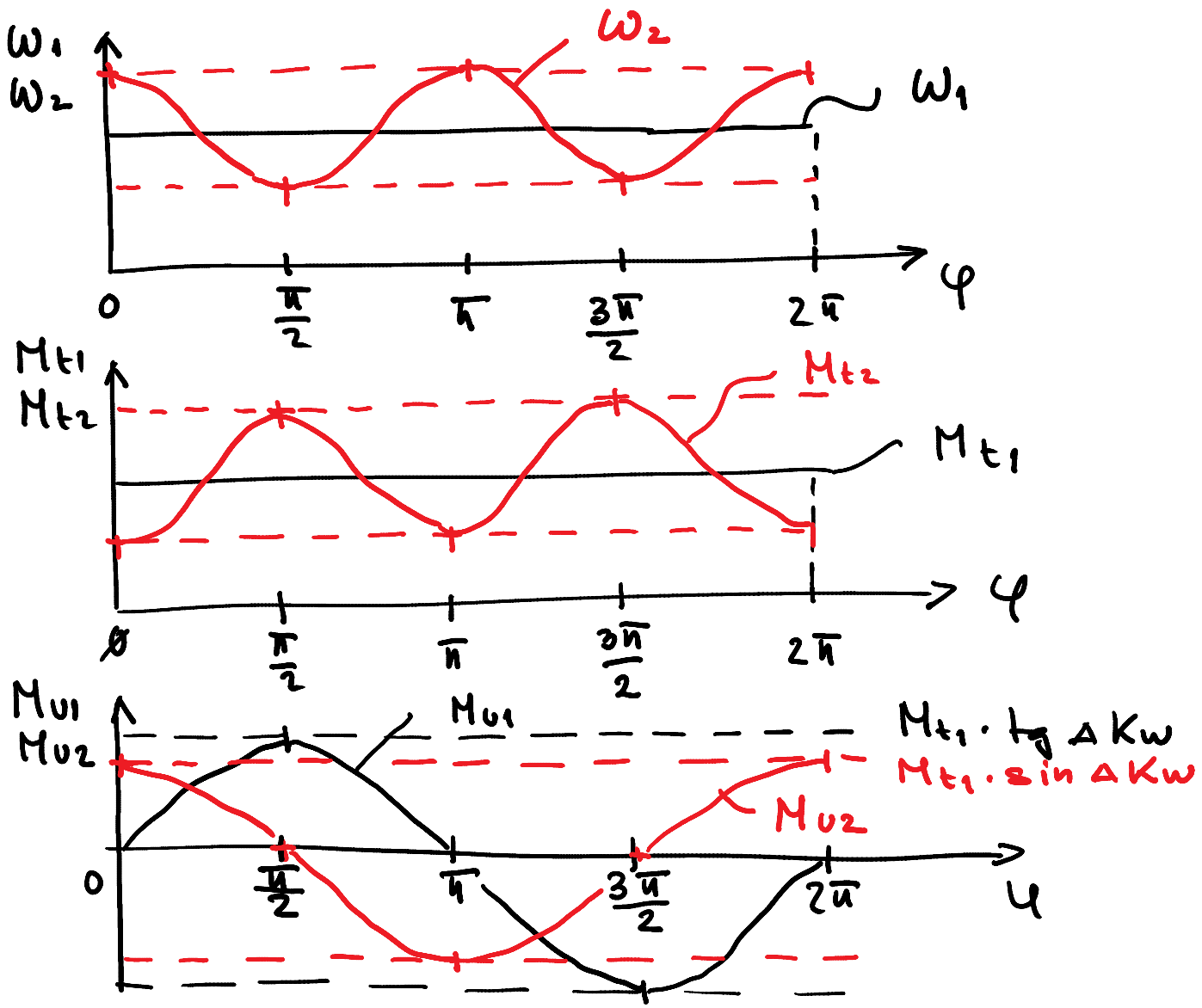
$$M_{t2} = \frac{M_{t1}}{\cos \Delta K_w}$$

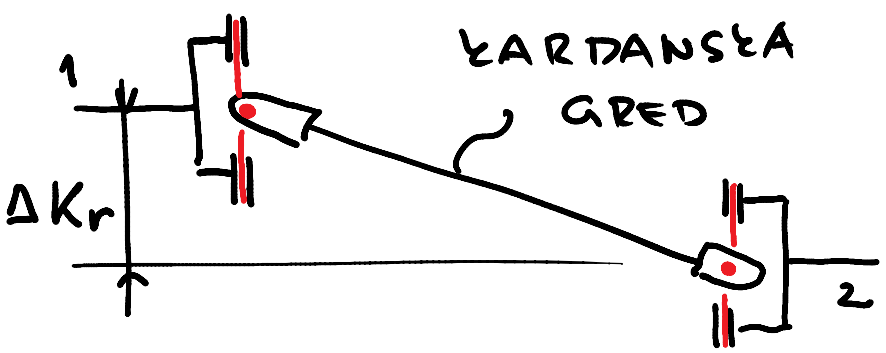
$$\cancel{M_{t1}} \cdot \omega_1 = \frac{\cancel{M_{t1}}}{\cos \Delta K_w}\, \omega_2$$

$$\omega_2 = \omega_1 \cos \Delta K_w$$

$$\operatorname{tg} \Delta K_w = \frac{M_{u1}}{M_{t1}} \rightarrow M_{u1} = M_{t1} \cdot \operatorname{tg} \Delta K_w$$

$$M_{u2} = \emptyset$$


ω1
ω2
ω2
ω1
φ
0
π/2
π
3π/2
2π
Mt1
Mt2
Mt2
Mt1
φ
0
π/2
π
3π/2
2π
Mu1
Mu2
Mu1
Mt1 · tg Δkw
Mt1 · sin Δkw
Mu2
0
π/2
π
3π/2
2π
φ



$\omega_1 = \omega_2$

$M_{t1} = M_{t2}$

Z NAMESTITEV KARDANSKIH ZGIBOV

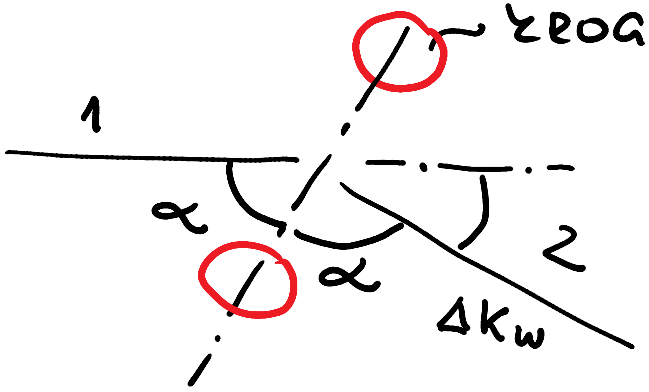
ΔKa KOMPENZIRAMO S TELESKOPSKO KARDANSKO GREDJO

W $\omega_1 = \omega_2$

$M_{t1} = M_{t2}$

NAMESTITEV KARDANSKIH ZGIBOV

HOMOKINETIČNI ČLEN

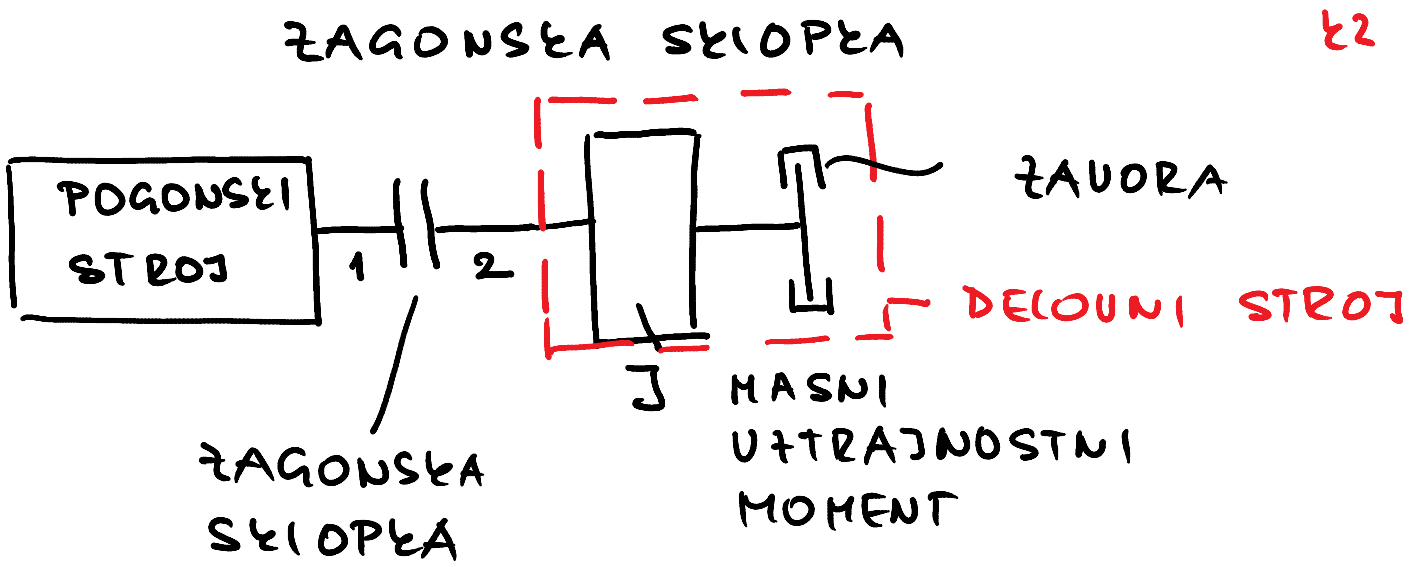


$\omega_1 = \omega_2$

$M_{t1} = M_{t2}$

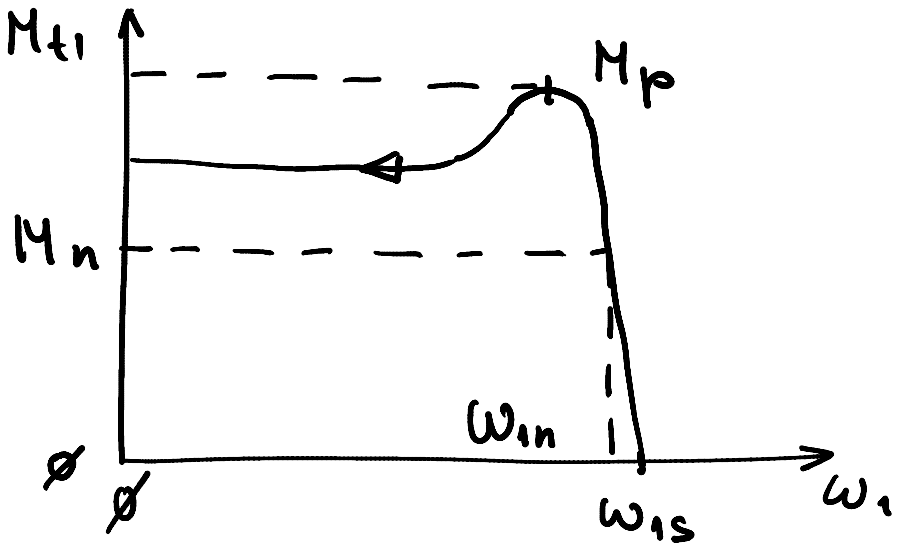
1 GRED Z VILICAMI

2 GRED S ZOBOTOM Z UTORI ZA KROGLE



k2 ZAČETEK SNOVI

POGONSKI STROJ NAJ BO ASINHRONI ELEKTROMOTOR M_{t1}, ω_1.



$\omega_{1s} = 2\pi\, n_{1s} \cdot \frac{1}{60}$ s^{-1}

M_n IMENSKI MOMENT ELEKTROMOTORJA

$n_{1n} = 1470$ vrt/min

$\omega_{1n} = 2\pi\, n_{1n} \cdot \frac{1}{60}$ s^{-1}

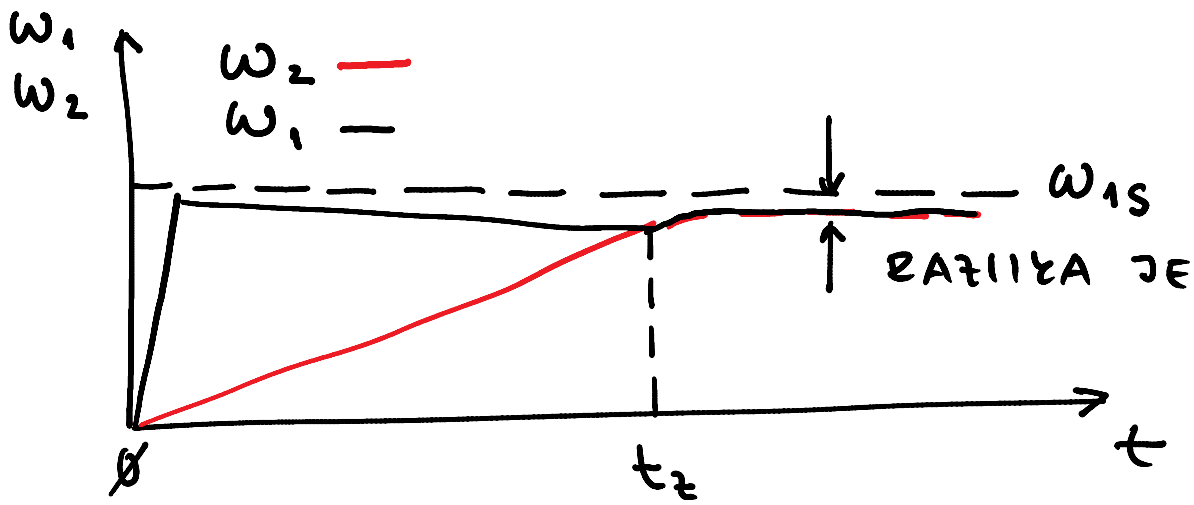
M_p PREKOCNI MOMENT

SINHRONA VRTILNA HITROST:

$$n_{1s} = \frac{f \cdot 60}{p} = \frac{50 \cdot 60}{2} = 1500 \text{ vrt/min}$$

$f = 50$ Hz FREKVENCA OMREŽJA

$p = 2$ ŠTEVILO POLOV



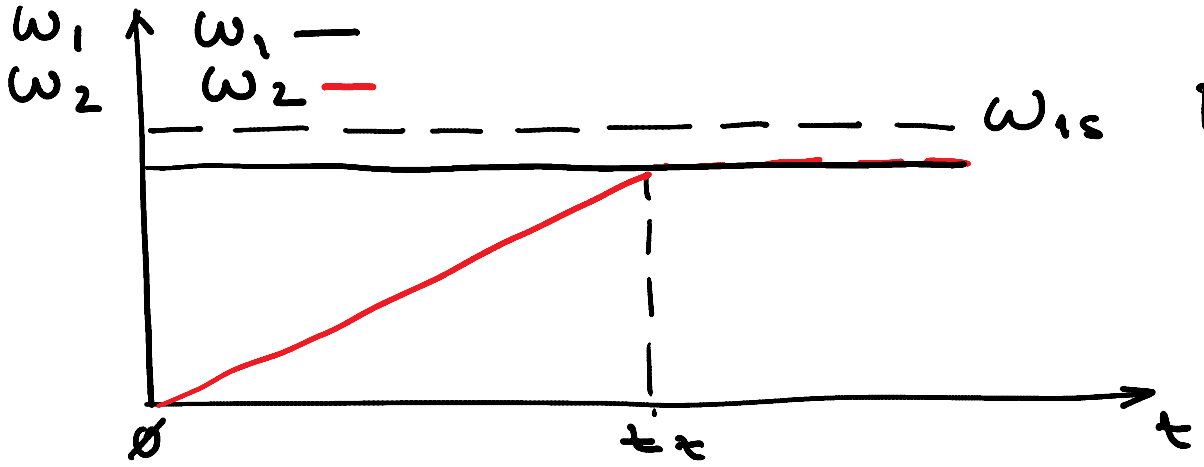
DEJANSKO STANJE

RAZLIKA JE POSLEDICA M_{to}

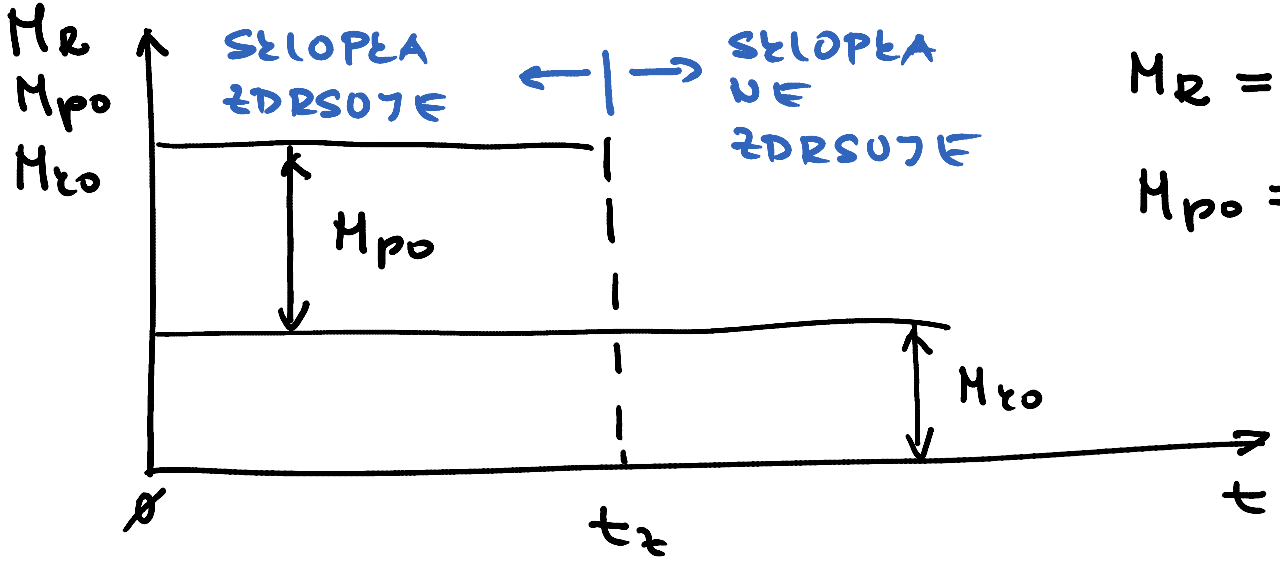
t_z ČAS ZAGONA

M_{to} TORISTNI MOMENT

ω_{1s} SINHRONA TOTNA HITROST



POENOSTAVLJENO STANJE



$$M_R = M_{to} + M_{po}$$

$$M_{po} = \frac{J\omega_1}{t_z}$$

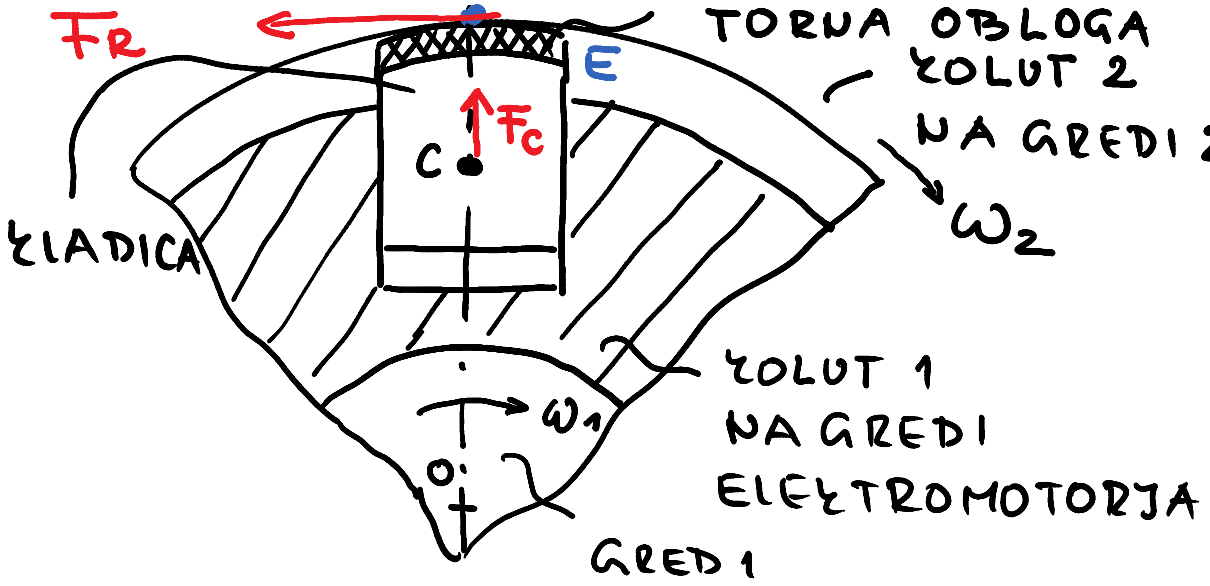
M_{to} TORISTNI MOMENT, ZI GA NASTAVIMO NA ZAVORI

M_{po} MOMENT POSPEŠEVANJA

$$M_{po} = J \cdot \alpha_2 \; ; \quad \omega_2 = \frac{t}{t_z}\omega_1 \; ; \quad \omega_1 = \text{const}$$

$$\alpha_2 = \frac{d\omega_2}{dt} = \frac{\omega_1}{t_z} = \text{Const}$$

M_R MOMENT TRENJA



$\overline{OC} = r$

$\overline{OE} = \frac{D}{2}$

$$F_c = m \cdot i \cdot \omega_1^2 \cdot r$$

C TEŽIŠČE ŽLADICE

m MASA ŽLADICE

i ŠTEVILO ŽLADIC

F_c SKUPNA CENTRIFUGALNA SILA, KI UPOŠTEVA VSE ŽLADICE

$$F_R = F_c \cdot \mu = m \, i \, \omega_1^2 \, r \, \mu$$

O SREDIŠČE GREDI 1

$$M_R = F_R \cdot \frac{D}{2} = m \, i \, \omega_1^2 \, r \, \mu \, \frac{D}{2}$$

M_R MOMENT TRENJA JE NAJMANJŠI MOMENT, KI GA SKLOPKA LAHKO PRENAŠA

$M_R = \text{const}$

V ČASU OD $t = 0$ DO $t = t_z$ VELJA $M_{t1} = M_R$

V ČASU OD $t = t_z$ NAPREJ VELJA $M_{t1} = M_{t0}$

NI ZA ITPIT

$$W_{po} = \int_0^{t_z} P_{po} \cdot dt = \int_0^{t_z} M_{po} \cdot \omega_2 \cdot dt$$

$$= M_{po} \int_0^{t_z} \frac{t}{t_z} \omega_1 \, dt = \frac{M_{po} \omega_1}{t_z} \int_0^{t_z} t \, dt = \frac{M_{po} \omega_1 t_z^2}{2 t_z}$$

$$W_{po} = \int_0^{t_z} P_{po} \, dt = \int_0^{t_z} M_{po} \omega_2 \, dt = \int_0^{\omega_1} J \frac{d\omega_2}{dt} \omega_2 \, dt$$

$$= J \int_0^{\omega_1} \omega_2 \, d\omega_2 = \frac{J \omega_2^2}{2} \Big|_0^{\omega_1} = \frac{J \omega_1^2}{2}$$

$$\frac{M_{po} \omega_1 t_z}{2} = \frac{J \omega_1^2}{2} \rightarrow t_z = \frac{J \omega_1}{M_{po}}$$

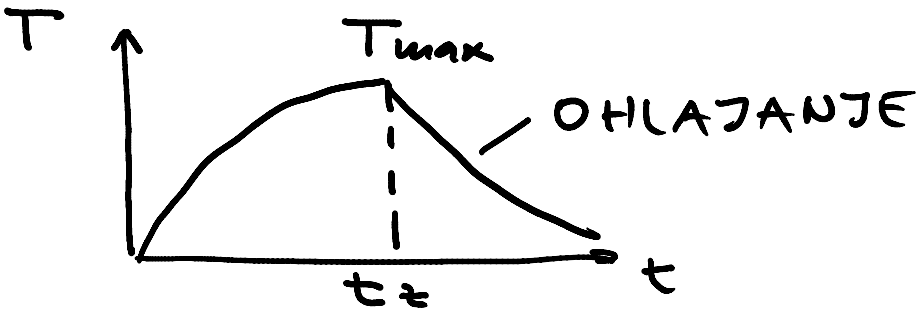
DELO TRENJA

$$W_R = \int_0^{t_z} M_R(\omega_1 - \omega_2)\,dt = M_R \int_0^{t_z} \left(\omega_1 - \frac{t}{t_z}\omega_1\right) dt$$

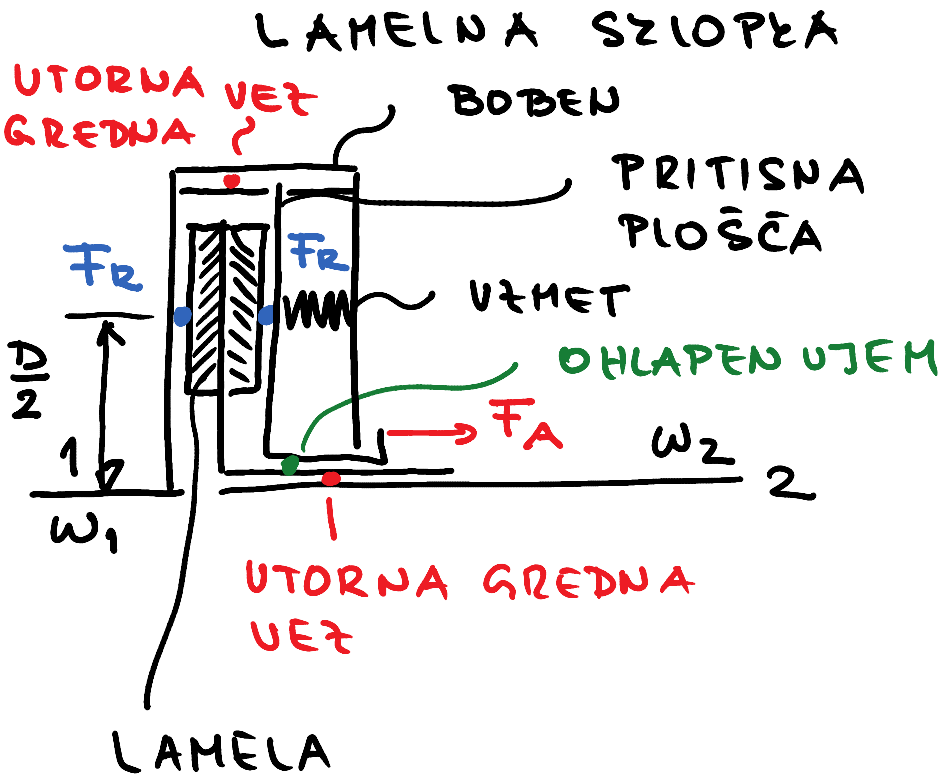
$$= M_R \omega_1 \int_0^{t_z} \left(1 - \frac{t}{t_z}\right) dt$$

$$= M_R \omega_1 \left(t_z - \frac{t_z^2}{2t_z}\right) = \frac{M_R \omega_1 t_z}{2}$$

W_R SE PRETVARJA V TOPLOTO Q TA PA POVIŠUJE TUDI TEMPERATURE T!



$T_{max} \leq T_{dop}$



$$M_R = F_R \cdot 2\,\frac{D}{2}$$

$$F_R = F_V \cdot \mu$$

F_V SILA UTMETI

$$M_R = F_V \cdot \mu \cdot D \cdot i$$

i ŠTEVILO LAMEL

F_A SILA POTREBNA ZA IZKLOP SKLOPKE

$$F_A = F_V$$