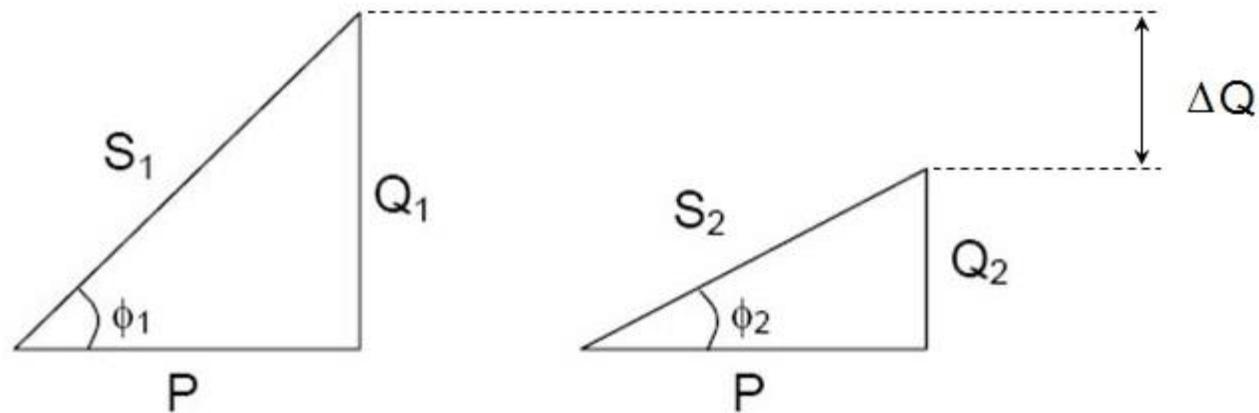


INSTALAÇÕES ELÉTRICAS

Correção do fator de potência



$$\Delta Q = P \cdot (\operatorname{tg}\varphi_1 - \operatorname{tg}\varphi_2)$$

$$\Delta Q = U \cdot I$$

$$Z = XC = \frac{1}{\omega C}$$

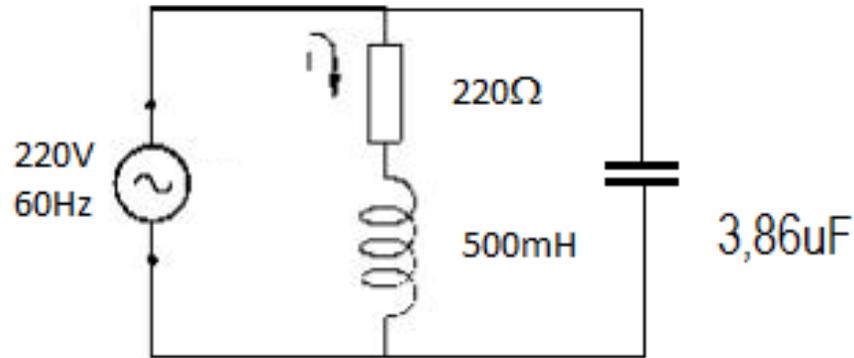
$$C = \frac{P}{\omega \cdot U^2} \cdot (\operatorname{tg}\varphi_1 - \operatorname{tg}\varphi_2)$$

$$\Delta Q = U \cdot \frac{U}{Z}$$

$$\Delta Q = U^2 \cdot \omega C = P \cdot (\operatorname{tg}\varphi_1 - \operatorname{tg}\varphi_2)$$

Exemplo:

1. No circuito abaixo, calcular o fator de potência. Corrigir o FP para 0,95, calculando o valor do capacitor e provando a correção.



$$jx_l = 377 \cdot 500m = j188,5\Omega$$

$$Z = 220 + j188,5\Omega = 289,71\angle 40,59^\circ \Omega$$

$$I_{ef} = \frac{220}{289,71} = 759,38mA$$

$$FP = \cos 40,59^\circ = 0,76$$

$$\arccos 0,95 = 18,20^\circ$$

$$tg 18,20^\circ = 0,33 = tg \alpha_2$$

$$tg 40,59^\circ = 0,86 = tg \alpha_1$$

$$C = \frac{220 \cdot 759,38m \cdot 0,76}{377 \cdot 220^2} \cdot (0,86 - 0,33) = 3,68 \mu F$$

$$-jx_c = -j \frac{1}{377 \cdot 3,68\mu} = -j720,81\Omega$$

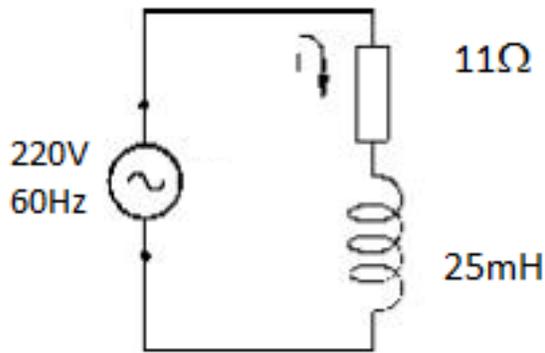
$$Z = \frac{220 + j188,5 + 0 - j720,81}{220 + j188,5 + 0 - j720,81} = \frac{289,71\angle 40,59^\circ \cdot 720,81\angle -90^\circ}{220 - j532,81} =$$

$$Z = \frac{208,83k\angle -49,41^\circ}{576,44\angle -67,56^\circ} = 362,27\angle 18,15^\circ$$

$$FP = \cos 18,15^\circ = 0,95$$

Exercício:

1. No circuito abaixo, calcular o fator de potência. Corrigir o FP para 0,96 calculando o valor do capacitor e provando a correção.



$$jx_l = 377 \cdot 25m = j9,42\Omega$$

$$Z = 11 + j9,42\Omega = 14,48 \angle 40,58^\circ$$

$$I_{ef} = \frac{220}{14,48} = 15,19A$$

$$FP = \cos 40,58^\circ = 0,76$$

$$\arccos 0,96 = 16,26^\circ$$

$$\operatorname{tg} 16,26^\circ = 0,29 = \operatorname{tg} \alpha_2$$

$$\operatorname{tg} 40,58^\circ = 0,86 = \operatorname{tg} \alpha_1$$

$$C = \frac{220 \cdot 15,19 \cdot 0,76}{377 \cdot 220^2} \cdot (0,86 - 0,29) = 79,34 \mu F$$

$$-jx_c = -j \frac{1}{377 \cdot 79,34 \mu} = -j33,43\Omega$$

$$Z = \frac{(11 + j9,42) \cdot (0 - j33,43)}{11 + j9,42 + 0 - j33,43} = \frac{14,48 \angle 40,58^\circ \cdot 33,43 \angle -90^\circ}{11 - j24,01} =$$

$$Z = \frac{484,07 \angle -49,42}{26,40 \angle -65,39^\circ} = 18,33 \angle 15,97^\circ$$

$$FP = \cos 15,97^\circ = 0,96 \text{ ou } 96\%$$