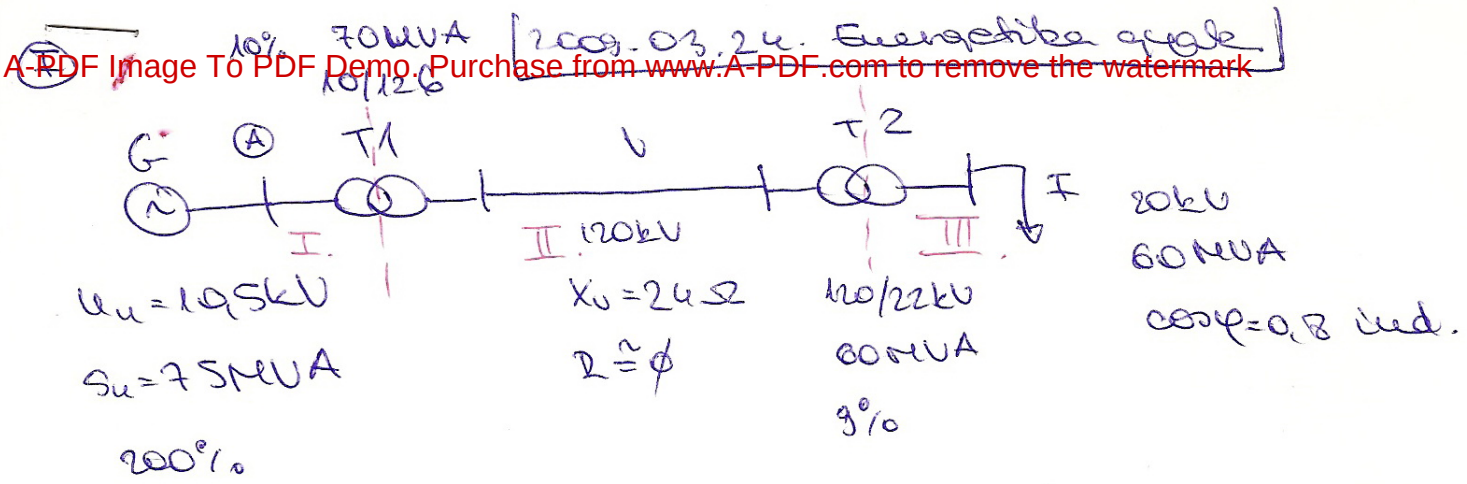
2009.03.24. Energetika gyak.



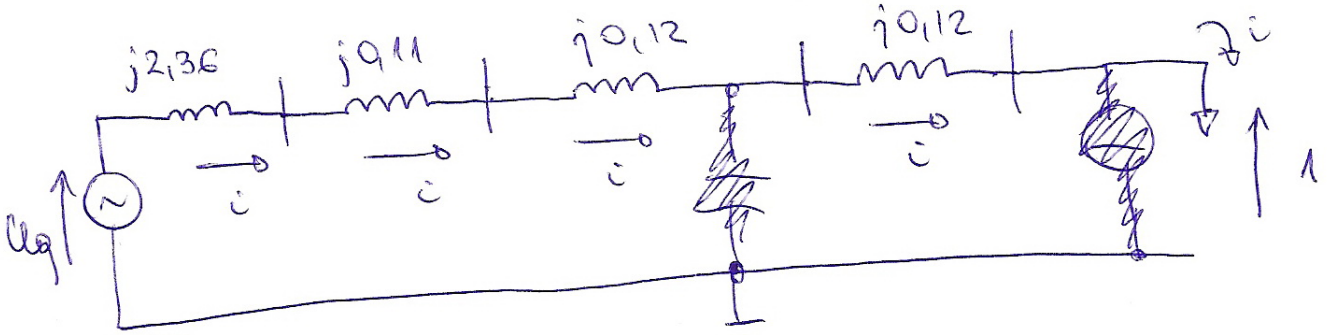
Feltételezzük: $U_I = U_{IN}$

U_g = ?

U^* = ?

I_g = ? $\quad \frac{I_g}{I_{gu}}$ = ?

	I	II	III	
U_a	$109,1 \frac{10}{126} = 8,65$	$20 \frac{120}{22} = 109,1$ ←	20	kV vonali
S_a	60	60 ←	60	MVA 3f
Z_a		$\frac{109,1^2}{60} = 198$		Ω
I_a	$\frac{60}{\sqrt{3} \cdot 8,65} = 4$			kA



$$X_g = \frac{X_g}{Z_a^I} = \frac{\frac{X_g(\%)}{100}\frac{U_{gn}^2}{S_{gn}}}{\frac{(U_a^I)^2}{S_a}} = \frac{X_g(\%)}{100}\frac{\left(\frac{U_{gn}}{U_a^I}\right)^2}{\frac{S_{gn}}{S_a}} =$$

$$= \frac{200}{100}\frac{\left(\frac{10,5}{8,65}\right)^2}{\frac{75}{60}} = 2,36$$

$$X_{T1} = \frac{X_{T1}^{(1)}}{Z_a^I} = \frac{X_{T1}^{(2)}}{Z_a^{II}} = \frac{\frac{\varepsilon}{100}\frac{(U_{T1n}^{(2)})^2}{S_{T1n}}}{\frac{(U_a^{II})^2}{S_a}} = \frac{\varepsilon}{100}\frac{\left(\frac{U_{T1n}^{(2)}}{U_a^{II}}\right)^2}{\frac{S_{T1n}}{S_a}} =$$

$$= \frac{10}{100}\frac{\left(\frac{126}{109,1}\right)^2}{\frac{70}{60}} = 0,11$$

$$X_{T2} = \frac{9}{100}\frac{\left(\frac{120}{109,1}\right)^2}{\frac{60}{60}} = 0,12 \qquad X_v = \frac{X_v}{Z_a^{II}} = \frac{24}{198} = 0,12$$

$$u_T = \frac{U_{Tn}}{U_a^{III}} = \frac{20}{20} = 1$$

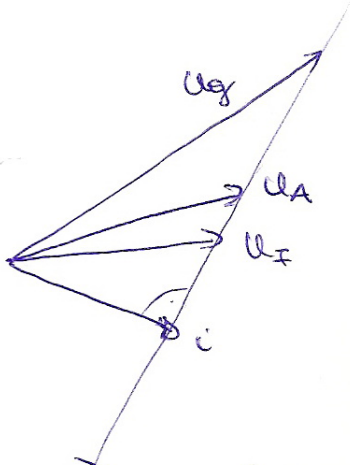
$$i = \frac{I_{Tn}}{I_a^{III}} = \frac{\frac{S_{Tn}}{\sqrt{3}U_{Tn}}(\cos\varphi \ominus j\sin\varphi)}{\frac{S_a}{\sqrt{3}U_a^{III}}} = \frac{\frac{S_{Tn}}{S_a}}{\frac{U_{Tn}}{U_a^{III}}}(\cos\varphi - j\sin\varphi) =$$

(inductiv)

$$= \frac{\frac{60}{60}}{\frac{20}{20}}(0,8 - j0,6) = 0,8 - j0,6$$

$$\dot{U}_g = \dot{U}_I + ij(X_g + X_{T1} + X_V + X_{T2}) =$$

$$= 1 + (0{,}8 - j0{,}6)j2{,}71 = 2{,}63 + j2{,}17 = 3{,}4 \angle 39{,}5°$$



$$U^A = U_I + ij(X_{T1} + X_V + X_{T2}) = 1 + (0{,}8 - j0{,}6)j(0{,}35) =$$

$$= 1{,}21 + j0{,}28 = 1{,}24 \angle 13°$$

$$|\dot{U}^A_f| = U^A U^I_{af} = 1{,}24 \cdot 8{,}65/\sqrt{3} = 6{,}19\,kV$$

$$U^A_V = U^A_f \sqrt{3} = 10{,}7\,kV$$

$$\left(U^A_V / U_{gn}\right) \cdot 100 \approx 102\,\%$$

$$\dot{U}^B_f = U^B \dot{U}^{II}_{af}$$

$$|i_q| = 1 \qquad \dot{I}_q = i_q \dot{I}^I_a = 4\,kA$$

$$I_{gn} = \frac{75}{\sqrt{3}\,10{,}5} = 4{,}12\,kA = \frac{S_{gn}}{\sqrt{3}\,U_{gn}}$$

$$\frac{I_g}{I_{gn}} \cdot 100 = 97\,\%$$

$$|i_V| = 1 \qquad \dot{I}_V = i_V \dot{I}^{II}_a$$

$S_a = U_A \cdot i_A^* = (1{,}21 + j0{,}28)\, 1{,}24 e^{j13} \cdot 1 e^{j\varphi} = 0{,}8 + j0{,}9$

$S_{A_{3f}} = 3_A S_{a3f} = (0{,}8 + j0{,}95)60 = 48 + j57$ MVA

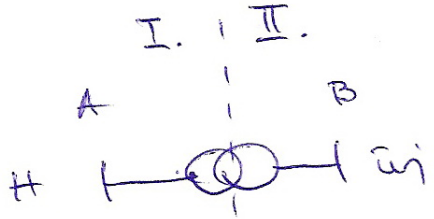
$S_f = U_I i_I^* = 1 \cdot 1 e^{j\varphi} = 0{,}8 + j0{,}6$

$S_{I_{3f}} = 48 + j36$ MVA

$57 - 36 = 21$ Mvar 2 trafó & vezeték

$q_A - q_I = |i|^2 (\underbrace{X_{T1} + X_{T2} + X_v}_{0{,}35}) = 0{,}35$

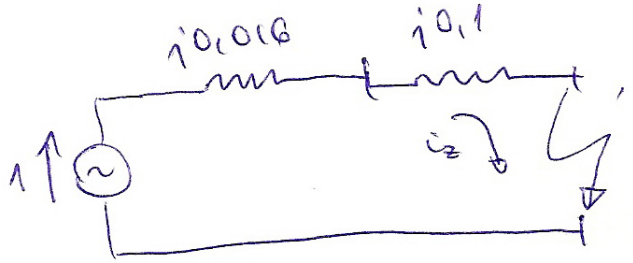
(I)



$U_H = 120$ kV

$S_Z = 4000$ MVA

	I	II	
U_a	120	22	kV
S_a	64	64	MVA
I_a	0,308	1,38	kA

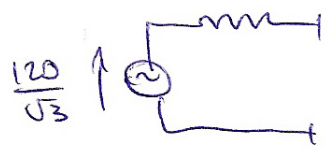


$S_2^B = ?$

$I_2^B = ?$

$$X^H(\Omega) = \frac{U_u^2}{S_Z}$$

$$X^H = \frac{\left(\frac{U_u^H}{U_a^I}\right)^2}{\frac{S_Z}{S_a}} = 0{,}016$$



$X^T = 0{,}1$

$$u^H = \frac{u_f^H}{u_{af}^I} = \frac{u_v^H}{u_{av}^I}$$

$$|i_z| = \left| \frac{U_H}{j(X_H + X_T)} \right| = \frac{1}{0{,}016 + 0{,}1} = 8{,}62$$

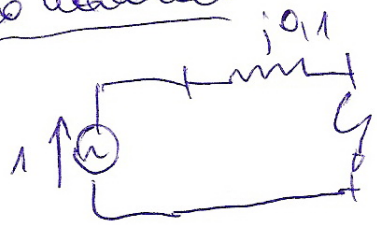
$$I_z^B = i_z \, I_a^{II} = 14{,}5\,kA$$

$$S_z^B = U_{nc}^B \cdot i_z^B = 1 \cdot 8{,}62 = 8{,}62$$

$$S_z^B = 8{,}62 \cdot 64 = 552\,MVA$$

$$S_{z3f}^B = \sqrt{3}\, U_n^B I_z^B = \sqrt{3} \cdot 22 \cdot 14{,}5\,kA = 552\,MVA$$

≅ ∞ vezbozat



$$|i_z| = 10 = \frac{1}{0{,}1}$$

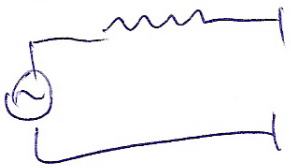
$$S_z = 1 \cdot 10 = 10$$

$$S_z = 10 \cdot 64 = 640\,MVA$$

↓
transzformator saját adatlati teljesítménye

$U_n = 22\,kV$

$S_z = 552\,MVA$



$$X_{eredő}^B = X^H + X_{tr} = \frac{U_u^{B\,2}}{S_z^B} = \frac{U_u^{H\,2}}{S_z^H} + \frac{\varepsilon}{100} \frac{U_u^2}{S_{trn}}$$

$$\frac{1}{S_z^B} = \frac{1}{S_z^H} + \frac{1}{S_z^{tr}}$$

$$S_z^{tr} = \frac{S_{trn}}{\frac{\varepsilon}{100}} = 6{,}4$$