POWER FACTOR CORRECTOR COMPENSATION USING MICROCONTROLLER

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ABSTRACT: *Power factor compensation circuit is used to improve power factor whenever power factor falls below a certain predetermined level. As we know electrical energy is been used in various day to day activities.There is vast increase in use of inductive loads in small as well as large industry applications. The loads which are inductive causes the decline in power factor and is one of the main reasons for power factor reduction in industrial applications. Therefore there is an urge to increase the degraded power factor. Power factor compensation provides solution to this problem. Due to low power factor there is unnecessary strain on supplier and transmission lines. Correcting power factor of required system, efficiency can be improved.*

Key Words:

I. INTRODUCTION

Currently the power is very precious and there is utmost need to use it wisely, safely and without any unneeded losses the industries might be small or large scale it requires the inductive load and then arises the problem of low power factor corrector and if the loads are of very large size this can cause a serious issue of loss of revenue and power to both industry and the supplier. The use of capacitor in those areas can avoid this issue as we know the capacitor has leading power factor and can compensate the overall losses if used correctly for achieving this we need to connect the capacitor in parallel across inductive load but its value need to be calculated and the value slightly greater than obtained must be used so as to avoid congestion. This can be achieved using controller ,but for this application we have decide to use the PIC as it is more reliable and having work efficiency that is desired for this application as our main focus is on Timers for this purpose.

II. LITERATURE SURVEY

1. The paper "Power factor correction unit using 89C52" published in 2014 contains the use of 89C52 to measure and correct the power factor. The advantage of this research was that it shows the best method to measure power factor of systems but the drawback was the increase in response time of microcontroller.
2. The paper "Power factor correction unit using active series of filters" contains the use of active filters for the purpose of power factor correction which is unique method for power factor correction. The advantage of this method was the use of active filters to improve power factor but the drawback was the use of active filters as the filters don't have sharp cut off frequencies and also there was no use of controller the circuit was not automatic.
3. The paper "Automatic Power Factor Improvement of Induction Motor using Arduino" contains practical realization and correction of power factor across the induction motor. The advantage of this paper was it solved the problem of low power factor practically at induction motor using it as inductive load. The drawback was that the use of Arduino UNO board increased the cost of the circuitry as it should be further connected to the controller.
4. The paper "Automatic power factor correction unit" published in 2016 contains the use of precision rectifier an EXOR gate and use of Arduino board along with inductive and capacitive loads for the purpose of power factor improvement and correction. The advantage of this paper is that it measures the value of voltage and current

and solves the problem of power factor and displays the corrected value but its drawback is the measurement of voltage and current value by using rectified sine wave and also use of precision rectifier which increases the size and complexity of circuit.

III. BLOCK DIAGRAM

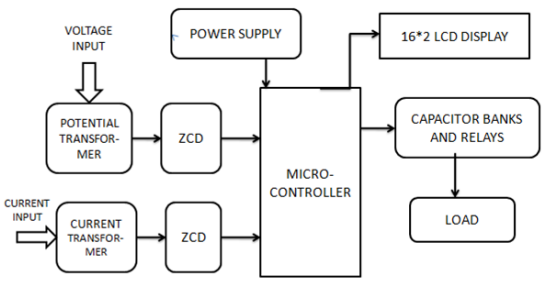

Figure1-Automatic Power Factor Correction

1.Potential Transformer:

Potential transformer is used to take the voltage input and apply it to pic controller for further use. And the care should be taken that voltage above 5 volts should not be applied to pic controller.

2.Current Transformer:

The current transformer is used to apply the input of current signal to compare with voltage signal for the purpose of power factor correction and calculation.

3.Zero Crossing Detector:

Zero crossing detector is basically the OP-AMP in which the reference voltage of any one input is considered as ground it is configured so as the controller can detect the voltage and current variation as high and low input as we know that the functionality of ZCD is comparison of inputs and depending on that output is either high or low. LM 358 is a ZCD IC.

5.PIC Microcontroller:

Fig shows the pin diagram of Pic 18F4550

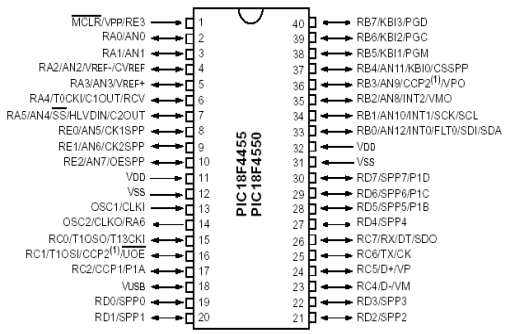

Figure 2-PIC microcontroller

The controller we prefer here is PIC controller as it is best suited for the operation of timers and counters and has external interrupts which are very useful and is having decent internal memory which is suited for application.

8. Liquid Crystal Display:

PIC controller does the calculation part and is used to display the desired result. LCD have easier programming, is cheap and easily display characters, numbers and so on.

There are 16 pins in LCD and their explanations are given in the following table.

Figure 3-LCD display

PIN ASSIGNMENT		
Pin no.	Symbol	Function
1	Vss	Power supply (GND)
2	Vdd	Power supply (+5V)
3	Vo	Contrast Adjust
4	RS	Register select signal
5	R/W	Data read /write
6	E	Enable signal
7	DB0	Data bus line
8	DB1	Data bus line
9	DB2	Data bus line
10	DB3	Data bus line
11	DB4	Data bus line
12	DB5	Data bus line
13	DB6	Data bus line
14	DB7	Data bus line
15	A	Power supply for LED B/L (+)
16	K	Power supply for LED B/L (−)

Figure 4-Pin description

9. Capacitor Banks

Figure shows capacitor used at load side:

Figure 5-Capacitor load

Capacitor has a key role in regulating power factor to a desired level , as from basics the capacitor has a leading power factor and is used to

compensate the lagging power which is caused due to inductive load used in domestic and industrial use.

10.Relays

Relays are used for the adding capacitors as per the demand of inductive load to compensate the power factor to a desired role using controller with synchronization.

IV.CONCLUSION

Thus by using automatic power factor corrector concept the problem of low power factor can be eliminated, and can be very useful for industries using inductive load .As the power factor is directly related with power consumption, it should be as high as possible and ideally 1 to reduce the power consumption and to avoid the penalty from Maharashtra State Of Electric Board which is caused when the Industries uses large power then the rated due to low power factor. Hence by using Capacitor load in parallel with inductive load power factor can be increased. And also power factor correction techniques can be used in the industries, power systems and also houses to make them stable and due to that the system becomes stable and efficiency of the system increases. .

V.REFERENCES

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