Experiment No. 3
Power Measurements and Power Factor Correction
ECE 213

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1 Introduction

The dissipation of power in circuit elements is a major factor to be considered in power distribution and circuit design. When working with loads with complex impedance, additional current will be required to excite the circuit, which leads to increased heating and power loss in the current carrying wires.

2 Background

The equation for a capacitors impedance is $\frac{1}{i\omega C}$. The equation for an inductors impedance is $i\omega L$. A resistors impedance is its resistance. Therefore, the impedance of the motor model is $50 + 20\pi i$, with the line resistance, the impedance of the circuit is $60 + 20\pi i$. Using Ohms law, the current in the motor is therefore $.0159 - .01665i$ Amps, the voltage is $1.841 + .1665i$ Volts.
To select a power correction capacitor, find a value of capacitance such that the impedance of the system has a zero imaginary component. The value of capacitance to achieve that is roughly 1 micro-Farad. The current across this new circuit is 33.33 milliamps. The voltage across the motor is 1.66 Volts.

3 Procedure

a. Simulate circuit without capacitor

b. Simulate circuit with capacitor

c. Build and test circuit without capacitor

d. Build and test circuit with capacitor

4 Equipment

- Oscilloscope
- Function generator
- Current measurement transformer

5 Conclusions

The purpose of this lab was achieved. A circuit was built with and without power factor correction, then simulated and measured in both states. The measurements generally complied with the calculated values.