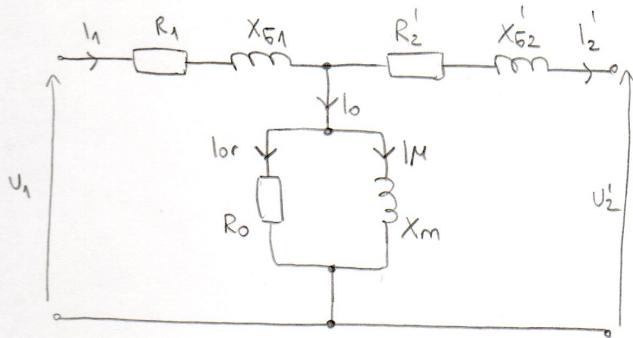


Transformator - KS i PH

uodaje se za 1 fazu u obliku zvezde (bez obzira na spoj Y, D, Z)

T-sHEMA



$$U_2' = \frac{w_1}{w_2} U_2, \quad R_2' = \left(\frac{w_1}{w_2}\right)^2 R_2, \quad X_2' = \left(\frac{w_1}{w_2}\right)^2 X_2$$

T/2-sHEMA nema X_{25} nego je na primoru X_5

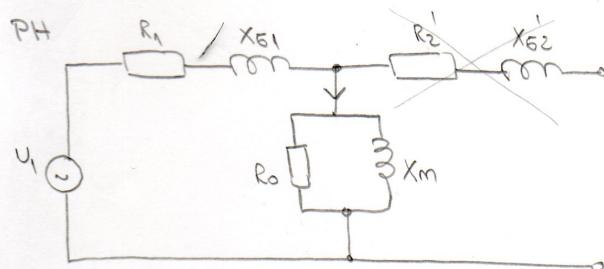
elementi uodaje se sheme određuju se iz mjerljive otpora manota, pokusa ph i ks i te preračunavaju se na toplo stanje (75°C)

tipične vrijednosti:

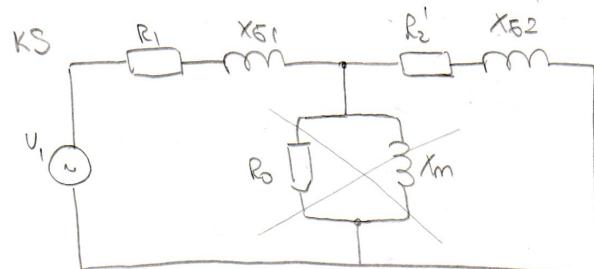
$$\text{za male tr. : } R_1 \approx R_2' = 1\% \quad X_{51} = X_{52}' = 5\%$$

$$\text{za velike tr. : } R_1 \approx R_2 = 0,1\% \quad X_{51} \approx X_{52}' = 12-20\%$$

$$R_0 = 100\ 000\%, \quad X_\mu = 10\ 000\%$$



zamjenjuje se vrednost grane i određuju se R_0 i X_m



zamjenjuje se poprečna grana i određuju se R_K i X_K

U_1 - primarni napon
 U_2' - sek. napon preračunat na stranu primara

R_1 - radni otpor prim. manota
 R_2' - radni otpor sek. man. preračunat

X_{15}, X_{25}' - rasipne reaktancije

X_m - glavna reaktancaja

R_0 - fiktivni radni otpor

gubića na učinku odgovaraju grub. u Fe

Pokus PH i KS

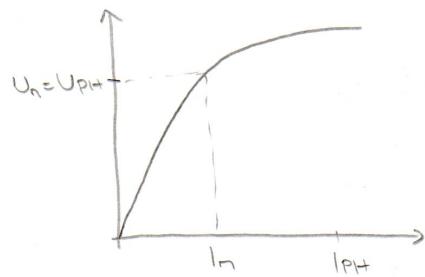
- pokusac PH određuje se glavna reaktancija X_m i radni otpor R_0
 Prinut se priključi na napon, a stozaljeke sekundovra su otvorene.
 Teci će struja i_{PH} , tj. suaga potrebna za pokrivanje gubitaka ph.
 To se sastoji od jalone kosep. za magnetizirajuće jezgre, radne kosep.
 u fazi s naponom. Kao sluzi za pokrivanje gubitaka i male
 kosep. struje za uzbijanje kapaciteta naneota.
 Zanemarjuje se uzdubljava građa

Pokusac se određuje i gub. u željezu nastali
 zbog hitrosti i vr. struja

$$P_n = \mu_{Fe} k_n \frac{B^2}{2}$$

$$B_{rs} = \mu_{Fe} k_v \frac{B^2 d^2}{2}, d \approx 0,35 \text{ mm}$$

Nazivna RI očekuje se u kolijevu jer je
 $I_{nH}, U_{nB}, B_{max} \approx 1.7T$



$$U = U_n$$

$$I = 3-10\% I_n$$

$$P = 0,5-2\% P_n$$

- pokusac KS određuje se X_k i R_k

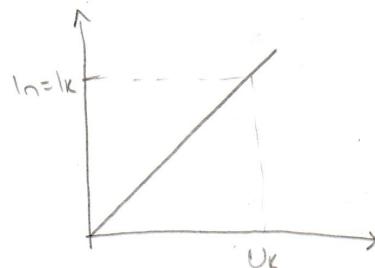
$$X_k = X_{S1} + X_{S2}'$$

$$R_k = R_1 + R_2' + R_{dod} \text{ gub. u naneotima}$$

Stozaljeke sekundovra su kratko spojene, a prikrov je naneotne
 potencije magnetne struje. Zanemarjuje se poprečna građa
 (Ne provodi se pri U_n jer bi struja bila veća od I_n)

Mjeri se od veće struje prema manjoj (da R ne raste)

Pokusac KS određuje se i gubici u radneice otpornicama i tzv. dodatku
 gub. (zbog vr. struje)



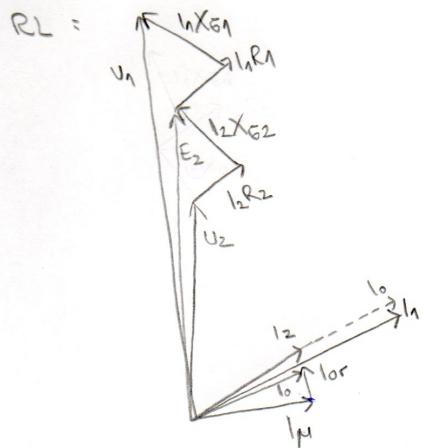
$$U_k = 4-12\% U_n, U_2 = 0$$

$$I = I_n$$

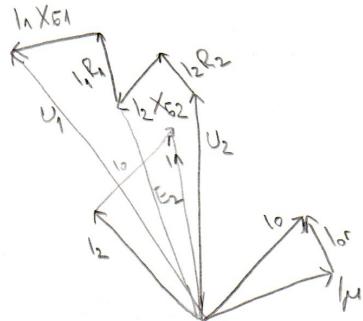
P - mala

Fazorski dijagrami transformatora

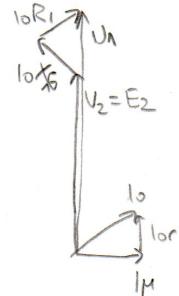
T - schema



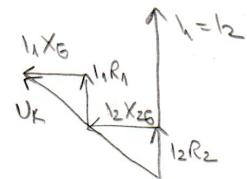
$RC =$



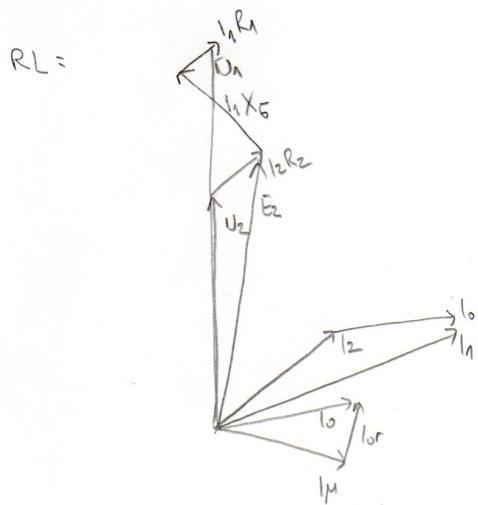
$PH =$



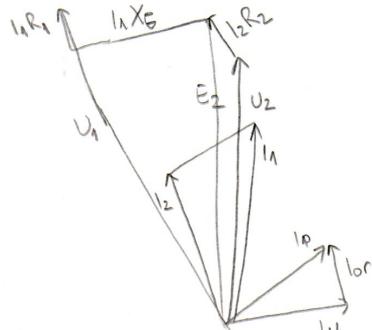
$KS =$



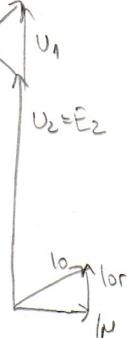
T/2 - schema



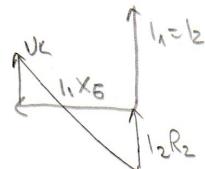
$RC =$



$PH =$



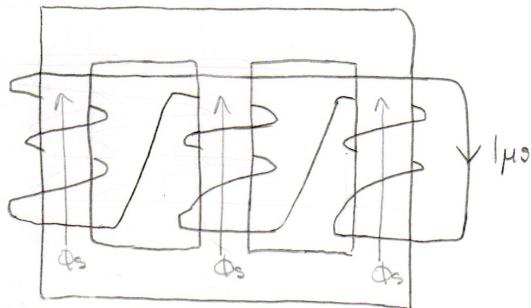
$KS =$



Uloga tercijara

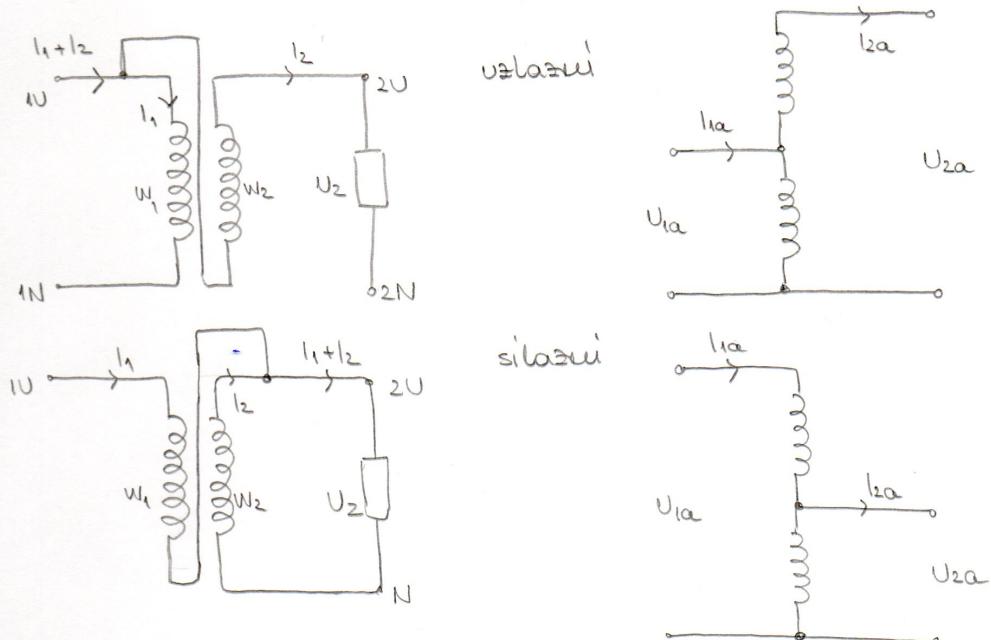
- tercijor je kratkosjedni manot malog otpora jednoliko razdjeljen na sva 3 stupa (svi sviči seržki spojevi čine tokut.)
- manotan je oko stupa i **spriječava zatvaranje 3. harmonika toka** u prostoru između stupa i kotla
- usta reakcija jednaka je direktnoj - tercijor **ruši uklon.** od iznosa bliskog reakcije ph na iznos blizak reakcije ks
- u slučaju neisimetričnog opterećenja po fazama Kad nema ul-voda javljaju se istofazni tokovi u jezgri. Naponi inducirani tim tokovima mijenjaju faze napona. No u terciju će poteci struja inducirana od istofaznih tokova u jezgri. Koja će svim djelovanjem **pouštiti djelovanje istofaznih struja tereta**
- tercijor u tr. u spoju YY ima funkciju smanjivanja usta reakcije tr., simetrična opterećenja po fazama, smanjivanje usta koeficijent struje ukj....
- može se koristiti i **za priključak trošila**, tj. u elektronici ili traku stanici gdje su potrebna 3 različita napona. Ako se ne koristi za učepljivanje trošila mariva se i stabilizacijski manot

upr YNyn0d5



Autotransformator - užlazni, silazni, ST, UK, +/-

- trafa u kojem se energetička naponata osice čineg, putem (induktivno) prenosi i galvaniskom putem direktno s povezavom na sekundar
- VN strana imala oba napona (i zajednički i serijski), a NN samo zajednički



Napona (potrošnja) snaga veća je od tipike snage kada bi imao 2-naponeći t. istih dices.

$$ST = Sa \left(\frac{U_{1a} - U_{2a}}{U_{1a}} \right), \quad Sa = U_{1a} I_{1a}$$

Često je zahtjev da UKa bude veći, (do 40%) zbog velikih Iks

$$UKa\% = \frac{2K}{Sa} \cdot 100 = \frac{2K ST}{(U_{1a})^2} \frac{U_{1a}}{(U_{1a} - U_{2a})^2} U_{1a}$$

$$UKa\% = \frac{U_{1a} - U_{2a}}{U_{1a}} \cdot \frac{ST}{Sa}$$

$$UKa\% = \frac{ST}{Sa}$$

- (+) prednosti
- manji gubitci
 - veća brisanost
 - lakši transport
 - niža cijena

- (-) neadekvatne
- zbroj galvanische veze
 - povezani sekundarni krug prenosi se direktno prenose
 - spoj mora biti λ da se izvod zaj. naponata uvezeti
 - komplexniji izolacijski sus.
 - ne smije se koristiti za snizavanje napona s naponima između na nebezpečni prakodob do prekida u dovodu ul-voda cijela uveza f na 220V

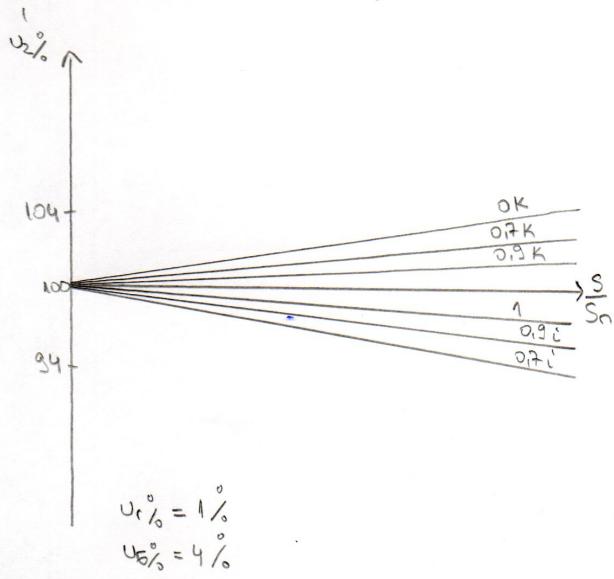
Često se dogodjuje regulacijska sklopka koju se podešava prema potrebi (polet teretom). Koriste se za velike snage na povezivanju VN ureža (400, 220, 110KV)

Napomena: Često se i trafa u stedljivoj pogonu

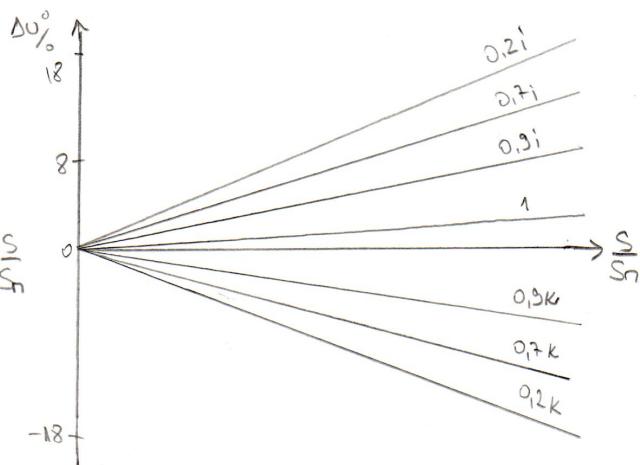
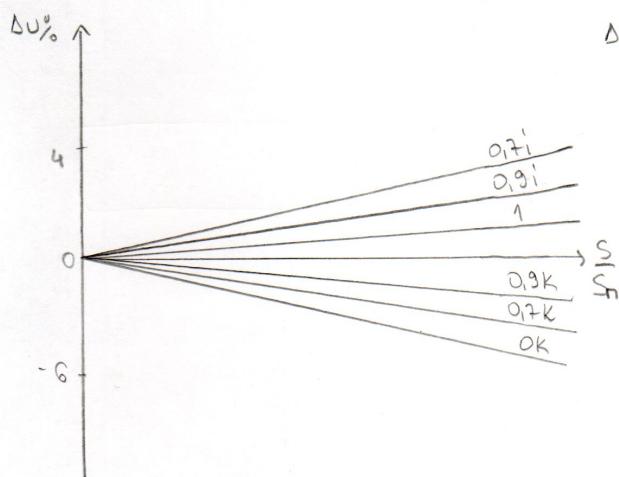
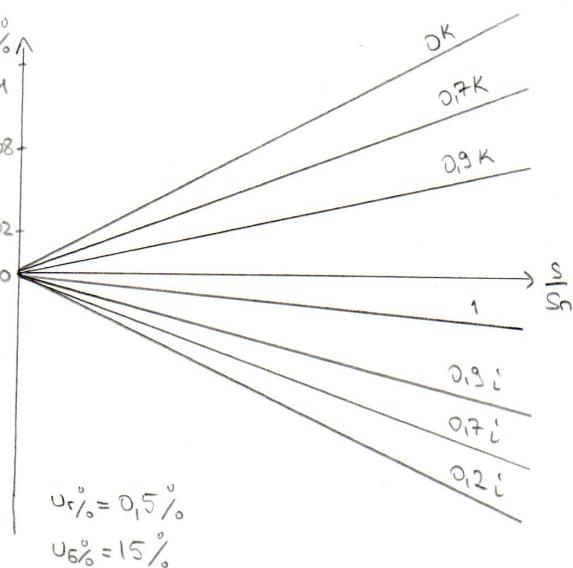
Varijska karakteristika i pad napona na tr.

- varijska kor. = omislost napona sekundara nereguliraniog tr. o opterećenju pri različitim konst. faktorima snage

mali (distributivni) trfo



veliki (energetski) trfo

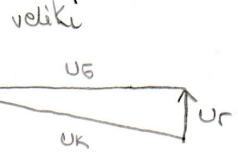
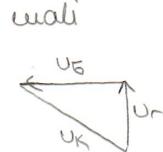


U_K -napon kratkog spoja, ugl se izražava u postocima naponskog napona

$$U_K \% = \frac{U_K}{U_n} \cdot 100 = \frac{\sqrt{3} I_{fn} Z_K}{\sqrt{3} U_{fn}} = \frac{S_n Z_K}{U_n^2}$$

$$S_n = \sqrt{3} U_n I_n = 3 U_{fn} I_{fn}, \quad I_n = I_{fn}$$

$$U_r \% = \frac{I_{fn} R_K}{U_{fn}} \cdot 100 = \frac{P_K}{S_n} = \frac{S_n R_K}{U_n^2}, \quad U_6 = \frac{I_{fn} X_K}{U_{fn}} \cdot 100 = \frac{S_n X_K}{U_n^2}$$



Iндукциони напон, маг.ток и струја магнетизирајућа

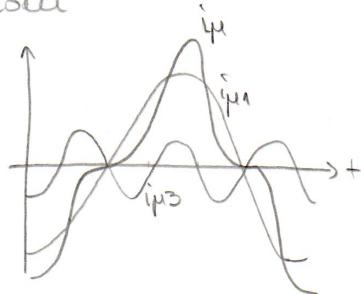
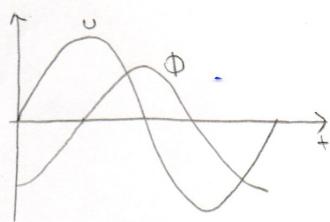
$$I_o = I_{or} + I_{\mu}$$

↙ ↘

radna konfig. za
potiskivanje gub.
zbog histerese
(simetrija, u fazi
s napominkom)

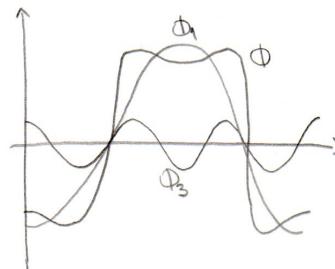
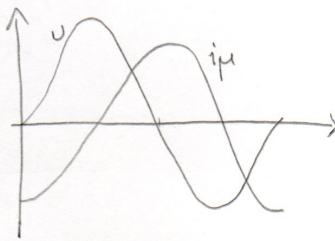
u stroju mag. osi u osnovnog izražaju je
i 3. harmonika. U 3f mreži zatv.
uglovog trena potrebuju povratne vod.

3f transformator s izvedenjem u ul-vodove



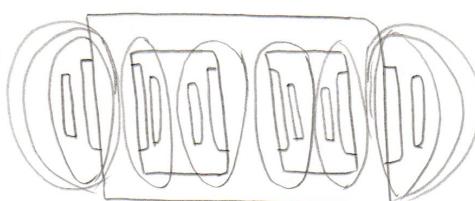
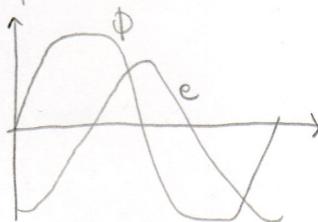
tok je simetriji jer se
ul-vodove mogu zatvoriti
3. harmonika stroj

3f transformator bez ul-voda



zbog neispravnosti
protoka 3. hor. stroje
javlja se 3. hor. toka
zbog čega se deformiraju
 ϕ i u

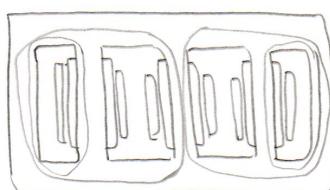
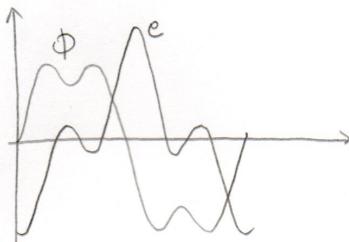
3stupni transformator (λ bez ul-voda)



3. hor. je isto fazan u
sva 3 stupa. Neuna
povratni put kroz jezgru
pa se zatvara rasipavanje
kroz zrak (gdje je $R_m \gg$)

$$\Phi_3 = \frac{W_i \mu^3}{R_m} \quad R_m \uparrow \quad \Phi_3 \downarrow$$

5stupni ili 3x jednofazni (bez ul-voda)



za 3. hor. postoji povratni
put kroz jezgru
 $R_m \downarrow \quad \Phi_3 \uparrow$

Uvjeti za paralelno spojajuće trakce

moraju imati :

isti satni broj

isti nazivni naponi transformatorje U_{1n}/U_{2n}

približno jednaki naponi U_1 (razlika do 10%)

nešto manje od 2

skupine (po satnicim brojevima)

I. 0, 4, 8

II. 2, 6, 10

III. 1, 5

IV. 7, 11

- paralelni rad moguće je i ako satni broevi nisu isti, ali tada se trakcijski učinak mora razlikovati prema različitim stupnjima

- paralelni spoj (bez otvaranja kotla) mogeće je kod tr. s

poravnanim satnicim br. samo iz iste skupine (samo I. ili samo II.)
neporavnanim satnicim br. iz obe neporavne skupine (kombinacija III. i IV.)

Razlika DC i AC magnetiziranja

- Kod AC mag. struje se ujčenja ovisno o materijalu jezgre, a kod DC ujč. ne, jer ovisi samo o karakteristike napona i očekivane otpornosti manjata.
- Kod AC mag. struje ovisi o impedanči, tj. najviše o induktivitetu koji ovisi o geometriji mag. kuge i svojstvima materijala kroz kog se zatvara mag. polje

DC

$$\oint H dl = NI = \Theta$$

$$H_{Lsr} = NI$$

$$I = \frac{HL}{N} = \frac{BL}{\mu N}$$

$$U = IR$$

$$\mu_{Fe} L \rightarrow \mu_{drvo}$$

$$I_{drvo} = I_{Fe}$$

$$B_{Fe} \rightarrow B_{drvo}$$

AC

$$\oint H dl = NI = \Theta \quad \Phi = \frac{NI}{R_m}$$

$$H_{Lsr} = NI$$

$$I_m = \frac{H_m L}{N} = \frac{B_m L}{\mu N}$$

$$L = \frac{\Psi_m}{I_m} = \frac{N \Phi_m}{I_m} = \frac{NN I_m}{I_m R_m} = \frac{N^2}{R_m}$$

$$R_m = \mu \frac{L}{S}$$

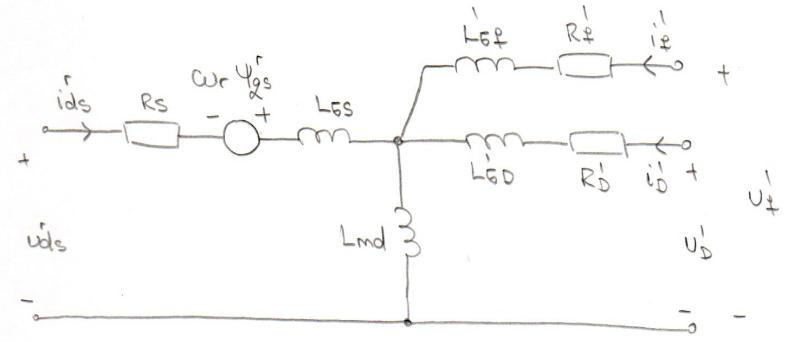
$$U = 4,44 \cdot NBS$$

$$\mu_{Fe} > \mu_{drvo}$$

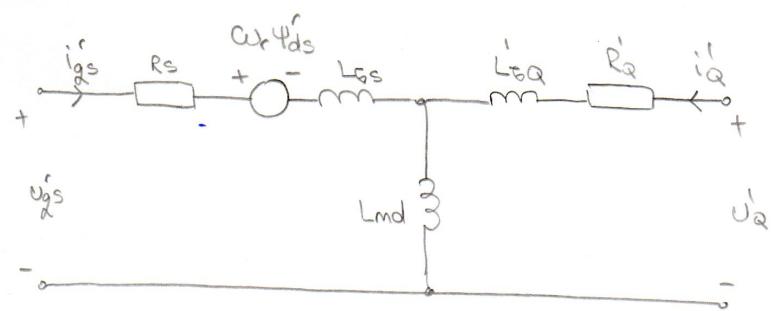
$$I_{Fe} < I_{drvo}$$

$$L_{Fe} > L_{drvo}$$

Nadomysua shema SS v dñg koordinatnom sus.



f - užbuden' manot (dlos)
 D - prigušen' manot v dlo si
 Q - prigušen' manot v g osi



Podjela sinkronih motora

- I.) kolektorski DC motori - užbudni moment je zauvijek trajni i magnetska (feritica)
- II.) elektronički koncentrirani motor - trajni magnetski na rotoru; napajaju je strjama trapezne oblike; struju istovremeno vode 2 faze
- III.) sinkroni motor s trajnim magnetskim - trajni magnetski na rotoru, napajaju je strjama sinusne oblike; struju vode sve 3 faze
 - a) SM s površinskim magnetskim (SPM = Surface Permanent Magnet) nisu za pogone koji trebaju veliki raspore brzina
 - b) SM s unutarnjim magnetskim (IPM = Interior Permanent Magnet)
 $X_d > X_q$, osice drugog razinjaju i elektantni reoci.
i za velike brzine i velike rasponue (upr. el. vuča)

Reluktantski moment

- u rotoru s istaknutim polnim postoje magnetska neisimetrija i računog raspore u d i g osi koje su učinile da je mag. vodljivost u d osi veća.
- Ako u stigu delye sačine profecanje statora ($\theta_r = 0$) onda krep. θ_{sd} i θ_{sg} uče se rezultirati proporcionalne krep. mag. induc. B_d i B_g jer je

$$B_d = \theta_{sd} \Lambda_d$$

$$B_g = \theta_{sg} \Lambda_g$$

$$\Lambda_d > \Lambda_g$$

$$X_d > X_g$$

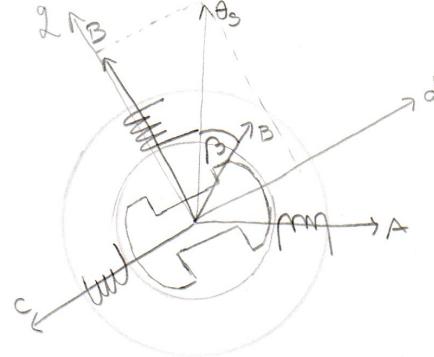
Kao rezultat javlja se fazni pogon β između vektora profecanja i induc.

i to tako da je os indukovanog prema osi pola tj. prema slevog veće 1

Pojavljaju se se reluktantski momenti koji nastoje da se os profecanja poklopí s osi max vodljivosti (d os)

$$M_{s,rl} = -\frac{D \pi P L}{2} B \dot{\theta} \sin \beta$$

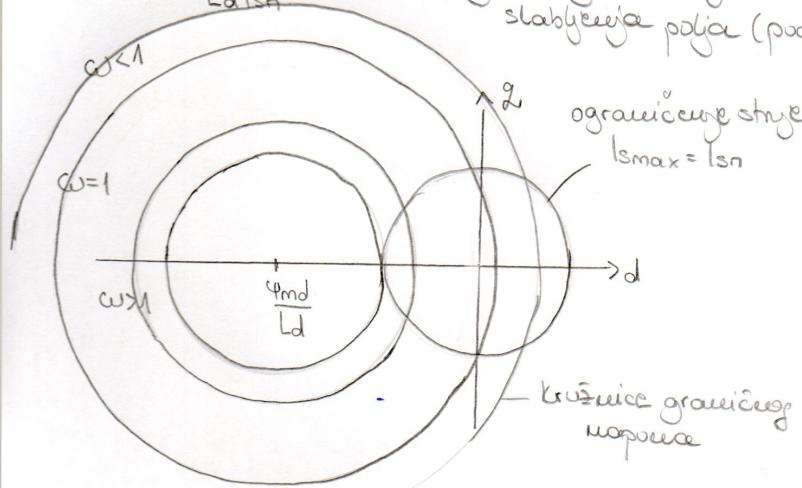
Mom. istog iznosa ali sup. smera delye i na rotor



Grafične kružnice marenca i strje

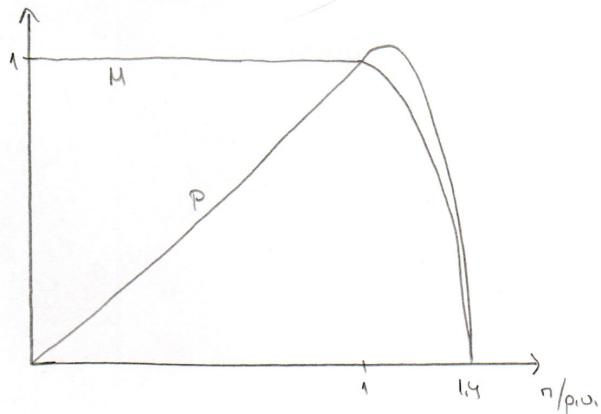
1) SPM $\Psi_{md} > Ld I_{sn}$, $X_d = X_2$ (zbog velikog zr. raspona \rightarrow mali Ld)

$$I_c = \frac{\Psi_{md}}{Ld I_{sn}} = 4 \quad \text{karak. strje - ujedno mogućnost konštančnje motora u režimu stabljeajuće polje (podržuje iako god razine brzine)}$$

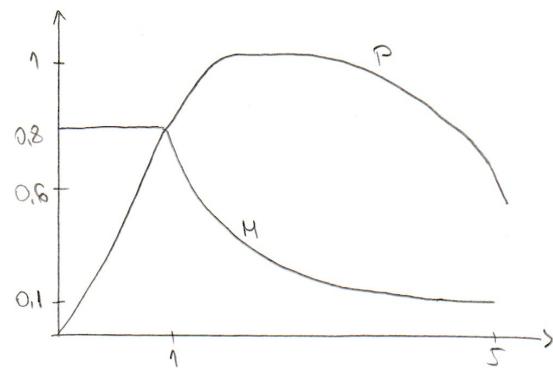
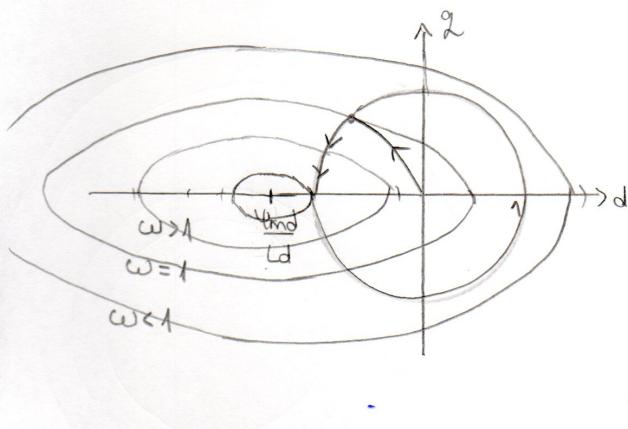


$Ld I_{sn}$ - tok arreaturnog marenca u d osi

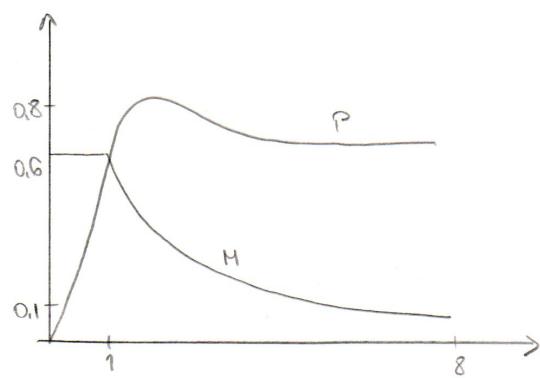
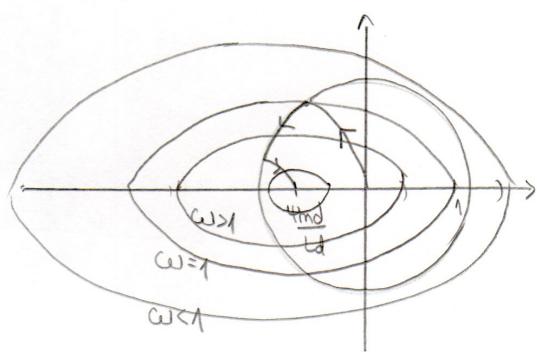
Ψ_{md} - tok marenca



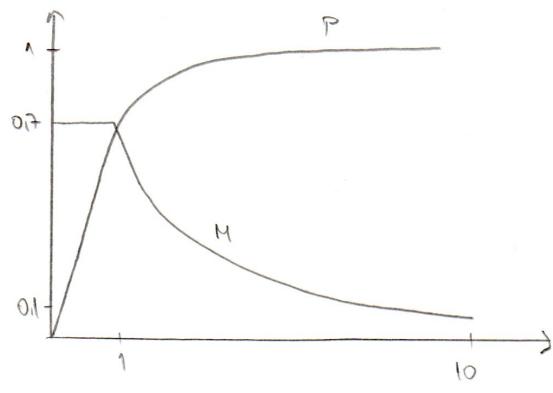
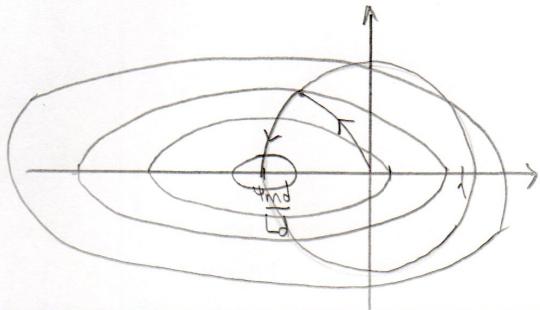
II) IPM $\Psi_{md} > L_d | s_m, L_g > L_d$
 $I_c = 1,4$



III) IPM $\Psi_{md} < L_d | s_m, L_g > L_d$
 $I_c = 0,6$



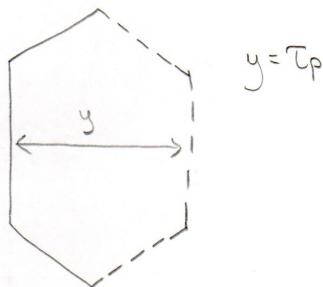
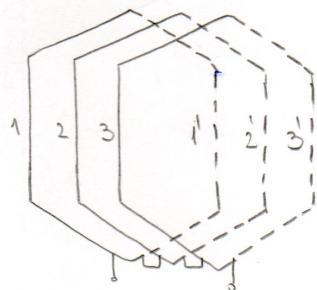
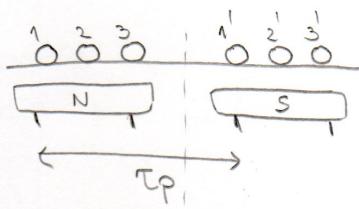
IV) IPM $\Psi_{md} = L_d | s_m, L_g > L_d$
 $I_c = 1 \rightarrow$ optimal value
 stability polygon



Skracuje svitke, faktori manota

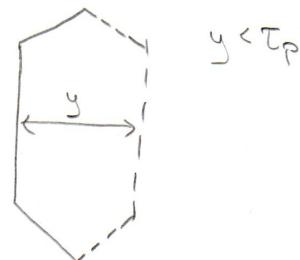
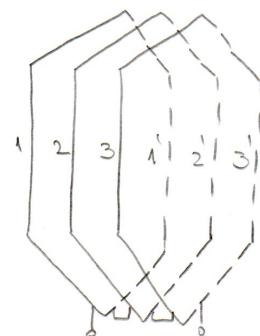
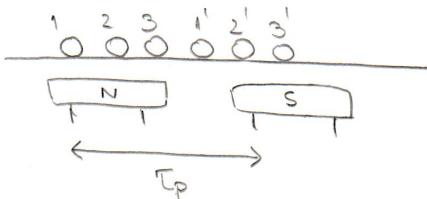
dijametralni svitak

= razmak od jedne do druge strane istog svitka (y) jednako je polovici koraka (τ_p)



skraceni svitak

= širiina svitka (y) je manja od polug koraka (τ_p)



$$\text{skracuje } k = \frac{y}{\tau_p}$$

„Sto se postiže skracujeće?“

- ušteda u duljini glave manota i njihov lakši suvještaj (glave nisu u mag. polju pa se u njima ne inducira napon, nego njihov otpor samo povlačiće jakeove gubitke)
- popravlja se oblik krivule napona, odgovarajući odabiranjem k eliminiraće se visi harmonički članovi, pa će napon biti sličnije obliku

- Tetivni faktor manjota = omjer ukupnog napona E i zbroja iznosa zonskih napona E_z ; pokazuje koliko se zbroj zonskih napona smanji jer ne leži na dijametru

$$f_t = \frac{E}{2E_z} = \sin\left(\frac{y}{T_p} \frac{\pi}{2}\right)$$

- Zonski faktor manjota = omjer stvarnog napona i zonu i alg. suvremenih napona u zoni

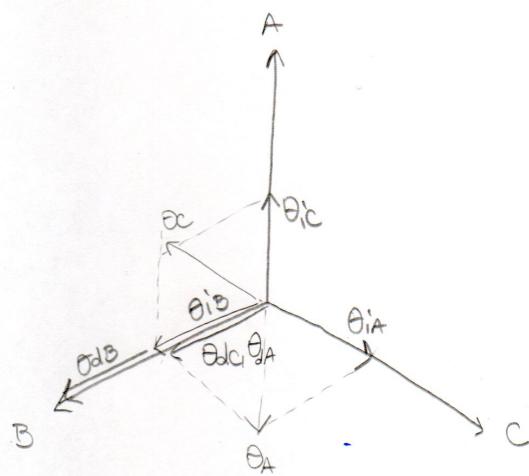
$$f_z = \frac{E_z}{2E_1} = \frac{\sin\left(\frac{L}{2}\right)}{2 \sin\left(\frac{L}{2}\right)} \quad L = \frac{p \cdot N}{360^\circ} = \Delta \ell$$

zona = svaki utori pod jedinicom polovce $N/2p$ ali su od toga neki utori prazni pa ostaje g utora koji čine jednu zonu manjatina

utorski korak T_u = razmak između srednjih susjednih utora
 polni korak T_p = razmak između srednjih polova

Vektori projecanja

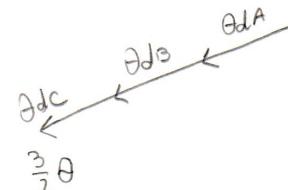
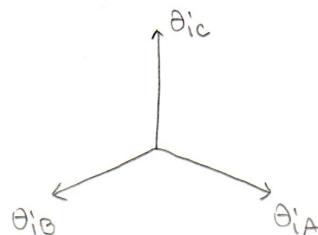
$I_B - \text{max}$



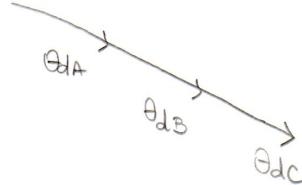
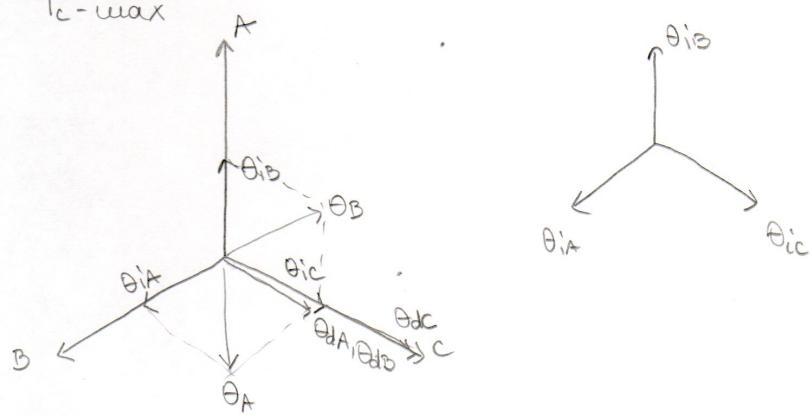
$$I_A = I_{AM} \cos(\omega t - \phi) = -\frac{1}{2} I_{AM}$$

$$I_B = I_{BM} \cos(\omega t - \frac{2\pi}{3})$$

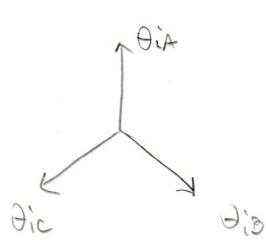
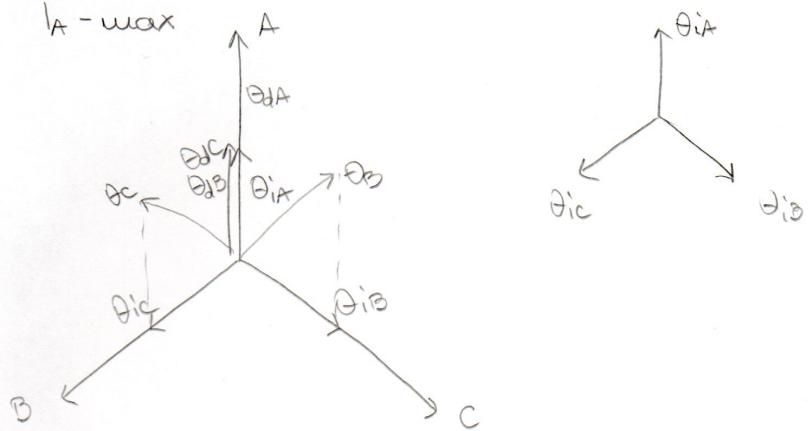
$$I_C = I_{CM} \cos(\omega t + \frac{2\pi}{3}) = -\frac{1}{2} I_{CM}$$



$I_C - \text{max}$



$I_A - \text{max}$



Razvijena struktura

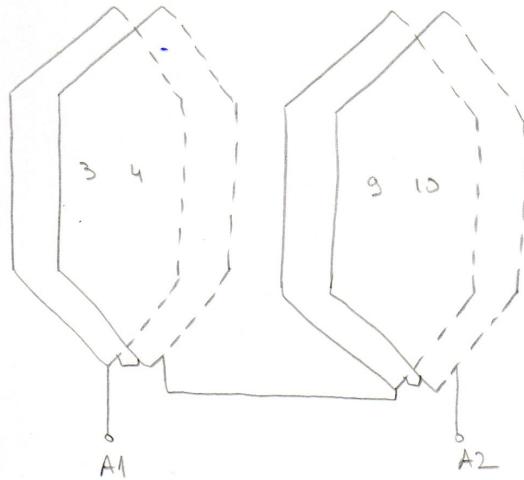
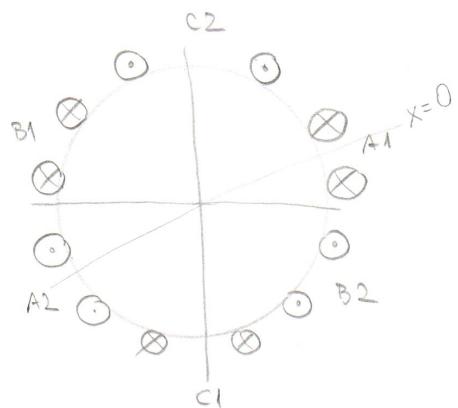
$$N=12$$

$$2p=2$$

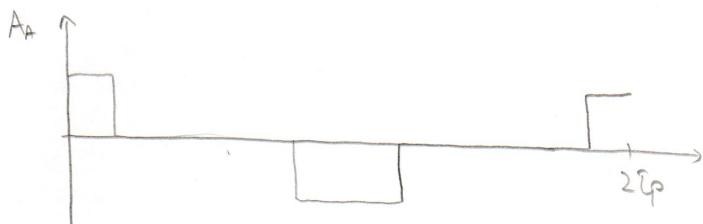
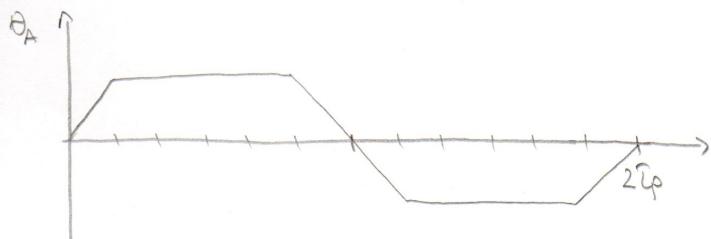
$$y=5$$

$$g = \frac{N}{2pm} = \frac{12}{2 \cdot 3} = 2$$

$$2p\bar{\ell}_p = N\bar{\ell}_p \rightarrow \bar{\ell}_p = \frac{12}{2} = 6$$

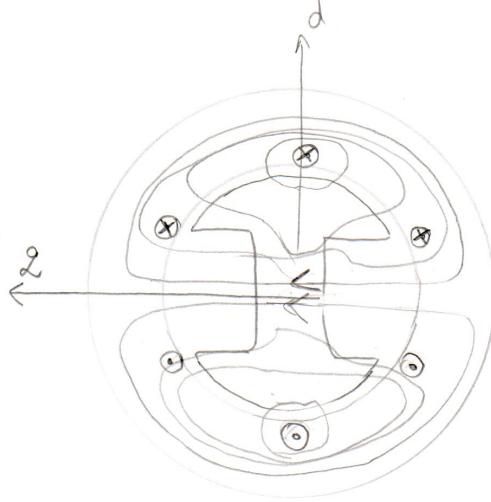
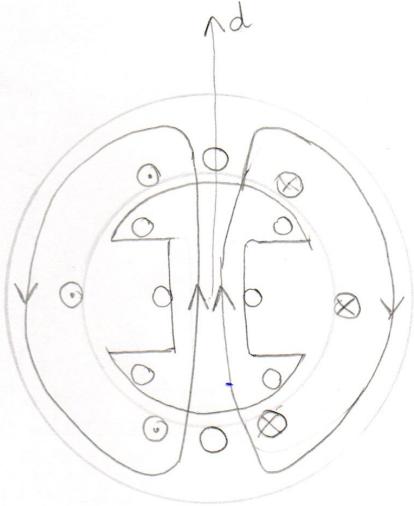


pocetak faze B je u 5.
pocetak faze C je u 9.



Siluete mag. polja dvopolnog stroja

resultante projecanje u d osi : resultante projecanje u z osi :



pravilo desuevuke "U"

Fazorski dijagrami siatkowego generatora

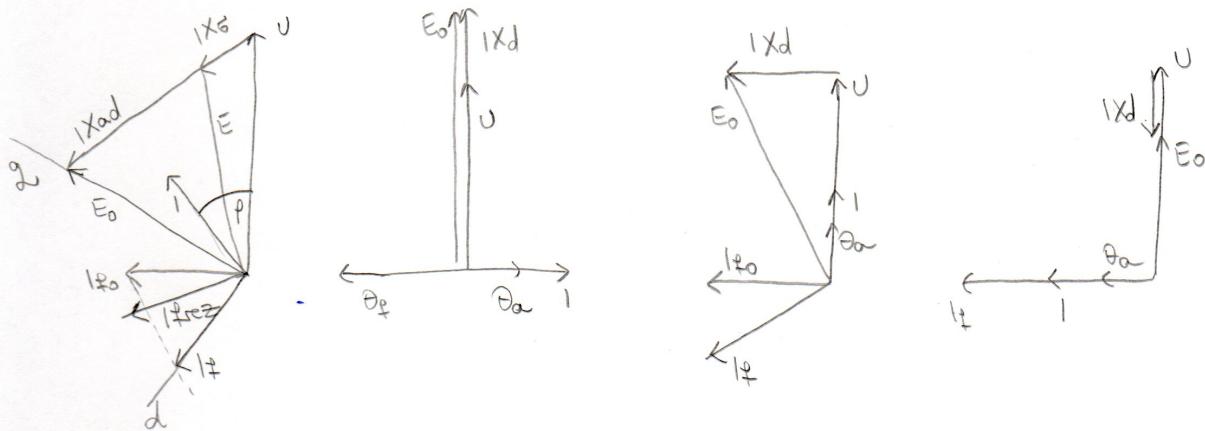
TG

$RC =$

$L =$

$R =$

$C =$



$$I_{q0} \perp U$$

$$I_{frez} \perp E$$

$$I_t \perp E_0$$

$$X_d \approx 120\%$$

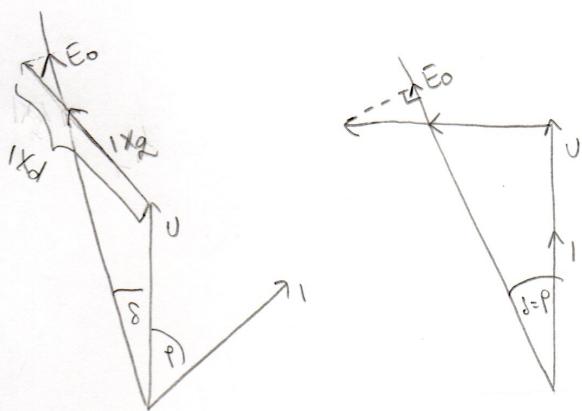
$$X_q < X_d$$

HG

$RL =$

$R =$

$RC =$



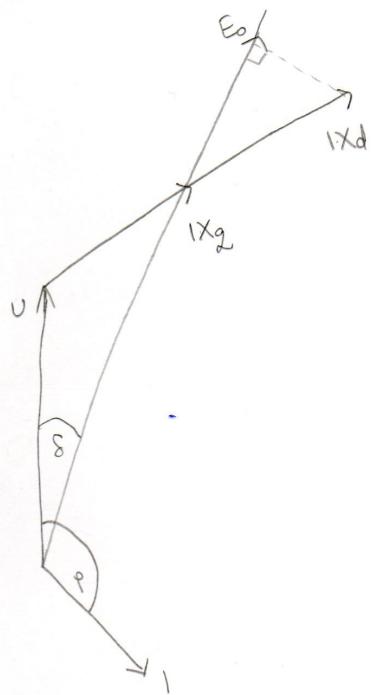
maiorzutem

podciążkiem

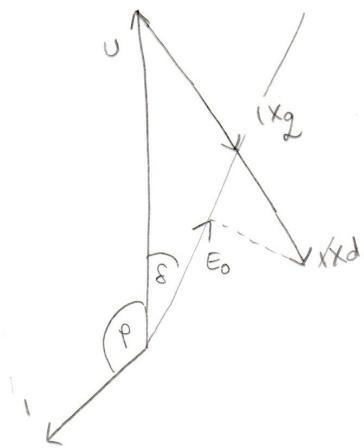
za silnik $\varphi > 90^\circ$

Fazorski dijagrami HG kod radi kao motor

nadzvukac

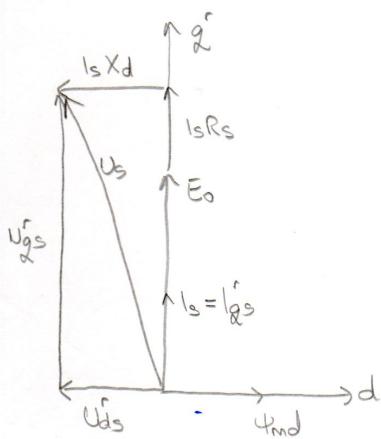


poduzvukac

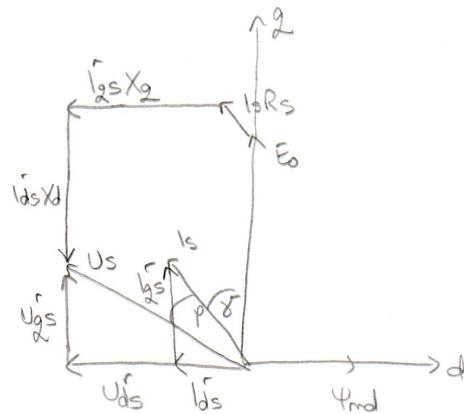


Fazorski dijagrami SPM-a

SPM



IPM



$$X_d = X_g, \gamma = 0$$

$$M_{max} = \frac{3}{2} \frac{P}{C_w s} E_o I_s$$

da bi ures. bio max. za bilo kog Is treba upravljati vektorom struje tako da je on okrenut na tok emognuta ψ_{md} , tj. struja Is mora biti u fazi s induksione Eo ($\gamma=0$)

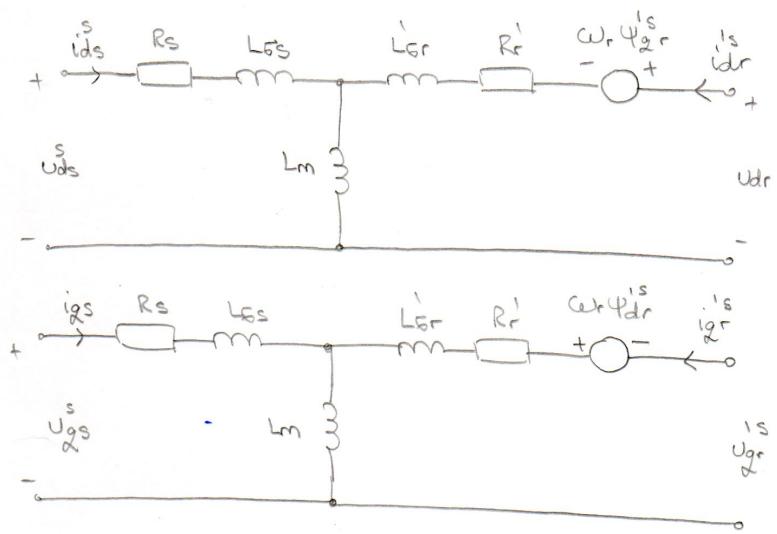
$$X_d < X_g, \gamma < 0$$

$$M_{max} = \frac{3}{2} \frac{P}{C_w s} \left[E_o I_s \omega s \gamma + \frac{1}{2} (X_d - X_g) I_s^2 \sin 2\gamma \right]$$

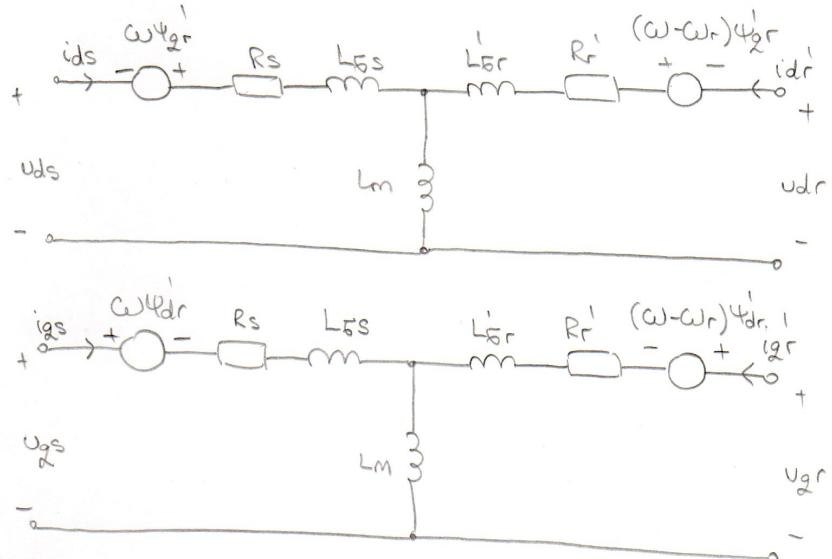
da bi ures. bio max vektorom struje treba upr. tako da se prethodi Eo za kut γ . Za određen R.T. može se proučiti optimalni γ kod kog se postiže M_{max} . Motor tada raznja emogn. i rektifikacijske vrednosti.

Nadomysua shema osiukrouog strjice

u statoskore koordinatnace sus.



u proizrofus rotirajucce koordinatnace sus.



$$f_{dgr}^s = f_{dgr}^r e^{j\omega_r t}$$

rotorski \rightarrow statorski

$$f_{dgr}^r = f_{dgr}^s e^{-j\omega_r t}$$

statorski \rightarrow rotorski

$$f_{dgs}^s = f_{dgs}^r e^{j\omega_r t}$$

proizvoljeno rot. \rightarrow statorski

$$f_{dgs}^r = f_{dgs}^s e^{-j\omega_r t}$$

statorski \rightarrow proizvoljeno rot.

$$f_{dgr}^r = f_{dgr}^s e^{j(\omega_r - \omega_s)t}$$

proizvoljeno rot. \rightarrow rotorski

$$f_{dgr}^s = f_{dgr}^r e^{-j(\omega_r - \omega_s)t}$$

rotorski \rightarrow proizvoljeno rot.

$$U_{dgs}^s = U_{sp} e^{j\omega_s t} + U_{sn} e^{-j\omega_s t}$$

$$U_p = \frac{1}{3} (U_{as} + \alpha U_{bs} + \alpha^2 U_{cs})$$

$$U_{sn} = \frac{1}{3} (U_{as} + \alpha^2 U_{bs} + \alpha U_{cs})$$

$$\alpha = e^{j\frac{2\pi}{3}}, \quad \alpha^2 = e^{j\frac{4\pi}{3}}$$

$$U_{as} = \sqrt{\frac{2}{3}} U e^{j\frac{\pi}{6}}$$

$$U_{bs} = \sqrt{\frac{2}{3}} U e^{-j\frac{2\pi}{3}}$$

$$U_{cs} = \sqrt{\frac{2}{3}} U e^{j\frac{4\pi}{3}}$$

Pogonska karta turbogeneratora

$$S_n = 247 \text{ MW}$$

$$U_n = 13800 \text{ V}$$

$$\cos\varphi = 0,85$$

$$n = 3000$$

$$\gamma = 98,6 \%$$

$$I_{fo} = 822 \text{ A}$$

$$I_{fk} = 1750 \text{ A}$$

$$P_{max,t} = 130 \text{ MW}$$

$$P_{min,t} = 30 \text{ MW}$$

$$\delta_{max} = 75^\circ$$

$$I_{fmin} = 0,15 I_{fn}$$

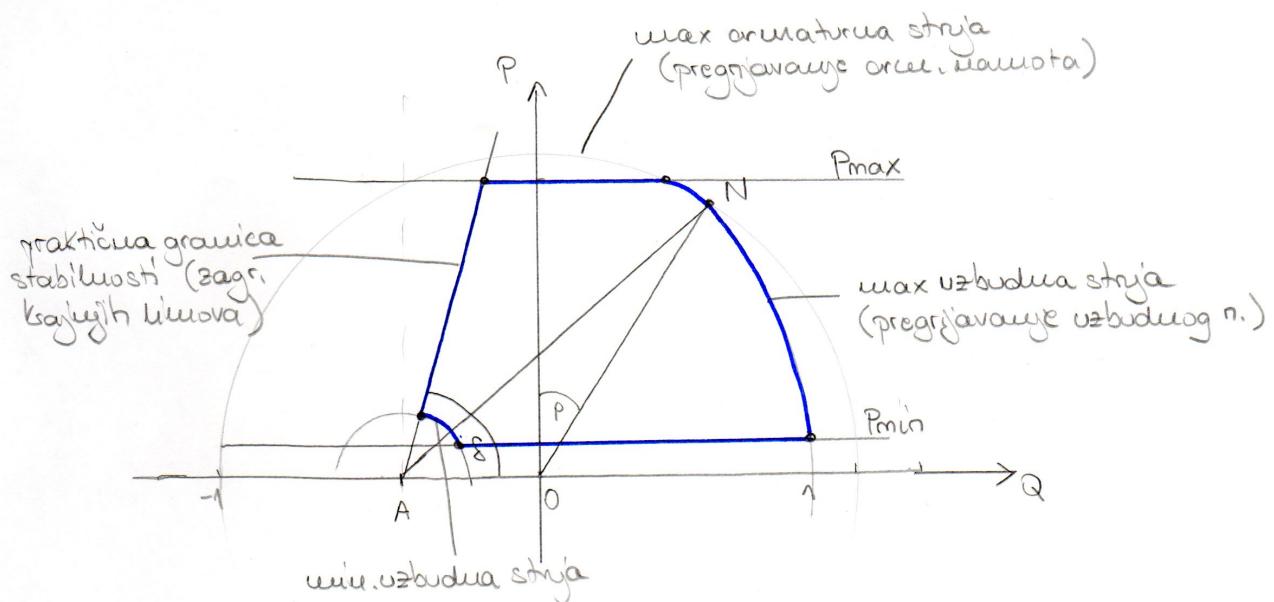
$$1^{\circ} \quad A = \frac{U_n^2}{X_d} \quad X_d = \frac{I_{fo}}{I_{fk}} = 2,13 \text{ p.u.}$$

$$A = \frac{1}{2,13} = 0,47 \quad |AN| = \frac{E_U}{X_d} = 1,3 \text{ p.u.}$$

$$2^{\circ} \quad \rho_n = \arccos(0,85) = 31,37^\circ$$

$$3^{\circ} \quad P_{min} = \frac{\gamma P_{min,t}}{S_n} = 0,12 \text{ p.u.} \quad P_{max} = \frac{\gamma P_{max,t}}{S_n} = 0,92 \text{ p.u.}$$

$$4^{\circ} \quad I_{fmin} = 0,15 I_{fn} = 0,15 \cdot 1,3 = 0,195 \text{ p.u.}$$



Pogonska karta hidrogeneratora

$$S_n = 35 \text{ MVA}$$

$$U_n = 10,5 \text{ kV}$$

$$\omega \rho_n = 0,9$$

$$n = 500$$

$$X_d = 126\%$$

$$X_g = 72\%$$

$$P_{\max,t} = P_n$$

$$P_{\min,t} = 0,11 P_n$$

$$I_{\max} = E_{on}$$

$$I_{\min} = 0,1 E_{on}$$

$$r = 5 \text{ cm} = 1 \text{ p.u.}$$

$$S_n = 1 \text{ p.u.}$$

$$P_n = \frac{P_n}{S_n} = \frac{S_n \cos \rho_n}{S_n} = 0,9$$

$$Q_n = \sin \rho_n = 0,4$$

$$I_{\text{arm},\max} = I_n = 1$$

$$I \neq E_0$$

$$1^\circ \quad P_{\max} = P_n = 0,9$$

$$P_{\min} = 0,11 \cdot 0,9 = 0,099$$

$$2^\circ \quad \theta = \arccos(0,9) = 25,8^\circ$$

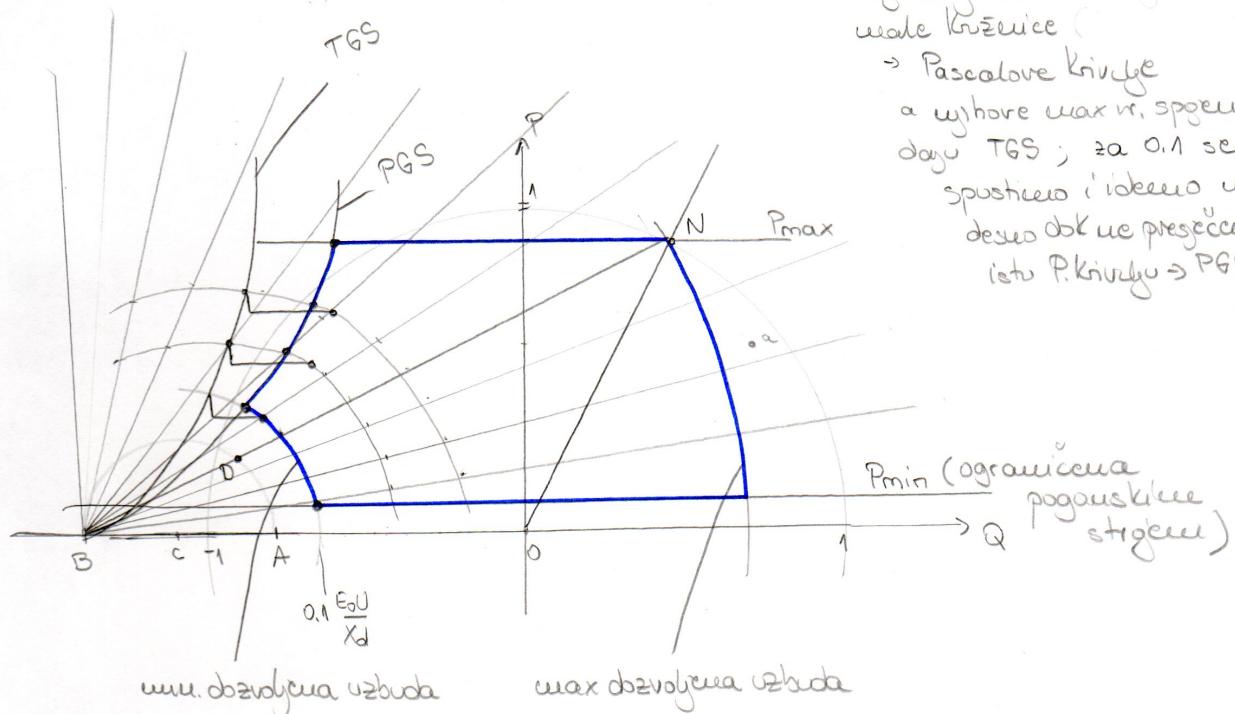
$$3^\circ \quad A = -\frac{U^2}{X_d} = \frac{-1}{1,26} = -0,79$$

$$B = -\frac{U^2}{X_g} = \frac{-1}{0,72} = -1,39$$

$$C = \frac{|AB|}{2} \quad |DN| = \frac{E_0 U}{X_d} =$$

je B povučeno pravce
na ujma označeno točke
koje su jednako udaljene od
maste krivice

→ Pasčalove krivice
a užore max r. spomen
daju TGS; za 0,1 se
spustiš i ideš u
desnu dok ne presegčeš
isto P. Krivulu → PGS



$$P = 21 \text{ MW} \rightarrow P = \frac{21}{35} = 0,6 \quad \text{za}$$

$$Q = 24 \text{ MVA} \rightarrow Q = \frac{24}{35} = 0,68$$

Projecanje i strujni oblog kada je $I_A = \max$

$$I_A = \max$$

$$I_B = -\frac{1}{2}$$

$$I_C = -\frac{1}{2}$$

