

4.14 carga 1: $Z = 10 \angle 30^\circ$, Y, equilibrado

carga 2: $Z = 15 \Omega$, Y, equilibrado

Fuente: 3 fas, $V_L = 250$ V

$P = ?$

$$\hat{I}_{AB} = \frac{250}{18.61 \angle 18.07^\circ} = 13.43 \angle -18.07^\circ \rightarrow \hat{I}_A = \sqrt{3} \angle -30^\circ \times I_{AB} = 23.28 \angle -48.07^\circ$$

$$P_T = \sqrt{3} \times 250 \times 23.28 \times \cos(18.07^\circ) = 9583.35 \approx 9.6 \text{ kW}$$

$$Z = \frac{3A^2}{A} = 3A$$

Y $\rightarrow \Delta$

$$\begin{cases} \dot{Z}'_{AB} = \dot{Z}'_{BC} = \dot{Z}'_{CA} = 30 \angle 30^\circ \Omega \\ \dot{Z}''_{AB} = \dot{Z}''_{BC} = \dot{Z}''_{CA} = 45 \angle 0^\circ \Omega \end{cases} \begin{cases} \dot{Z}_{AB} = \dot{Z} = \dot{Z}'_{AB} // \dot{Z}''_{AB} \\ \dot{Z}_{BC} = \dot{Z} = \dot{Z}'_{BC} // \dot{Z}''_{BC} \\ \dot{Z}_{CA} = \dot{Z} = \dot{Z}'_{CA} // \dot{Z}''_{CA} \end{cases} \dot{Z}_{AB} = \dot{Z}_{BC} = \dot{Z}_{CA} = 18.61 \angle 18.07^\circ \Omega$$

4.16 Motor: Δ

Fuente: $V_L = 110$ V, ABC, $W_1 = 577$, $W_2 = 1154$ W

$Z_m = ?$

$$P_1 = V_L I_L \cos(\theta + 30^\circ) = 577 \text{ W}$$

$$P_2 = V_L I_L \cos(\theta - 30^\circ) = 1154 \text{ W}$$

$$\frac{P_1}{P_2} = \frac{577}{1154} = \frac{1}{2} = \frac{\cos(\theta + 30^\circ)}{\cos(\theta - 30^\circ)} \Rightarrow \frac{\sqrt{3} \cos(\theta)}{2} + \frac{\sin(\theta)}{2} = \frac{\sqrt{3} \cos(\theta)}{2} - \frac{\sin(\theta)}{2} \Rightarrow \tan \theta = \frac{\sqrt{3}}{3} \Rightarrow \theta = 30^\circ$$

$$P_1 = 577 = 110 \times I_L \cos(30^\circ + 30^\circ) \Rightarrow |\hat{I}_L| = 10.49 \text{ A}$$

$$V_L = V_F \quad I_L = \sqrt{3} I_F \angle -30^\circ \Rightarrow |\hat{Z}| = \frac{V_F}{I_F} = \frac{110 \sqrt{3}}{10.49} = 18.16 \Omega$$

$$\dot{Z}_m = 18.2 \angle 30^\circ \Omega$$

4.17 carga: $Z = 45 \angle 60^\circ$, Δ , $Z = \frac{A^2}{3A} = \frac{A}{3}$ $\Delta \rightarrow Y$

Fuente: $V_L = 240$ V, 3 fas

Lineal: $Z_L = 2 + j1$

$V_{AN} = ?$

$$\text{carga: } |V_{AN}| = I_L \times Z_A = 8.19 \times 15 = 122.85 \Rightarrow V_L = V_{AN} \sqrt{3} = 212.78 \text{ V}$$

$$Z_T = 15 \angle 60^\circ + \sqrt{3} \angle 26.57^\circ = 16.91 \angle 55.62^\circ \Omega$$

$$I_L = \frac{240}{\sqrt{3}} \times \frac{1}{Z_T} = 8.19 \angle -55.62^\circ \text{ A}$$

4.23 a) $I_L = ?$, $I_m = ?$, $P_T = ?$, (Y)

$$\hat{I}_A = \frac{V_{AN}}{Z} = \frac{127}{100} = 1.27 \angle 0^\circ \text{ A}$$

$$\hat{I}_B = 1.27 \angle -120^\circ \text{ A}, \hat{I}_C = 1.27 \angle 120^\circ \text{ A}$$

$$\hat{I}_m = \hat{I}_A + \hat{I}_B + \hat{I}_C = 0 \text{ A}$$

$$P = \sqrt{3} \times 127 \sqrt{3} \times 1.27 \times \cos(10^\circ) = 483.87 \text{ W}$$

$$I_L = 1.27 \text{ A}$$

$$I_m = 0 \text{ A}$$

$$P = 484 \text{ W}$$

b) $Z_A = \infty$, $Z_B = Z_C = 100 \Omega$, $Z_m = 0 \Omega$

$$Y_A = 0, Y_B = Y_C = 0.01, Y_m = \infty$$

$$V_{mN} = \frac{(Y_A V_{AN} + Y_B V_{BN} + Y_C V_{CN}) \times (-1)}{Y_A + Y_B + Y_C + Y_m} = 0 \text{ V}$$

$$\hat{I}_A = \frac{V_{AN} + V_{mN}}{Z_A} = 0 \text{ A}$$

$$\hat{I}_B = 1.27 \angle -120^\circ \text{ A}$$

$$\hat{I}_C = 1.27 \angle 120^\circ \text{ A}$$

$$I_m = \hat{I}_A + \hat{I}_B + \hat{I}_C = -1.27 \angle 0^\circ \text{ A}$$

$$P_A = 127 \times 0 = 0 \text{ W}$$

$$P_B = 127 \times 1.27 = 161.29 = P_C \text{ [W]}$$

$$P_T = 322.58 \text{ W} \rightarrow \frac{P_T}{P} = 66.67\%$$

$$I_m = 1.27 = I_L \text{ [A]}$$

c) $Z_A = \infty$, Z_m

$$Y_A = Y_m = 0, Y_B = Y_C = 0.01$$

$$V_{mN} = \frac{127}{2} = 63.5 \text{ V}$$

$$\hat{I}_A = \frac{V_{AN} + V_{mN}}{Z_A} = 0 \text{ A}$$

$$\hat{I}_B = 1.1 \angle -90^\circ \text{ A}$$

$$\hat{I}_C = 1.1 \angle 90^\circ \text{ A}$$

$$\hat{I}_m = 0 \text{ A}$$

$$P_A = 0 \text{ W}$$

$$P_B = \dot{I} \dot{Z} \dot{I}^* = \dot{I}^2 Z = 121 \text{ W}$$

$$P_C = 121 \text{ W}$$

$$P_T = 242 \rightarrow 50\%$$

$$I_L = 1.1 \text{ A}$$

$$I_m = 0 \text{ A}$$

d) $Z_A = 0$, $Z_B = 100 = Z_C$, $Z_m = \infty$

$$Y_A = \infty, Y_B = Y_C = 0.01, Y_m = 0$$

curto em m' com A

$$V_{mN} = V_{AN} = 127 \angle 0^\circ \text{ V}$$

$$V_{BN} = 220 \angle -150^\circ \text{ V}$$

$$V_{CN} = 220 \angle 150^\circ \text{ V}$$

$$\hat{I}_B = 2.2 \angle -150^\circ \text{ A}$$

$$\hat{I}_C = 2.2 \angle 150^\circ \text{ A}$$

$$I_m = 0 \text{ A}$$

$$P_A = 0 \text{ W}$$

$$P_B = 2.2 \times 220 = 484 \text{ W}$$

$$P_C = 484 \text{ W}$$

$$P_T = 968 \rightarrow 200\%$$

$$I_L = 2.2 \text{ A}$$

$$I_m = 0 \text{ A}$$