Abu Dhabi University

Electric Circuits II

Lab Report 3

Power factor improvement by using capacitor bank in parallel with inductive load

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Section 1

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Abstract

In this lab we were educated in how to improve power factor using capacitors in parallel with inductive load.

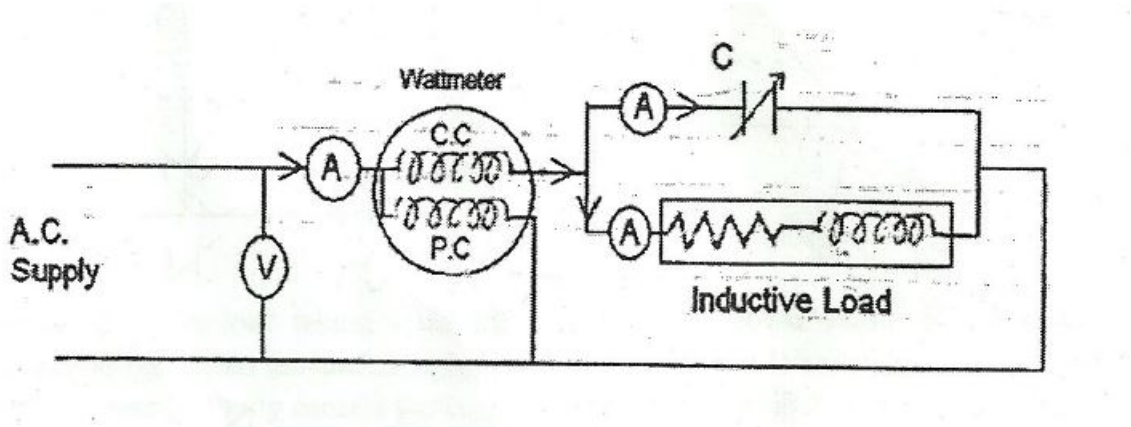
1 Introduction

The power factor of an AC electrical power system is defined as the ratio of the real power flowing to the load to the apparent power in the circuit.

More the inductive the circuit nature is, more energy losses and less power factor. Less the inductive the circuit nature is, less energy losses and less power factor. Less the Capacitive the circuit nature is, more energy losses and less power factor. More the Capacitive the circuit nature is, less energy losses and less power factor.

2 Experiment Set-up

The experiment was setup according to the circuit diagram below. The capacitive load was made variable by connecting wires to the capacitor board in the power lab. By changing the combination of different capacitors and turning them on, we were able to vary the capacitance. And Inductive load was kept constant by connected the wires to inductive board on power lab module.

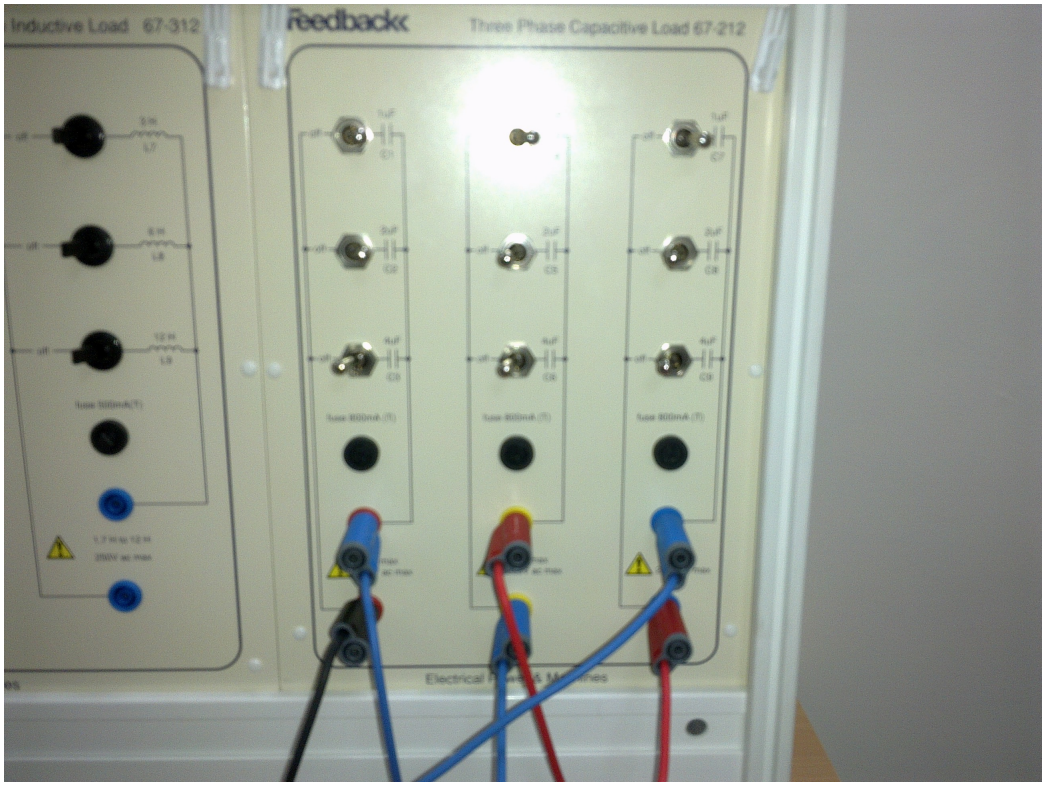


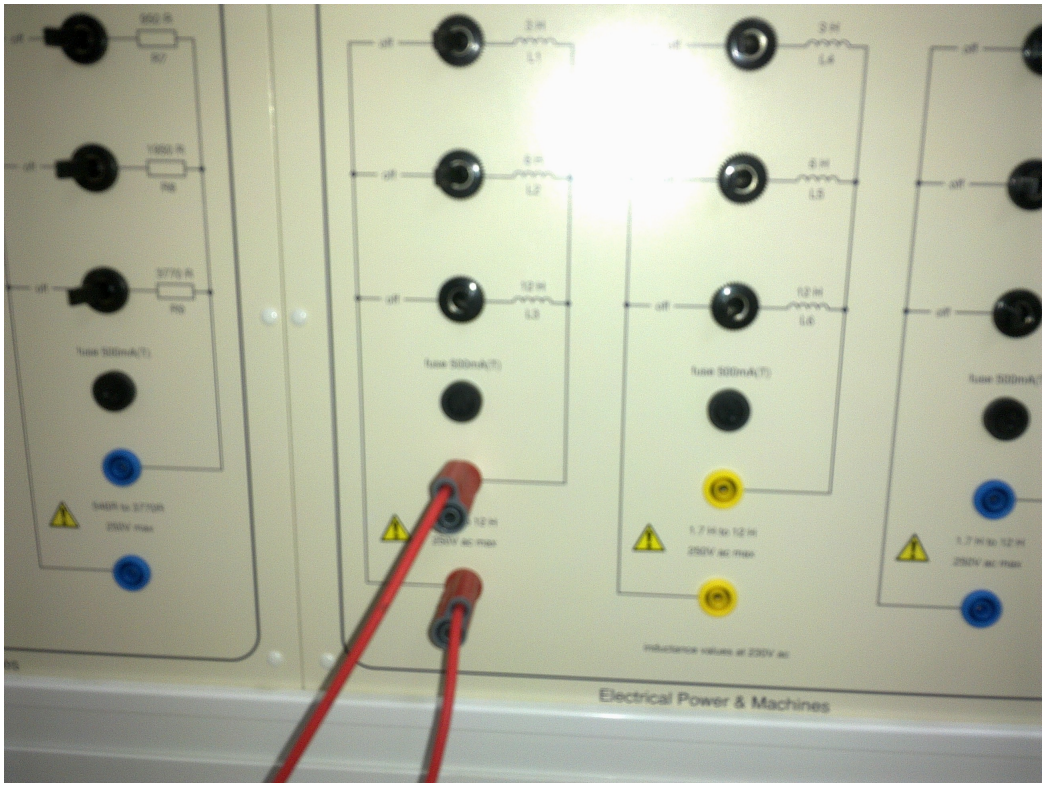
3 List of Equipment used

- Inductive Load
- Capacitor Bank
- Connecting Wires
- Phase Analyser
- Data Acquisition Module/ Power Factor meter.
- Resistive Load
- Watt meter

4 Procedure

- Connect the circuit as shown in the manual.
- Turn ON or OFF the particular capacitors to vary the capacitance according to the table given in the lab manual.
- Check and record the values onto the lab manual.

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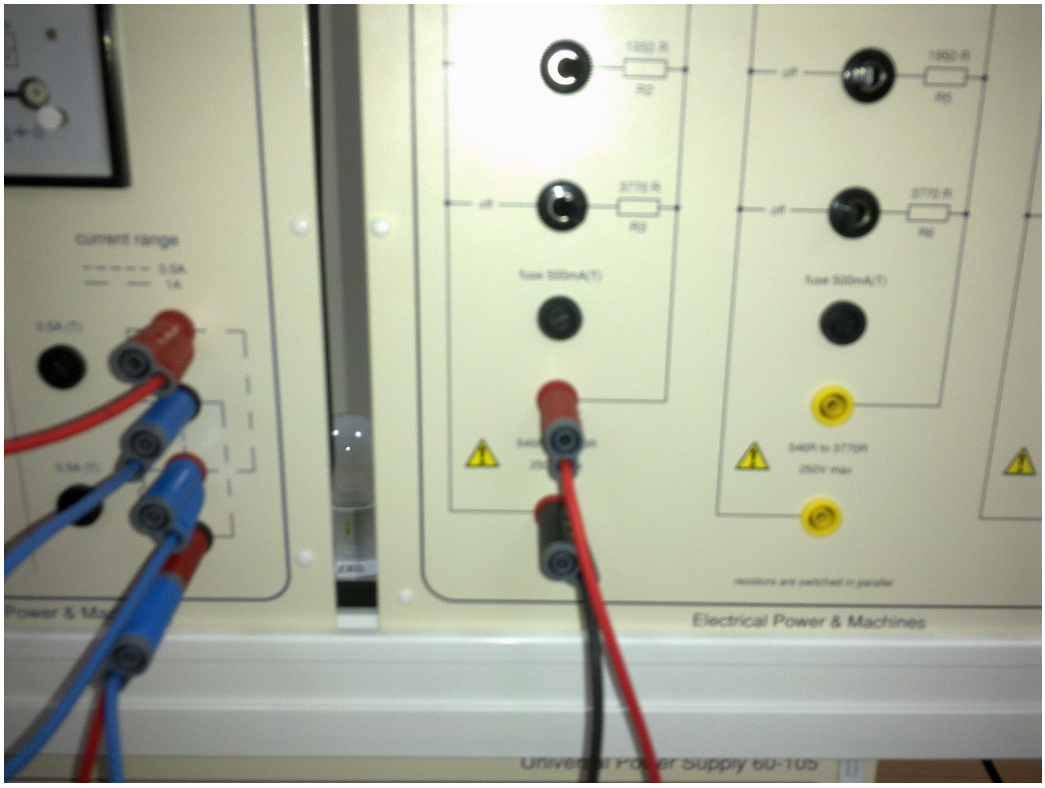
current range
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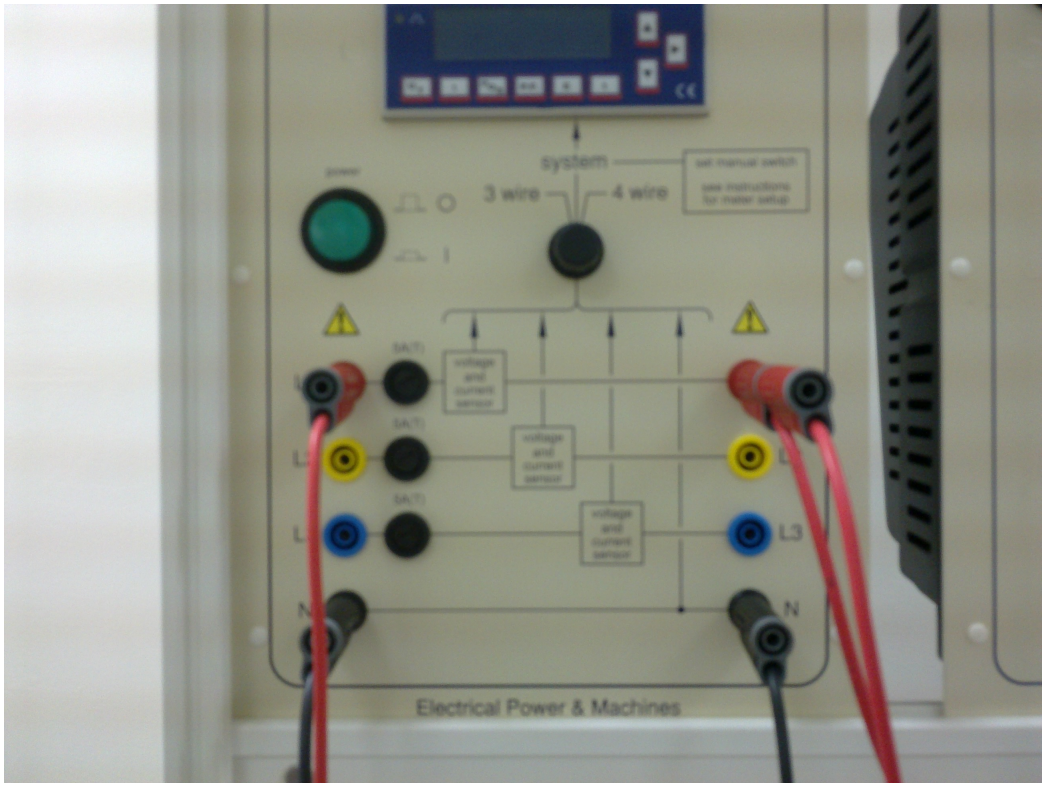
system
3 wire
4 wire
L3
N
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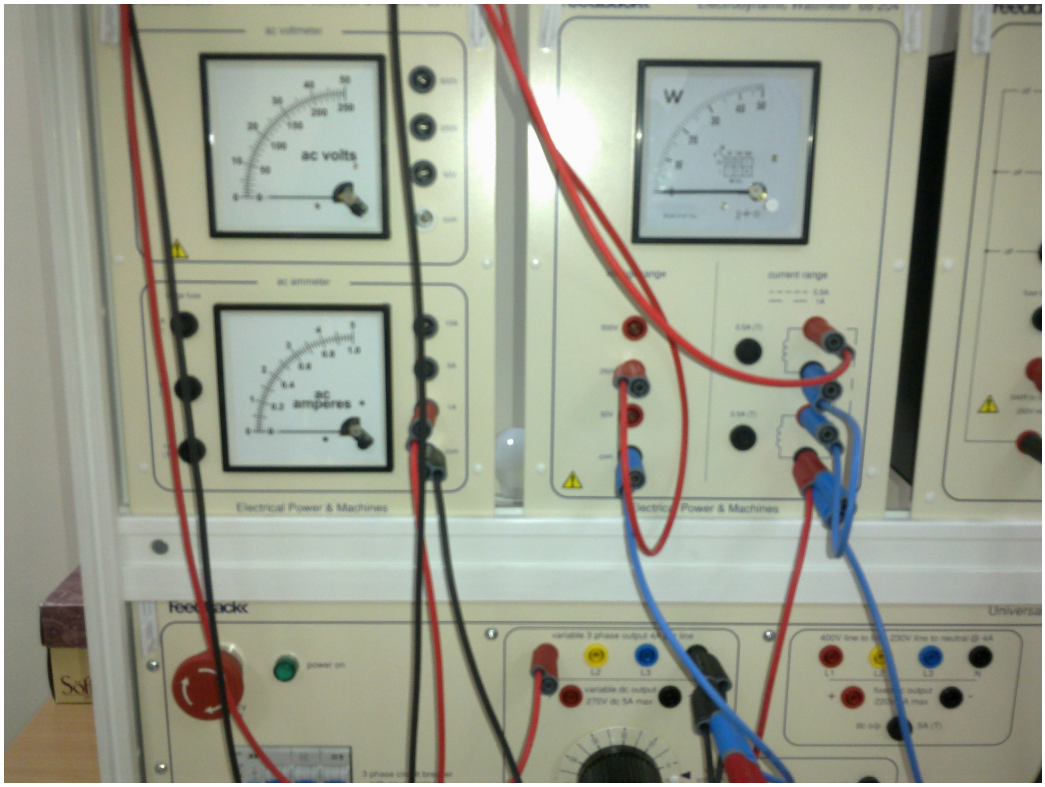
ac volts
ac amperes
W
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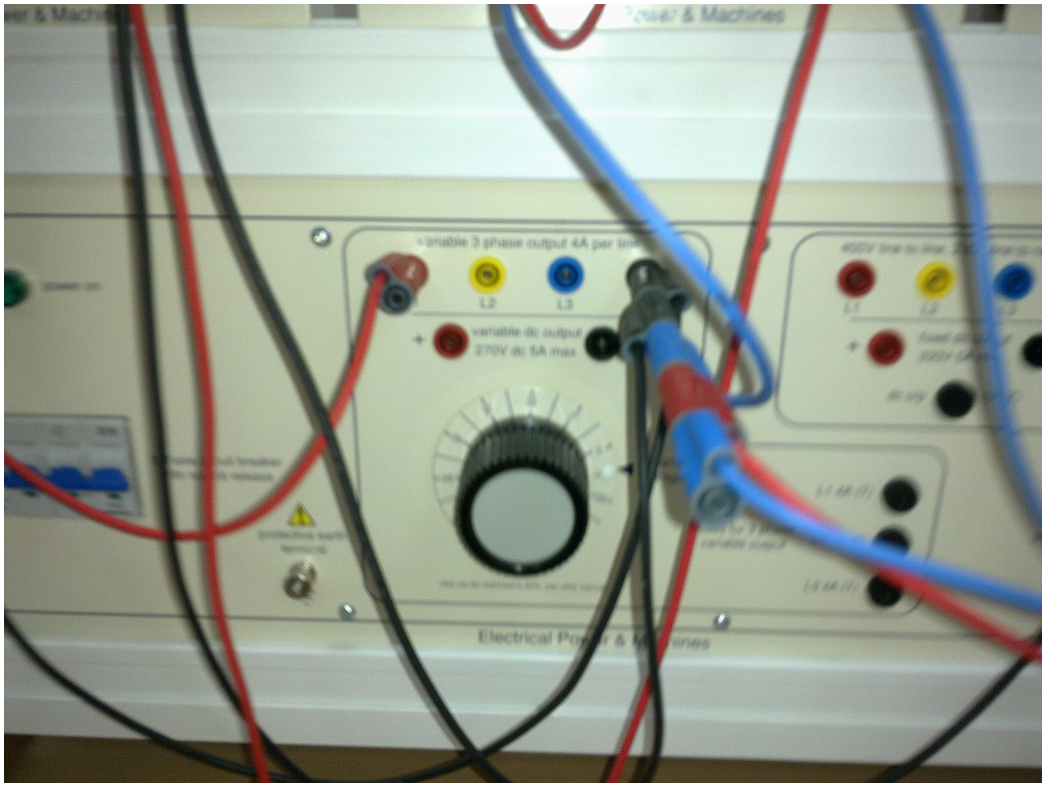
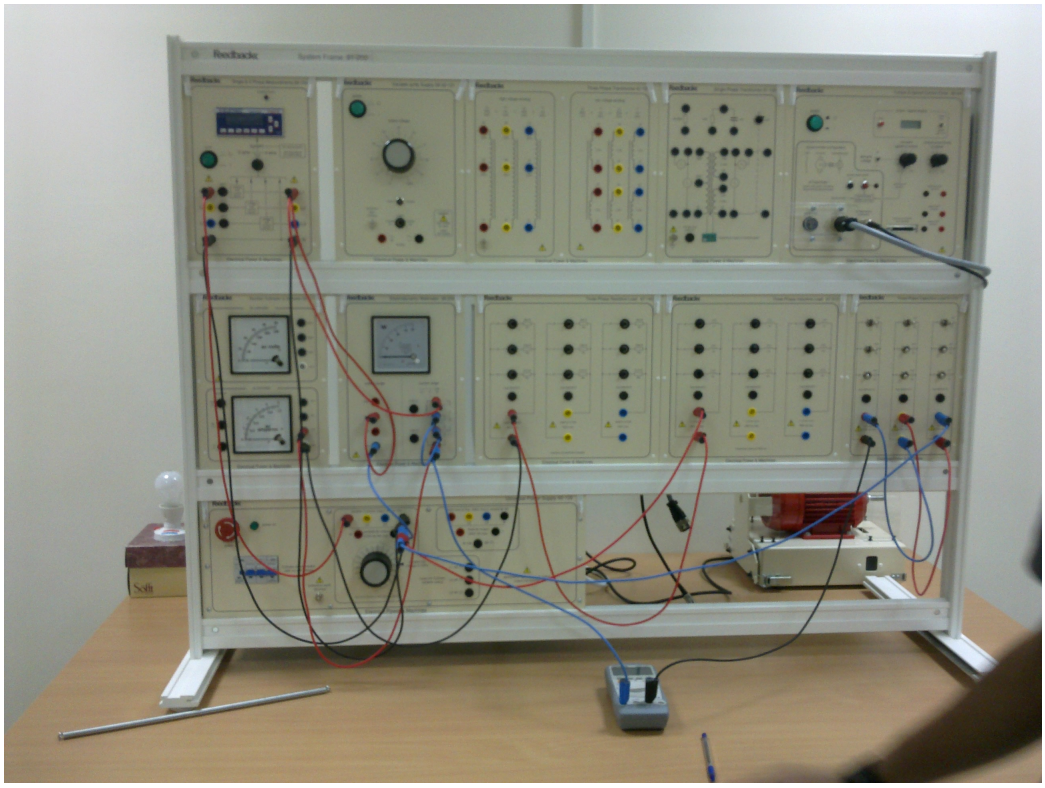

L2
L3



5 Results and Discussions

At the end of the exercise we got the following results:-

Capacitors	Current Source	Voltage Source	Current Capacitor	Current Inductor	P	Q	S	P.F. Measured	P.F. Calculated	Percentage Error
No Capacitor	0.05A	252	0.002A	0.05A	6.5	13.7	15.6	0.41	0.41	0%
C1/C4/C7	0.04A	252	0.027A	0.05A	6.7	7.4	9.9	0.64	0.68	6%
C1/C2/C4/C7	0.03A	252	0.034A	0.05A	6.5	5.7	8.6	0.77	0.76	1%
C1/C2/C4/C5/C7	0.02A	252	0.050A	0.05A	6.6	2.4	7.6	0.87	0.87	0%
C1/C2/C4/C5/C7/C8	0.04A	252	0.078A	0.05A	6.5	-5.4	8.9	-0.67	-0.7	4%

As we can clearly see that as we increased the capacitance in the circuit, the capacitive load increases and cancels out the inductive load which in turn increases the Power Factor. This terminology is used in Power transmissions where long cables are used to transmit electricity from one place to another.

Real life example of this experiment Transmission cables have conducting material in them (usually copper). This conductive material causes a changing magnetic field around it due to AC in it. As a result of changing magnetic field, inductive resistance is introduced. And this inductive resistance causes a lot of power to be dissipated.

To counteract this power loss, the inductive properties are reduced by introducing capacitors in parallel in the transmission lines. These capacitors reduce the inductive resistance to appropriate level and thus improving the power factor.

6 Conclusion

- Capacitors are reactive power supplying components. When capacitors are added in parallel to the inductive load, the inductive effect will be cancelled out.
- Beyond a certain value of capacitance, the reactive power becomes in the negative region and the apparent power does not decrease any more but starts increasing again which causes the power factor to decrease to lower values than one.
- low power factor increase energy losses in transmission. however high power factor decreases losses in AC transmission.