

Automatic power factor correction using microcontroller 8051

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Abstract— In today's world, good energy and power conservation are required. The use of energy is increasing on daily basis most of which is used in industrial and agricultural sector. Conservation of energy is crucial as most of the natural resources of power are decreasing at a significant rate. Power factor correction is essential for industries and others high inductive load. A nice power factor unit will bring power factor near to unity and hence provide economical operation. A good power factor has a lot of advantages like good power transferring capabilities, low losses and much more.

Keywords— Power factor, active power, reactive power, power consumption, power losses, efficiency, microcontroller, capacitor banks.

I. INTRODUCTION

The useful power availability is very important in present scenario for an efficient system. But in the modern world of industrialization inductive loads are highly used for the working purposes[2]. These inductive loads causes the losses in the efficiency of a system, by demanding the reactive power and reduces the useful or active power. This reduction in useful power causes burden on the system, so a conductor having larger cross section is used for the same power transmission as compared to high power factor[4]. Therefore, an Automatic Power factor Correction device is used for improving efficient transmission of active power. If the consumer, connect an inductive load, then the power factor lags, when the power factor goes below 0.97(lag) then the electric supply company charge penalty to the consumer. So it is essential to maintain the Power factor below within a limit. Automatic Power factor correction device reads the power factor from line voltage and line current, calculating the compensation requirement switch on different capacitor banks and by determining the delay in the arrival of the current signal with respect to voltage signal from the function generator with high accuracy by using an internal timer. This time values are then calibrated as phase angle and corresponding power factor. Then the values are displayed in the 2X16 LCD modules. Then the motherboard calculates the compensation requirement and accordingly switches on different capacitor banks[1]. This is developed by using 8051 microcontroller. The Automatic power factor correction device uses the microcontroller which has higher accuracy and has much higher efficiency[2][3]. With the help of AFC (Automatic power factor correction devices we can compensate the reactive power requirements with higher accuracy, helps in improving the loading efficiency.

II. LITERATURE REVIEW

It is known that Power Factor (Fig. I) is the ratio of real power and apparent power, it is measure of how effectively the current is being converted into useful work output. It is an important parameter to decide the efficiency of an electric circuit.

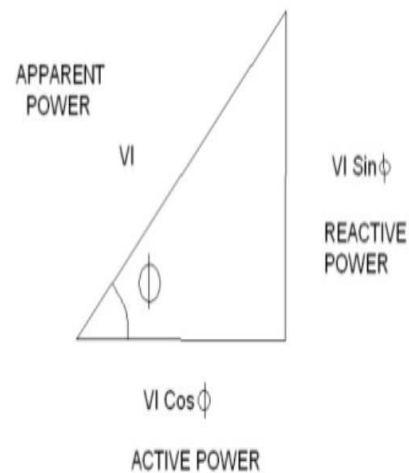


Fig. I

The main disadvantages of poor power factor are:

1. Poor efficiency
2. Higher conductor size
3. Larger KVA rating of equipment
4. Larger voltage drop

Due to above mentioned reasons it is not economic to run the system on low power factor. With the help of automatic power factor correction device which is developed based on microcontroller 8051 by using capacitive banks which is applied to the circuit which improves the power factor it also includes the induction motor by reducing the inductive component of current and thereby reduces the loses in the supply[3]. By using high power factor we would have to employ small cross section of the conductor for the same transmission of power which makes the system cost efficient. The KVA rating requirements of the equipment would be low for the same power[3][4].

III. OUTCOMES

This project produce outcome as power factor value which is then in turn displayed on LCD screen also it improves the existing power factor using capacitor banks connected in accordance with the required connection also it reduces the current that is being drawn by the highly inductive load using 8051 microcontroller which uses algorithms to start the capacitor banks in order to neutralize the excessive reactive power and hence improves power factor near to unity[4][5]. Through this project, power factor can be smoothly corrected. Since it is automatic therefore it does not require a human touch. It takes less space and also quick in response[4][5].

IV. CONCLUSION

This method is used to compensate power losses because of low power factor of average household and small industries. By selecting suitable capacitor banks for the circuits, we can increase the value of power factor up to unity and thus reducing the power losses[5][6].

V. ACKNOWLEDGEMENT

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