4.7 Carga: 15 KVA, FP = 0.5 atrasado.

$|S_2| = ?$ $\quad \% = ?$ $\quad S_3 = ?$

Carga.

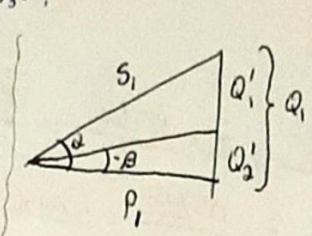
$S_1 = 15\text{KVA}$

$P_1 = 15\text{K} \times 0.5 = 7.5\text{ KW}$

$Q = 15\text{K} \times \frac{\sqrt{3}}{2} = 12.99\text{KVAr}$

$\alpha = +60° \rightarrow 0.5$ atrasado

$\beta = -30° \rightarrow 0.866$ adiantado



$Q_1 = Q_1' + Q_2'$

$Q_1' = P_1[\text{tg}\alpha - \text{tg}\beta]$

$Q_1' = 8660.25\text{ VAr}$

$\text{tg}\alpha = \frac{Q_1}{P_1}$ $\quad \text{tg}\beta = \frac{Q_2'}{P_1} \Rightarrow |Q_2'| = 7500 \times \text{tg}\,30$

$= +4330.13\text{ VAr}$

$S_2 = \frac{Q_2'}{\text{Sin}(-30)} = \frac{-4330.13}{-1/2} = 8.66\text{KVA}$

$Q_2 = Q_2' + Q_1 = 17.32\text{KVAr}$

$S = VI$

$\frac{S_1}{S_2} = \frac{VI_1}{VI_2}$

$I_2 = 57.73\%$ de I_1

Redução 42.3%

A redução máxima ocorrerá em um sistema puramente resistivo, logo

$S_3 = P_1 = 7.5\text{ KW} \Rightarrow Q_3 = Q_1$ $\quad Q_3 = +12.99\text{ KVAr}$

$\frac{S_3}{S_1} = \frac{7.5}{15} = 0.5$ de I_1

4.8 $I_L = ?$, $P_F = ?$, Diagrama $[V_L, V_F, I_{A'B'}]$ $\quad \hat{I}_A = \hat{I}_{AB} - \hat{I}_{CA}$

$V_L = 220$

$Y \rightarrow \Delta$

$Z_{ab} = \frac{2\times3 + 2\times1 + 3\times1}{1} = 11\,\Omega$

$Z_{bc} = \frac{11}{3}\,\Omega$

$Z_{ca} = \frac{11}{2}\,\Omega$

Equivalentes (//)

$\dot{Z}_{ab} = j2 // 11 // -j1 = 1.968\angle -79.7°\,\Omega$

$\dot{Z}_{bc} = \frac{11}{3} // j1 // -j3 = 1.39\angle 67.75°\,\Omega$

$\dot{Z}_{ca} = \frac{11}{2} // j3 // -j2 = 4.05\angle -42.51°\,\Omega$

$\hat{I}_{AB} = \frac{220\angle 0°}{1.97\angle -79.7°} = 111.8\angle 79.7°\text{ A}$

$\hat{I}_{BC} = \frac{220\angle -120°}{1.39\angle 67.75°} = 158.46\angle 172.25°\text{ A}$

$\hat{I}_{CA} = \frac{220\angle 120°}{4.05\angle -42.51°} = 54.36\angle 162.51°\text{ A}$

$\hat{I}_A = 118\angle 52.55°\text{ A}$

$\hat{I}_B = 197.96\angle -153.4°\text{ A}$

$\hat{I}_C = 105.38\angle -2.75°\text{ A}$

$\dot{S} = \dot{I}_{A'B'}^2 \cdot \dot{Z}_{AB} + \dot{I}_{B'C'}^2 \cdot \dot{Z}_{BC} + \dot{I}_{C'A'}^2 Z_{CA} = 26403.19\angle 0.04° \cong 26.4\angle 0°\,[\text{KVA}]$

Logo, $S = P = 26.4\,[\text{KW}]$

Carga 1

$\dot{V}_{AN} = 127\angle 0°\text{ V}$

$\dot{V}_{BN} = 127\angle -120°\text{ V}$

$\dot{V}_{CN} = 127\angle 120°\text{ V}$

$\hat{I}_A = \frac{V_{AN} + V_{nn'}}{Z_A} = 52.91\angle -10.89°\text{ A}$

$\hat{I}_B = 72.10\angle -103.3°\text{ A}$

$\hat{I}_C = 87.17\angle 113.41°\text{ A}$

$Y_C = 1$, $Y_B = \frac{1}{2}$, $Y_A = \frac{1}{3}$, $Y_n = 0$

$V_{nn'} = -\frac{Y_A V_{AN} + Y_B V_{BN} + Y_C V_{CN}}{Y_A + Y_B + Y_C + Y_n}$

$= 41.63\angle -46.10°\,[V]$

$\dot{V}_{AB} = 220\angle 30°\text{ V}$

$\dot{V}_{BC} = 220\angle -90°\text{ V}$

$\dot{V}_{CA} = 220\angle 150°\text{ V}$