

Names _____

Objective: to understand how power factor (pf) is improved to a specified level and the effect that improved pf has on an electrical supply.

Pre-lab

For the circuit shown in figure 1, calculate the current drawn from the supply (I_L), real power (P_L), reactive power (Q_L), apparent power (S_L), and the pf at the load (pf_L). Enter the predicted values in the appropriate places in table 1.

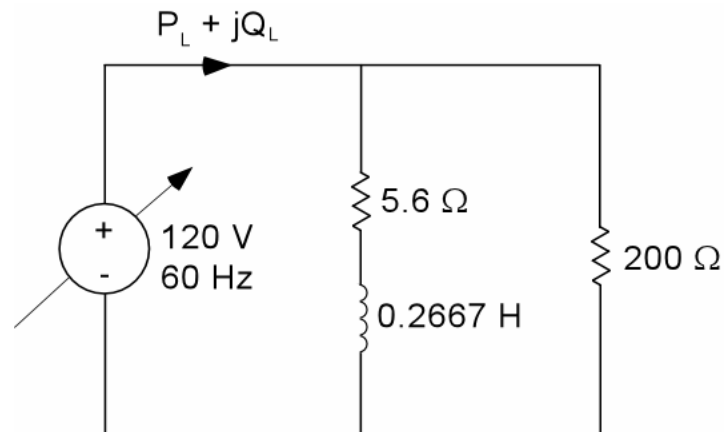


Figure 1

For the circuit shown in figure 2, calculate the size of capacitor (μF) needed to correct the pf to 0.9 lagging and enter it in figure 2, then calculate the current drawn from the source (I_R). Enter the predicted values in the appropriate places in table 2.

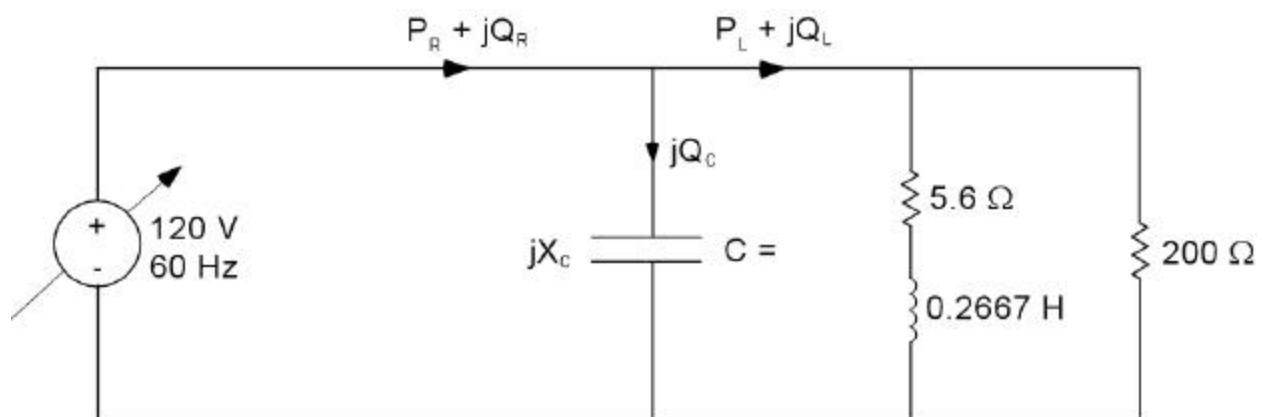


Figure 2

In-lab Measurements

The circuit shown in figure 3 shows the connections for using the Yokogawa meter for measuring power and associated quantities.

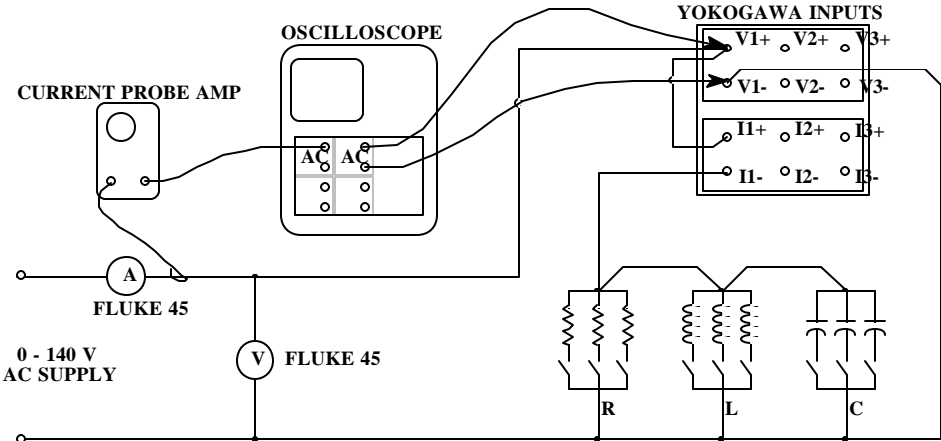


Figure 3

Establish the circuit in figure 1 by switching the 300 Ω and 600 Ω resistors in parallel and placing the 0.4 H and 0.8 H inductors in parallel. The 5.6 Ω resistor does not have to be connected as it accounts for the losses in the inductors.

Measure the current drawn from the supply (I_L), real power (P_L), reactive power (Q_L), apparent power (S_L), and the pf at the load (pf_L). Enter the measured values in the appropriate places in table 1, and complete the %diff column.

Connect the value of capacitance calculated in the pre-lab and once again measure the current drawn from the supply (I_R), real power (P_R), reactive power (Q_R), apparent power (S_R), and the pf at the supply (pf_R). Enter the measured values in the appropriate places in table 2, and complete the %diff column.

$I_L(A)$			$P_L(W)$			$Q_L(VAR)$			$S_L(VA)$			pf_L		
Calc	Meas	% diff	Calc	Meas	% diff	Calc	Meas	% diff	Calc	Meas	% diff	Calc	Meas	% diff

Table 1

$I_R(A)$			$P_R(W)$			$Q_R(VAR)$			$S_R(VA)$			pf_R		
Calc	Meas	% diff	Calc	Meas	% diff	Calc	Meas	% diff	Calc	Meas	% diff	Calc	Meas	% diff

Table 2

Observe the shape of the current I_R on the oscilloscope. Notice how this changes when the capacitors are switched on and off.

On the back of this page, explain why the shape of current with a capacitive component is so distorted.