

$$E_1 = 4,44 \cdot f \cdot N_1 \cdot \Phi_m \quad \Phi_m = B \cdot A$$

$$\xi_n = \frac{P_{cun}}{P_{fen}} \quad P_{fen} = P_0$$

$$P'_{fe} = P_{fen} \cdot \left(\frac{f'}{f_n}\right) \cdot \left(\frac{B'}{B_n}\right)^2 \quad P'_{cu} = P_{cun} \cdot \left(\frac{I'_2}{I_{2n}}\right)^2$$

$$P_{izn} = S_n \cdot (1 - \eta_n) = P_{cun} + P_{fen}$$

$$I_{1n} = \frac{S_n}{\sqrt{3} \cdot U_1}$$

$$\mu_R \% = P_{cun} \% \quad P_{cun} \% = \frac{P_{cun}}{S_n} \cdot 100 \%$$

$$\mu_X \% = \sqrt{\mu_K^2 - \mu_R^2}$$

$$\cos \varphi_K = \frac{\mu_R \%}{\mu_K \%}$$

$$\omega_{max} = \omega_{max n} \cdot \frac{1 + \xi_n \cdot X^2}{1 + \xi_n} \quad \text{če } I = I_0, \text{ potem } X = 1$$

$$\omega(t) = \omega_{max n} \cdot (1 - e^{-\frac{t}{T}})$$

če se jak \$X\$ poveča, se \$\mu_K\$ in \$\mu_R\$ tudi \$X\$ povečata!

2 trafota paralelno

$$X_1 \cdot \mu_{K1} = X_2 \cdot \mu_{K2}$$

$$X_1 \cdot S_{n1} + X_2 \cdot S_{n2} = S_B$$

moč prvega moč drugega skupno

$$E_{orn} = \sqrt{(U_{2nr} + I_{2nr} \cdot X_{sr} \cdot \sin \varphi_{2n})^2 + (I_{2nr} \cdot X_{sr} \cdot \cos \varphi_{2n})^2}$$

če oddaja delovno moč \$P\$, potem je \$\cos \varphi_{2n} = 1\$ in \$\sin \varphi_{2n} = 0\$

$$I_{1n} = I_{10} \cdot \frac{E_{orn}}{\mu_{2nr}}$$

$$\delta_n = \arctg \frac{I_{2nr} \cdot X_{sr} \cdot \cos \varphi_{2n}}{\mu_{2nr} + I_{2nr} \cdot X_{sr} \cdot \sin \varphi_{2n}}$$

$$\frac{P_2}{S_{2n}} = \frac{U_{2r} \cdot E_{or}}{X_{sr}} \cdot \sin \delta$$

$$f_{pv} = \frac{\sin(2 \cdot \gamma \cdot \frac{\alpha_g}{2})}{2 \cdot \sin(\frac{\gamma \cdot \alpha_g}{2})}$$

za prvo harmon. komp. je \$\gamma = 1\$

$$2P = 4 \text{ (za 4-polnega)}$$

$$\alpha_g = \frac{360^\circ}{N} \quad \tau_p = \frac{N}{2P}$$

$$\alpha_e = P \cdot \alpha_g \quad q = \frac{\tau_p}{m}$$

$$f_{sv} = \sin\left(\frac{\alpha}{\tau_p} \cdot \gamma \cdot 90^\circ\right)$$

$$f_{nv} = f_{pv} \cdot f_{sv}$$

$$\alpha = \frac{M_n}{M_{om}} \quad \eta_n = \frac{P_n}{P_1} = \frac{P_n}{\sqrt{3} \cdot U_{1n} \cdot I_{1n} \cdot \cos \varphi_1} \quad \delta_{om} = X \cdot \delta_n$$

$$\delta_n = \frac{n_s - n_n}{n_s} \quad E_{2n} = \delta_n \cdot E_{20} \quad \eta_{om} = \eta_s \cdot (1 - \delta_{om})$$

$$X = \frac{1}{\alpha} \pm \sqrt{\left(\frac{1}{\alpha}\right)^2 - 1} \quad f_2 = \delta_n \cdot f_1 \quad M_n = \frac{P_n}{\omega_n} = \frac{P_n \cdot 60}{2\pi \cdot n_n}$$

če v krog dodamo upornost R_{2dod} :

$$\delta_b = \frac{\sqrt{3} \cdot I_{2n} \cdot (R_{2r} + R_{2dod})}{E_{20}} \quad R_{2r} = \frac{\delta_n \cdot E_{20}}{\sqrt{3} \cdot I_{2n}} \quad \eta_b = \eta_s \cdot (1 - \delta_b) \quad \text{če } M_b = M_n, \text{ potem } I_2 = I_{2n}$$

$$\eta = \frac{P_2}{P_1} = \frac{M_n \cdot \omega}{P_{1n}} = \frac{M_n \cdot 2\pi \cdot n}{\sqrt{3} \cdot 60 \cdot U_{1n} \cdot I_{1n} \cdot \cos \varphi_1}$$

moč izgub na dod. up. in rotor. navitju:

$$P_{2dod} = 3 \cdot I_{2n}^2 \cdot R_{2dod} \quad P_{2el} = 3 \cdot I_{2n}^2 \cdot R_{2r} \quad \text{omahna napetost: } U' = U_{1n} \cdot \sqrt{\frac{M_n}{M_{om}}}$$

KRATKOSTIČNA KLETKA:

$$P_{2eln} = \delta_n \cdot P_{vpn} = \delta_n \cdot \frac{(P_n + P_{tr,r})}{1 - \delta_n}$$

$$P_{cu1n} = 3 \cdot I_{1n}^2 \cdot R_1 \quad P_{1n} = \sqrt{3} \cdot U_{1n} \cdot I_{1n} \cdot \cos \varphi_{1n}$$

$$P_{fen} = P_{1n} - P_{cu1n} - P_{vpn} \quad \eta_n = \frac{P_n}{P_{1n}} \quad f_2 = \delta_n \cdot f_1$$

Ventilatorska obremenitev:

$$M_b' = M_{bn} \cdot \left(\frac{n'}{n_n}\right)^2 \quad I_2' = I_{2n} \cdot \frac{M_n'}{M_{bn}} = I_{2n} \cdot \left(\frac{n'}{n_n}\right)^2$$

$$\delta' = \frac{n_s - n'}{n_s} \quad \delta_n = \frac{n_s - n_n}{n_s} \quad R_{2dod} = \frac{E_{20}}{\sqrt{3}} \cdot \left(\frac{\delta'}{I_2'} - \frac{\delta_n}{I_{2n}}\right)$$

zaporedno (serijsko vzbujanje):

zasičen: $\leftarrow R_m = R_i + R_v \rightarrow$ nezasičen:

$$I' = I_n \cdot \left(\frac{n'}{n_n}\right)^2 \quad \frac{n'}{n_n} = \frac{U' - I' \cdot R_m}{U_n - I_n \cdot R_m} \quad I' = I_n \cdot \left(\frac{n'}{n_n}\right) \quad \left(\frac{n'}{n_n}\right)^2 = \frac{U' - I' \cdot R_m}{U_n - I_n \cdot R_m}$$

tuje vzbujanje: motor

$$I_i' = I_{in} \cdot \frac{n'}{n_n} = I_{in} \cdot \frac{M_{in}'}{M_{in}} \quad I_{in} = \frac{P_n}{U_n \cdot \eta_n}$$

$$\frac{n'}{n} = \frac{U_n - I_i' \cdot (R_i + R_a) - \Delta U_{\Sigma\epsilon}}{U_n - I_{in} \cdot R_i - \Delta U_{\Sigma\epsilon}} \quad R_i = \frac{U_{in}}{I_{in}}$$

$$n = n_n \cdot \frac{U_n - I_i' \cdot R_i - \Delta U_{\Sigma\epsilon}}{U_n - I_{in} \cdot R_i - \Delta U_{\Sigma\epsilon}} \quad \text{to računamo če } M_{in} \neq M_{in}' \text{ torej } I_i' \neq I_{in}$$

če deluje kot generator:

$$I_{ig} = \frac{P_{el}}{U_n} \quad \eta_g = \eta_n \cdot \frac{U_n + I_{ig} \cdot R_i + \Delta U_{\Sigma\epsilon}}{U_n - I_{in} \cdot R_i - \Delta U_{\Sigma\epsilon}}$$