

Automatic Power Factor Correction System

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Abstract

In present technological revolution power is very precious. So we need to improve the power factor with suitable method. Whenever thinking about any programmable device then the embedded technology comes into front.

Automatic power factor correction system read the angle between line voltage and line current and calculating the power factor. Then this calculated value display in 2x16 LCD module. When Power factor is not good then for improvement power factor used different capacitor bank. This is developed by using 8051 microcontroller. Automatic power factor techniques can be applied to the industries, power system and the households to make them stable and efficiency of the system as well as the apparatus increases. The use of microcontroller reduces the cost.

***Keywords:** Power, Microcontroller, Inductive Load, Capacitor load, Current Transformer.*

INTRODUCTION

Automatic Power factor Correction Device is very useful device For improving efficient transmission of active power .If consumer connect inductive load, then the power factor is lags. When the power factor

goes below 0.97 then the electric supply company charges to the customers. So it is essential to maintain the power factor Below within Limit.

Automatic power factor correction device read the power factor from line voltage and line current calculating the compensation requirement switch on different capacitor bank. Power factor is the ration between the real power and the apparent power drawn an electrical load where the KW is the actual load power and the KVA is the apparent load power. A load with a power factor of 1.0 result in the most efficient loading of the supply .when power factor is less than1.0 then higher losses in the supply system. A poor power factor means line current lagging to the voltage.

Poor power factor is generally causes due to an inductive load such as an induction motor, power transformer, light ballasts. A poor power factor due to an inductive load can be improved by using the capacitor load.

II. LITERATURE SURVEY

The traditional approach to power factor correction in industrial application involves installation of capacitor bank. But with the widespread use of non-linear load, such as variable speed drives(VSD), PF improvement is difficult &capacitor absorb harmonic Current cause overheating of capacitor & it's damage.

This article analyzes Phase shifting technique for harmonic mitigation .industrial case study is presented to demonstrate the applicability of the proposed technique for harmonic reduction and power factor correction at the same time[4].

This paper focuses on those phenomena “other side of power factor correction” that paper used concept of damage and distribution to a given power system .the scope of the paper included an outline on some available mathematical tools to analyze on industrial power system [3]

In this paper single phase 1kw o/p full bridge rectifier has been designed &tested result presented .further the result both the scheme are compared and advantages of active power is recorded and demonstrate in this work[2]

III. SYSTEM ARCHITECTURE

The shown below diagram each block are various purpose for automatic power factor correction system. The most important component is microcontroller 8051 based on microcontroller featuring a high level of integration and low power consumption.

256x8 bit internal RAM.32bit programmable I/O Line. Two 16-bit Timer/counter. 5 interrupt Sources.

In that system we have to use two transformer to generate voltage & current signal & phase comparator is used to compare phase between current & voltage signal. When two signals are in phase then PF is good is equal to 1. But practically nearly equal to 0.8. another block is relay to

switching capacitor Bank when PF is low and finally display corrected Power factor on LCD.

A. Microcontroller (8051)

8051 is the name of a big family microcontroller. This is the main part of the project. This takes input from a comparator as an external interrupt and calculates PF depending upon the program. When PF is low then it gives a command to the relay to switch the capacitor bank.

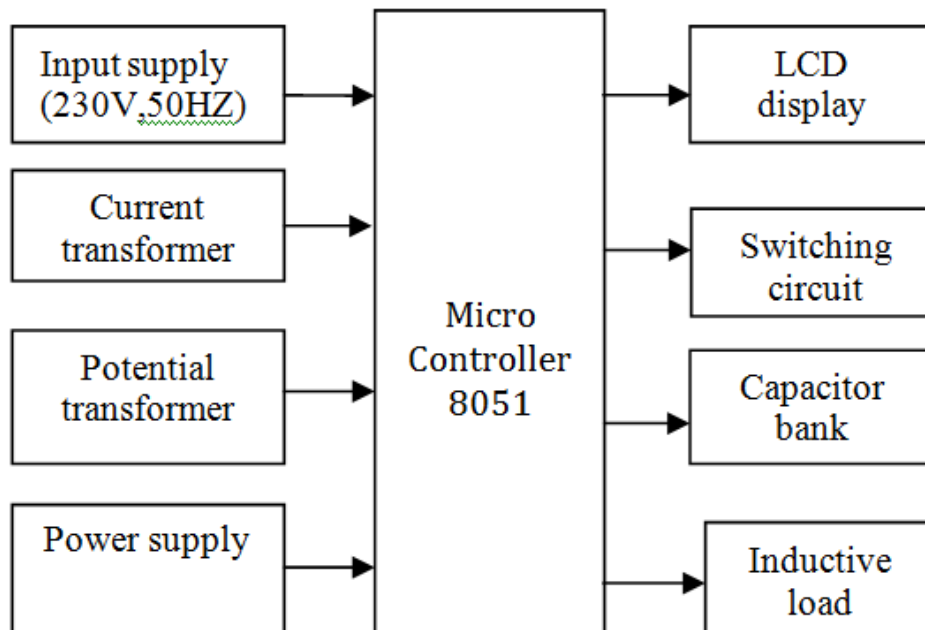


Fig 1 Block Diagram of proposed system

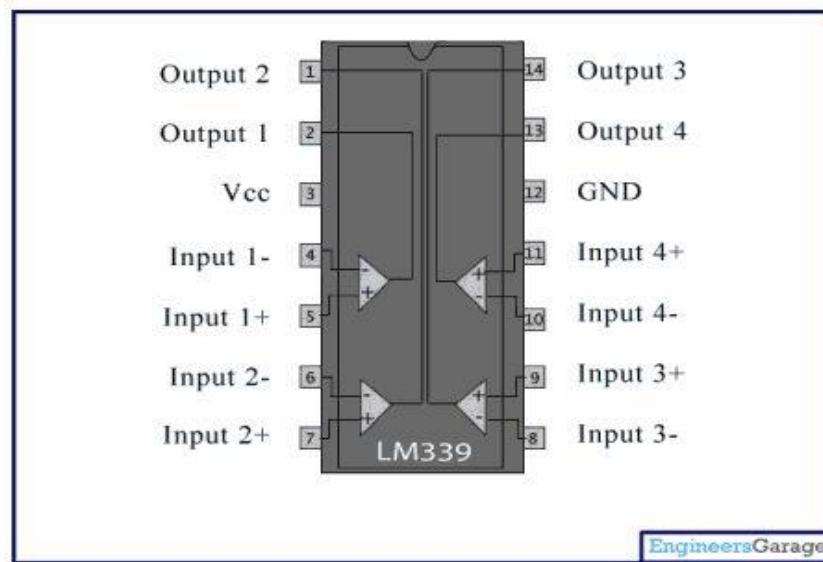


Fig 2 Phase comparator LM339

B. Phase comparator (LM 339)

Phase detector is nothing but zero cross detector. LM339 is a voltage comparator 14 pin IC having 4 comparators. This comparator features high gain wide Bandwidth. It detects phase between current & voltage. It detects phase of line voltage & line current.

C. Current Transformer (CT 225)

Current transformer is nothing but a device which gives output proportional to phase current. Most important specification to selecting CT is it should be highly sensitive. CT225 is used in that system

current transformer works on the principle of induction.



Fig 3 Current Transformer

D. Switching element (Relay)

In that system used electromagnetic switch is Relay is SPDT. The electromagnetic relay normally has 2 contact points named as

normally open (NO)& normally closed(NC).When relay is normally open then relay is energized. When relay is normally closed then relays off.

E. LCD display (2x16)

This is most important output device LCD Display is used to display power factor .It is display in which display 16 character at time in 2 rows.2*16LCD has 14 pin LCD. In that 8 data lines & 3 control lines.

IV. FLOWCHART OF SYSTEM

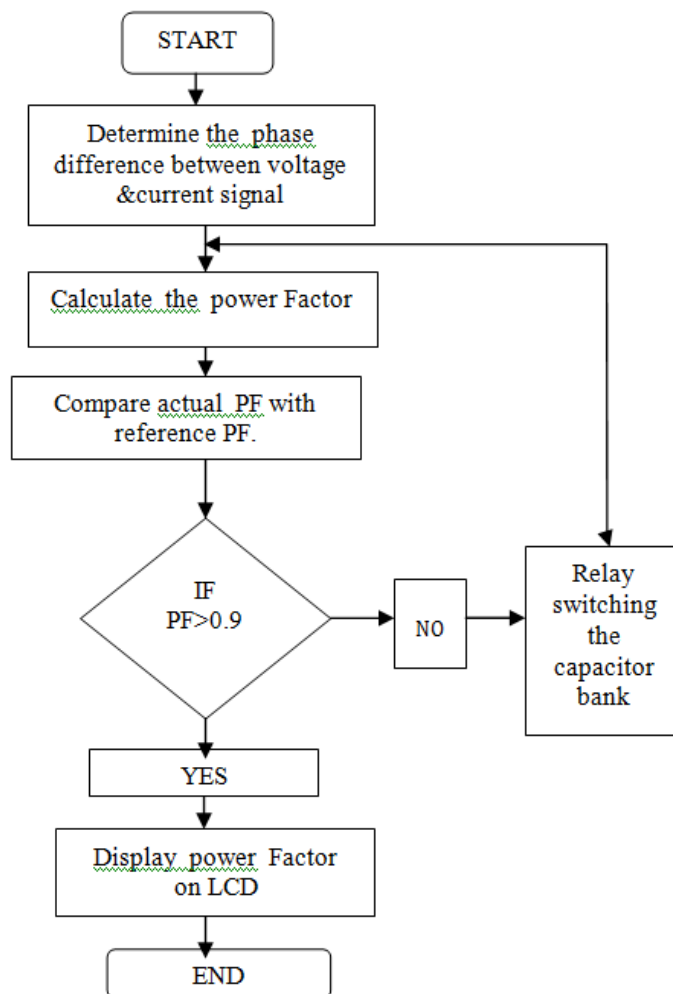


Fig 4 Flowchart of proposed system

F. Power Supply

This block provides operating voltage to different blocks. We have used IC7805 & IC 7812, Which is fixed positive voltage regulator gives +5v & +12v at its output. This power Supply section provide +5volt for microcontroller & other components like LCD etc. and +12volt for RELAY.

SUMMARY

By observing all aspects of the power factor it is clear that power factor is the most significant part for the Company as well as for the costumer. By using capacitors into the circuit the Power Factor is improved and the value becomes nearer to 1 thus minimising line losses and improving the efficiency of a plan of this system is to produced advance system means we used instead of 8051 microcontroller we have to use ARM or PIC controller to better performance of System.

enginerring society Summer Meeting 2012,IEEE.

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