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Reactive Power Compensation and Power Factor Correction by using Static VAR Compensator (SVC)

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Abstract: ***In this paper, a reactive power compensation system using static VAR compensator is presented. To confine on system stability and reliability, the reactive power compensation is the fundamental way forflexible AC transmission systems (FACTS). The variations of reactive power have an effect on thegenerating units, lines, circuit breakers, transformers, relays, and isolators. It can also cause effective voltage sags and increase losses. In the proposed system, the lead time between voltage pulse and curren pulse is measured and fed to the interrupt pins of the microcontroller where the program takes over to bring the shunt capacitors to the circuit to get the reactive power compensated. Back-to-back SCRs interfaced through optical isolation from the microcontroller are used in parallel for controlling the capacitor.***
Keywords: VAR compensator, SVC, power factor, Reactive Power Compensator etc...

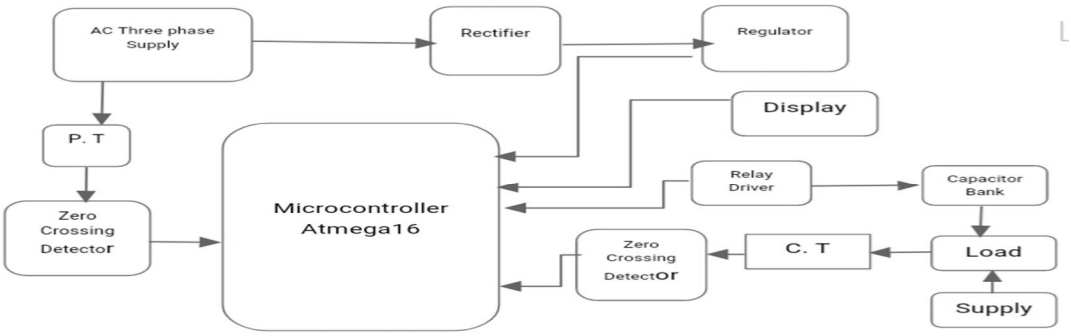
I. INTRODUCTION

Due to rapidly growing population, the utilization of the power and electrical appliances is increasing Also, there is shortage of power generation as till now millions of houses are still in the dark. A major part of generated electricity is consumed by the industries and the large-scale factories generally having the inductive load in it. Due to it high penalty charges are applied to them also this causes the high voltage drop in transmission lines, transformers, alternators, etc. Resulting is the larger line current drown by the electrical equipment. The overall product of it is Low Voltage Regulation. In A.C. circuit the power factor is defined as the ratio of the real (active) power to the apparent power. Active power is the power consumed by the resistive loads and apparent power is the combination of true power and reactive power without any phase angle. Power factor correction (PFC) aims to improve power factor, and therefore power quality.it reduces the load on the electrical distribution system, increases energy efficiency and reduces electricity costs it also decreases the likely hood of instability and failure of equipment.

II. OBJECTIVE

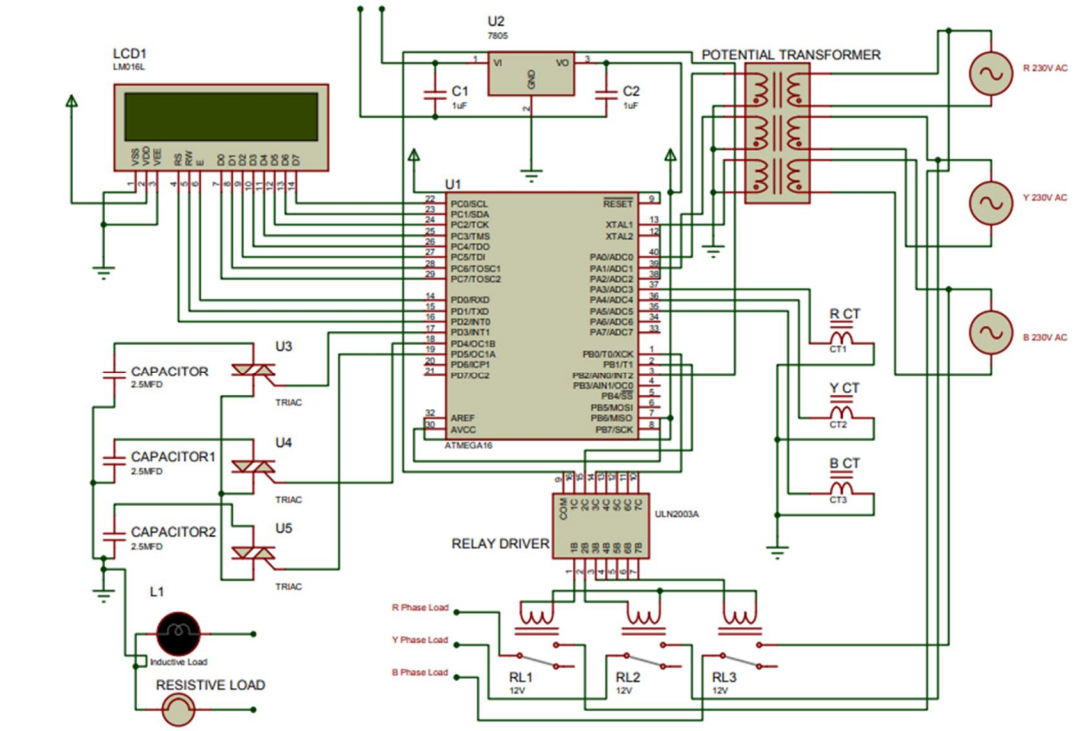
A. The main objective of our paper is to improve power factor.
B. Voltage and Current Level Detection in the System.
C. Increase loading capacity of power system.
D. Analyze the input as well as output power in the System.
E. To control the amount of reactive power by regulating the voltage.

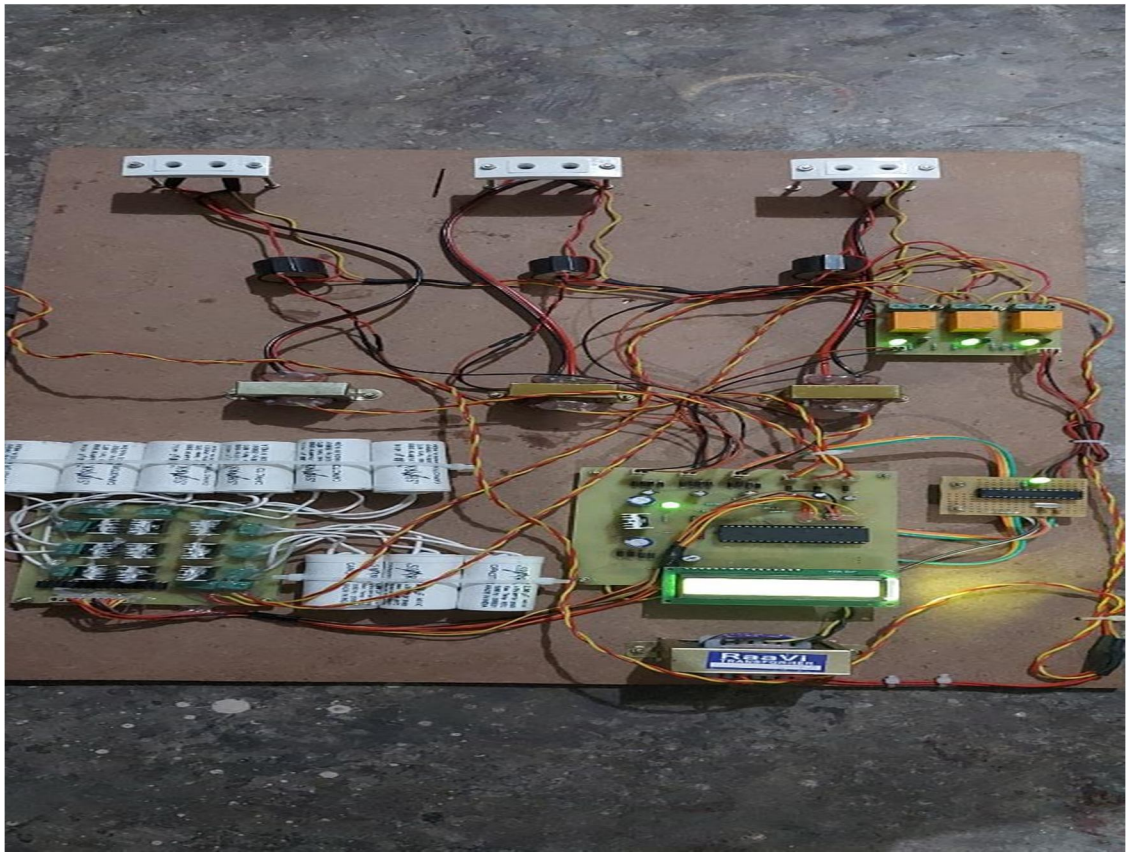
III. BLOCK DIAGRAM



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IV. CIRCUIT DIAGRAM AND EXPERIMENTAL SETUP





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V. METHODOLOGY

For the use of Microcontroller, the power is rectified and regulated at the 5V. The input as well as output is detected by using the zero-crossing detector and it gives signal to the microcontroller. Zero crossing detector is a voltage comparator that compares the output voltage with reference to the input voltage. If Inductive load is connected in the system, then the zero-crossing detector will give signal to the microcontroller. Microcontroller will give the signal to the relay drivers or the thyristor Switches through the opt coupler. These switches are directly connecting the load to the capacitor bank. Capacitor bank will compensate the reactive power in the output that will result in the power factor correction in the system. Capacitor bank is consisting of the number of capacitors that are connected to the load in parallel. The LCD Display will display the power factor of the output side. SVC is an impedance comparing device which comes in the family of FACTS, that is used to compensate the reactive power and correct the power factor in the system.

VI. RESULT

There are numerous benefits to be gained through power factor correction. These benefits range from reduced demand charges on your power system to increased. Load carrying capabilities in your existing circuits and overall reduced power system loses. There are also huge environmental benefits associated with power factor correction, which means the company is reducing power losses also voltage regulation is good And hence this project compensates the reactive power & help to correct the power factor.

VII. CONCLUSION

Power factor correction equipment designed based on microcontroller and capacitor banks was used for measurement and monitoring of modeled electrical load and the power factor correction device designed was able to improve the power factor from 0.94 to 0.98 under the test load conditions. With the proper amount of reactive power compensation, the system capacity is released as there is a reduction in current drawn.

VIII. ADVANTAGES

A. It is an automatic system that improves the power quality automatically.
B. Voltage regulation improvement.
C. More reliable as losses are less in this system as compared to the switched capacitor banks or synchronous condensers.
D. Ensures long life of power system.
E. Reduces power system losses in the system as the reactive power is compensated.

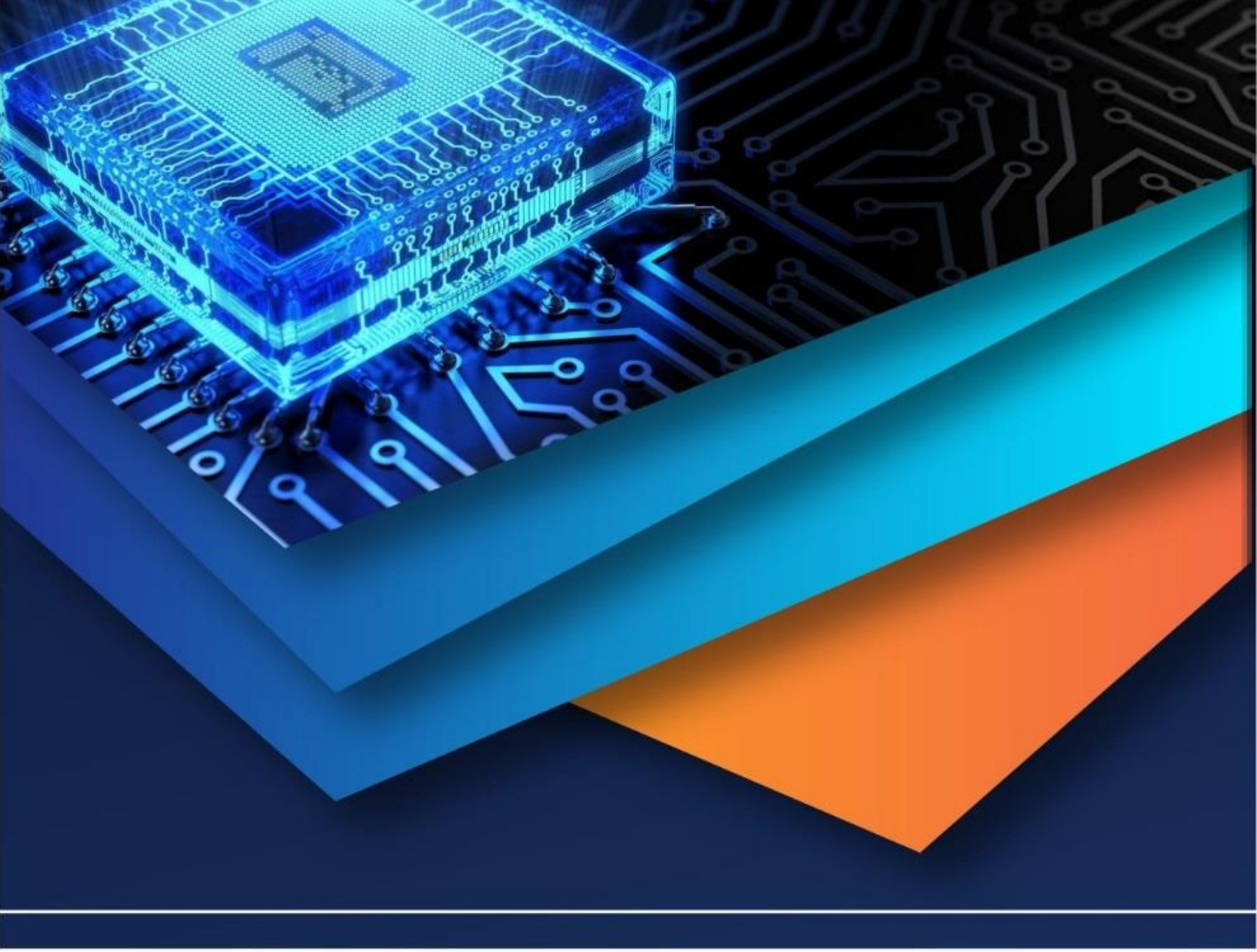
IX. FUTURE SCOPE

It can be concluded that power factor correction techniques can be applied to the industries, power systems and also, households to make them stable and due to that the system becomes stable and efficiency of the system as well as the apparatus increases. The use of microcontroller reduces the costs. The automotive power factor correction using capacitive load banks is very efficient as it reduces the cost by decreasing the power drawn from the supply as it operates automatically. Manpower is not required and this automated power factor correction using capacitive load banks can be used for industries purpose in future.

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