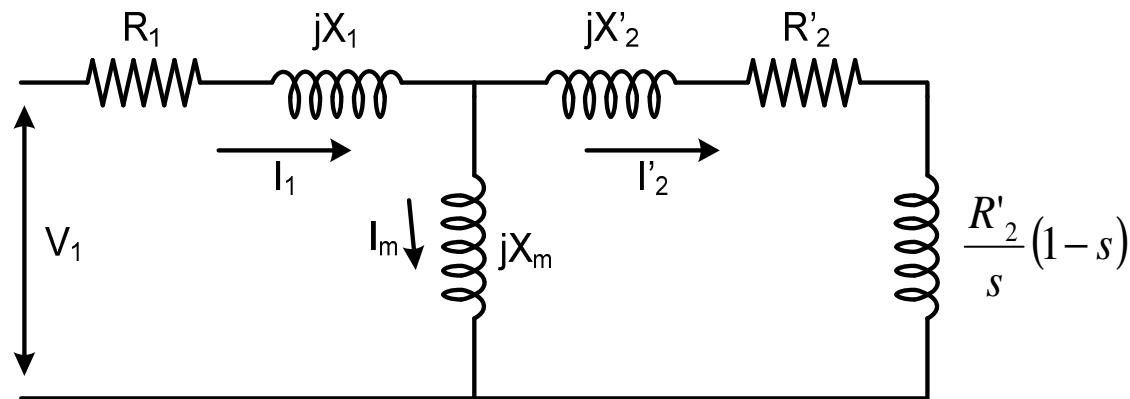


OPTIMASI PEMBEBAN PADA MOTOR LISTRIK



Pembebanan motor listrik

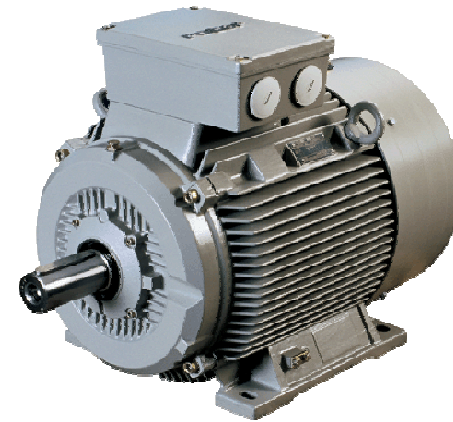
- Motor mempunyai efisiensi tertinggi saat berbeban 80% s/d 85% beban penuh



Rangkaian ekivalen motor induksi 3-fasa per fasa

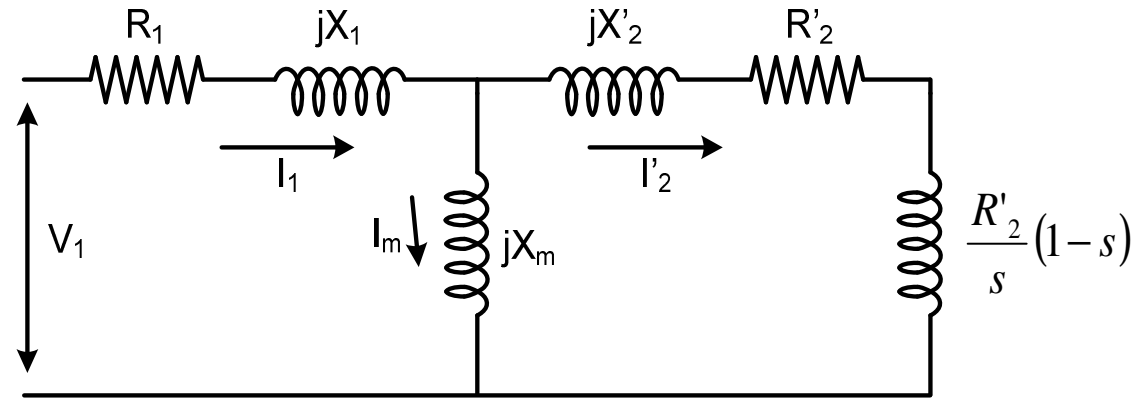


Torsi maksimum motor induksi





Torsi maksimum motor induksi



$$T_m = \frac{P_m}{\omega_r} = \frac{P_g}{\omega_s} = \frac{I'^2_2 \cdot R'_2 / s}{\omega_s}$$

$$\omega_r = \frac{2 \cdot \pi \cdot N r}{60}$$

$$T_g = \frac{1}{\omega_s} \left[\frac{s E_2^2 r_2}{r_2^2 + (s X_2)^2} \right] = \frac{s \alpha}{s^2 + \alpha^2} k$$

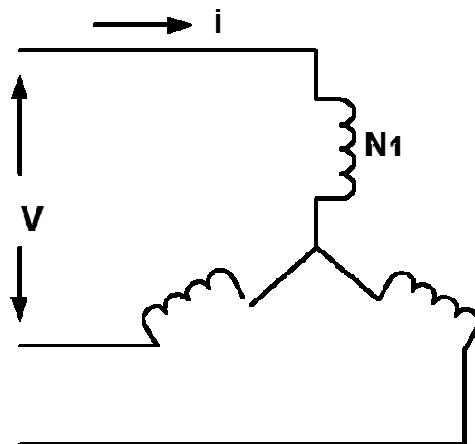
$$k = \frac{E_2^2}{\omega_2 x_2}$$

$$\alpha = \frac{R_2}{X_2} = \frac{R'_2}{X'_2}$$

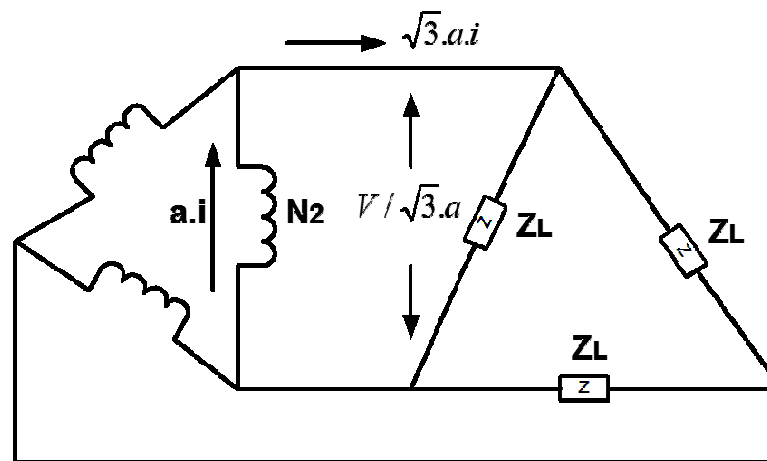
$$T_m = \frac{1}{\omega_s} P_m = P_g (1 - s) = \frac{s \alpha (1 - s)}{s^2 + \alpha^2} k$$

Optimalisasi Pembebanan Transformator

Rangkaian Hubungan 3-fasa



1) Hubungan bintang (Y)



2) Hubungan delta

Rangkaian Tiga Fasa

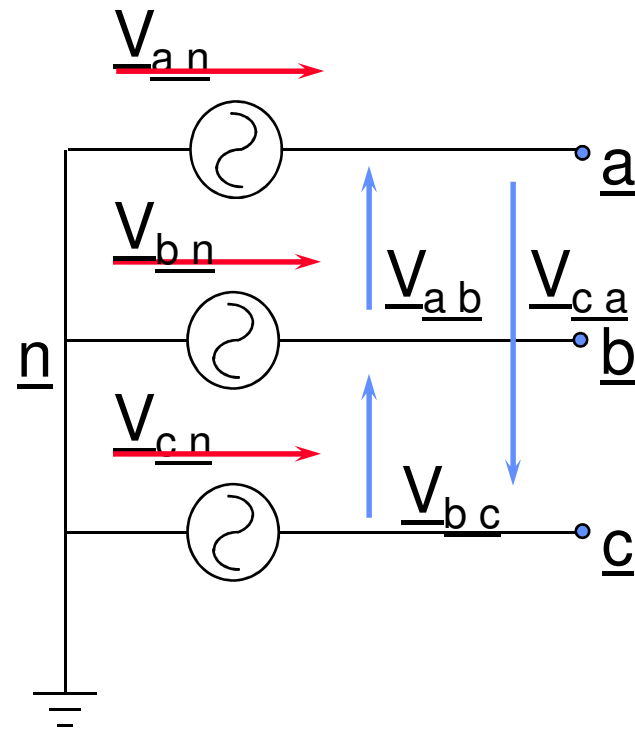
Sistem dihubungkan Wye

- Titik netral di-tanahkan
- Tegangan 3-fasa mempunyai magnitudo yg sama.
- Perbedaan fasa antar tegangan adalah 120° .

$$\underline{V}_{an} = |V| \angle 0^\circ = V$$

$$\underline{V}_{bn} = |V| \angle -120^\circ$$

$$\underline{V}_{cn} = |V| \angle -240^\circ$$



Rangkaian Tiga Fasa

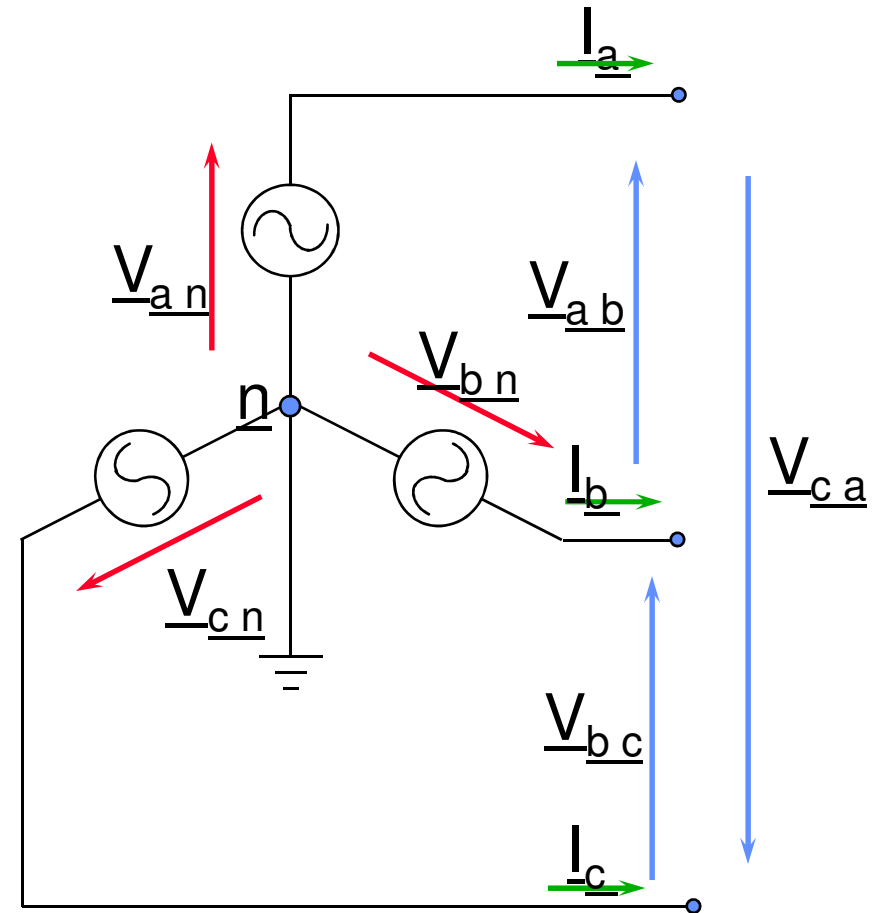
Sistem dihubungkan Wye

- Tegangan **LINE to LINE** berbeda dg tegangan **FASA**

$$\underline{V}_{ab} = \underline{V}_{an} - \underline{V}_{bn} = \sqrt{3} \underline{V}_{an} \angle +30^\circ$$

$$\underline{V}_{bc} = \underline{V}_{bn} - \underline{V}_{cn} = \sqrt{3} \underline{V}_{bn} \angle -90^\circ$$

$$\underline{V}_{ca} = \underline{V}_{cn} - \underline{V}_{an} = \sqrt{3} \underline{V}_{cn} \angle +150^\circ$$



Besar Tegangan **LINE to LINE** adalah $\sqrt{3}$ tegangan **FASA** (rms)

Rangkaian Tiga Fasa

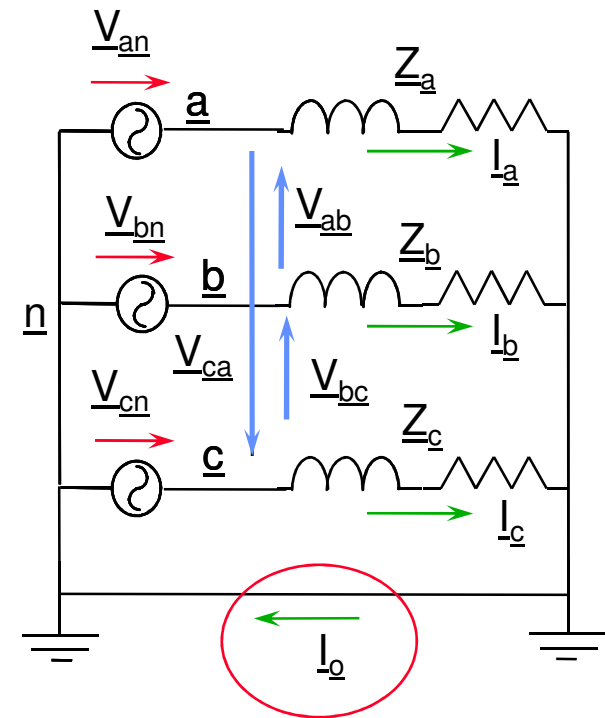
Sistem Wye Berbeban

- Impedansi beban adalah Z_a, Z_b, Z_c
- Setiap sumber tegangan mensuplai **ARUS LINE** ke beban.
- Arus dinyatakan sebagai:

$$I_a = \frac{V_{an}}{Z_a} \quad I_b = \frac{V_{bn}}{Z_b} \quad I_c = \frac{V_{cn}}{Z_c}$$

- Pada sistem mengalir **ARUS KE-TANAH** sebesar:

$$I_0 = I_a + I_b + I_c$$



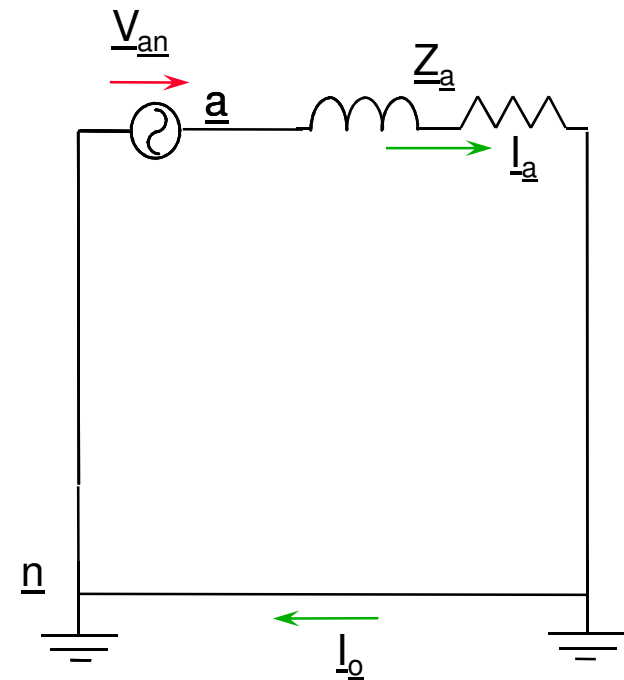
Rangkaian Tiga Fasa

Sistem Wye Berbeban

- Jika BEBAN SETIMBANG ($Z_a = Z_b = Z_c$) maka:

$$I_0 = I_a + I_b + I_c = 0$$

- Dalam hal ini rangkaian ekuivalen satu fasa dapat digunakan (fasa a, sebagai contoh)
- Fasa b dan c di-"hilangkan"



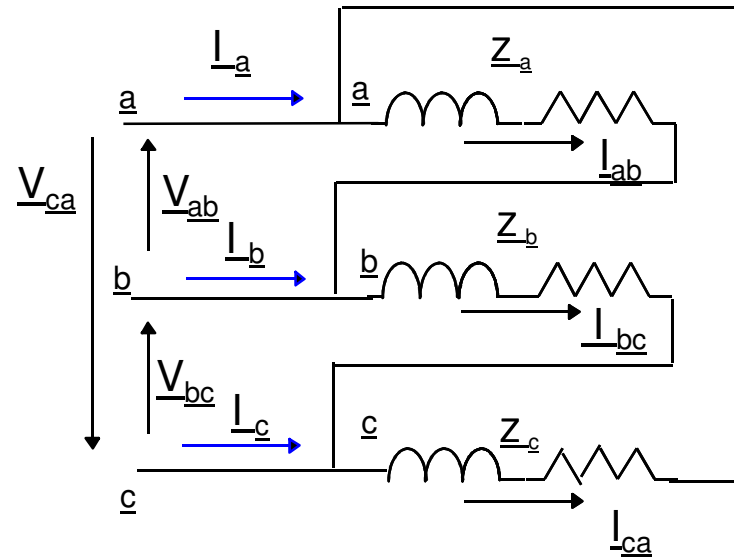
Rangkaian Tiga Fasa



Sistem Terhubung Delta

- Sistem hanya punya satu macam tegangan, yakni LINE to LINE (V_{LL})
- Sistem mempunyai dua arus :
 - Arus LINE
 - Arus FASA
- Arus FASA adalah:

$$I_{ab} = \frac{V_{ab}}{Z_{ab}} \quad I_{bc} = \frac{V_{bc}}{Z_{bc}} \quad I_{ca} = \frac{V_{ca}}{Z_{ca}}$$



Rangkaian Tiga Fasa

Sistem Terhubung Delta

Arus LINE :

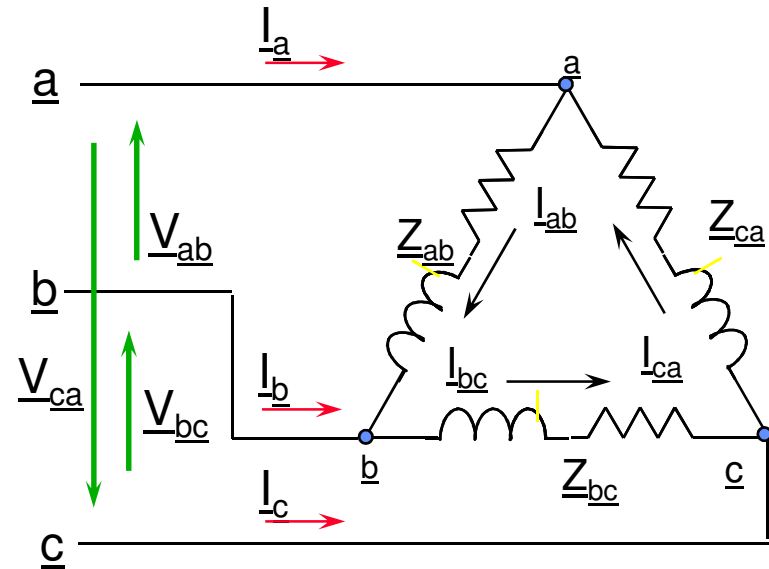
$$\underline{I}_a = \underline{I}_{ab} - \underline{I}_{ca}$$

$$\underline{I}_b = \underline{I}_{bc} - \underline{I}_{ab}$$

$$\underline{I}_c = \underline{I}_{ca} - \underline{I}_{bc}$$

- Pada beban setimbang:

$$I_a = \sqrt{3} I_{ab} \angle -30^\circ$$



A man with dark hair and a light beard, wearing a yellow long-sleeved shirt, is lying on his stomach with his head resting on his hand. He is looking directly at the camera with a slight smile. The background is a blurred indoor setting with large windows.

Semoga Sukses