~~EE564~~ Generator

250kW, 8pole.

$X = \frac{l'}{D}$ (aspect ratio) $= \frac{\pi}{2p}\sqrt[3]{p} = 0.623$

$\Rightarrow l' = 0.623D$

Cmech = ? 250 grafiğe göre

250 kW/m³

$S_i = C\,D^2 l' n_{syn}$ ← ~~80 Hz~~ 50/4

↑

say pf = 0.8

Pout = 250kW

250k ↓

$S_i = 312.5\ kVA = C_{mech} \times D^3 \times 50/4 \times 0.623$

D = ~~292 mm~~ ~~[illegible] mm~~ 543mm

~~$l' = 0.623D = 182\ mm$~~ ~~290 mm~~ 339mm

n_{syn}? $w = 2\pi (n_{syn} \cdot p)$ f   p = pole pair

$p \cdot n_{syn} = 50$ $n_{syn} = 50/4$
↑
4

air gap? $\delta = 0.18 + 0.006 \times P^{0.4}$ mm

⇒ $\delta = 1.05$ mm

Stator slot number selection

- slot pitch, τ_u'dan gidecük   p = 8

$q_s = 1 \Rightarrow 24 \Rightarrow \tau_u = \frac{\pi \cdot 543}{Q_s} = 71$ mm

(*) $q_s = 2 \Rightarrow Q_s = 48 \Rightarrow \tau_u = 35.5$ mm

$q_s = 3 \Rightarrow Q_s = 72 \Rightarrow \tau_u = 23.67$ mm

$q_s = 4 \Rightarrow Q_s = 96 \Rightarrow \tau_u = 17.75$ mm

$q_s = 5 \Rightarrow Q_s = 110 \Rightarrow \tau_u = 14.2$ mm

$7 \leq \tau_u \leq 45$ mm

large powerda τ_u small daha iyi. $q \geq 2$

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Teeth genişliği

Say $b_d \cong \tau_u / 2 = 18$ mm

B_{avg} → tur sayısı?

$l' = 339$ mm bulmuştuk

$\hat{B}_d = \frac{l' \cdot \tau_u \cdot B_\delta}{l \, k_{FE} \cdot b_d}$ (τ_u → 35.5, b_d → 18 mm)   ⇒ B_δ = ?

$\hat{B}_d$: tooth peak flux density say 1.6T

k_{FE}: stacking factor = 0.96

$l' = l + 2\delta$ ⇒ $l = 336.9$ mm actual kalınlık.
(δ = 1.05)

⇒ $\hat{B}_\delta = 0.77T$ ⇒ $B_{avg} = 0.49T$

Q_r selection. p 373.

$Q_r \approx 1.2 Q_s^{0.48} = 60$

~~Dış radial uzunluğu~~ ?

Tur sayısı N_{ph} ?

$E = 4.44\, N_{ph}\, f\, \Phi_{pp} \cdot k_w$

$k_w = k_p \cdot k_d$

$k_p \rightarrow 1$ (integral slot)

$k_d = \frac{\sin(q\alpha/2)}{q \sin(\alpha/2)} = 0.998$

integral slot $\Rightarrow k_p = 1$

$\Phi_{pp} = B_{avg} \cdot A_{pole}$ ⇒? $A_{pole} = \frac{\pi\, 543m \times 339mm}{8}$

B_{avg} = 0.49T

$A_{pole} = 0.07229\, m^2$

$E = 4.44\, N_{ph}\, f\, \Phi_{pp}\, k_w$

E: %10 margin kay, 230×1.1=253; N_{ph}: ?; f: 50; Φ_{pp}: Φ; k_w: 0.998

⇒ N_{ph} = 32 tur

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Nslot ?

$Q_s = 48$ Q_s per phase = 16 slots.

W_p = 32 tur = 64 conductors ⇒ 64/16 = 4 conductors/slot.

Slot area

I = 362 A ; I = JA

J = 6 A/mm² (air cooled)

⇒ $A_{wire} = 60mm^2$, Paralel yapmak lazım.

~~AWG 30 kablo $A_{wire} = 0.0509\, mm^2$~~

Radox 155 kablo ; cross sect = 1.5mm²

⇒ 40 tanesi paralel

⇒ 4 cond/slot × 40 = 160 wire/slot

$A_{wire-overall} = \left(\frac{2.6}{2}\right)^2 \pi = 5.3mm^2$

say ff = 0.5

$A_{slot} = \frac{1}{ff} \times 5.3mm^2 \times 160 = 1700mm^2$

⇒ h_{slot} = 1700/bd = 94m