IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 4, April 2021

DOI 10.17148/IJIREEICE.2021.9419

POWER FACTOR CORRECTIONS OF GRID CONNECTED HYBIRD SYSTEM

V. Gokulakrishnan[1], T. Jagadeesan[2], C. Rajeshwarman[3] and Dr. S. Sivasakthi[4]

UG Scholar, Department of Electrical and Electronics Engineering Krishnasamy College of Engineering and Technology, Cuddalore[1,2,3]

Professor, Department of Electrical and Electronics Engineering Krishnasamy Collegeof Engineering andTechnology, Cuddalore[4]

Abstract: Electric energy being the only form of energy which can be easily converted to any other form plays a vital role for the growth of any industry. The Power Factor gives an idea about the efficiency of the system to do useful work out of the supplied electric power. To improve the powerfactor to desired level, reactive power compensators are used in the substations. The most commonused device is capacitor bank which are switched on and off manually based on the requirement. The work carried out is concerned with developing power factor correction equipment based on embedded system which can automatically monitor the power factor in the electrical system and take care of the switching process to maintain a desired level of power factor which fulfils the standard norms. The voltage and current signal from the system is sampled and taken as input to measure the power factor and if it falls short of the specified value by utility, then the device automatically switch on the capacitor banks to compensate for the reactive power. The number of capacitors switched on or off is decided by the microcontroller based on the system power factor and the targeted power factor. The measurement and monitoring of three different possible load types suggested that only the inductive loads required power factor correction**.**

Keywords: APFC, Capacitors, Atmega 328p.

INTRODUCTION

1.1 OVERVIEW

In the present technological revolution, power is very precious and the power system is becoming more and more complex with each passing day. As such it becomes necessary to transmiteach unit of power generated over increasing distances with minimum loss of power. However, with increasing number of inductive loads, large variation in load etc. the losses have also increased manifold. Hence, it has become prudent to find out the causes of power loss and improvethe power system. Due to increasing use of inductive loads, the load power factor decreases considerably which increases the losses in the system and hence power system losses its efficiency.

1.2 OBJECTIVE

- Reduces electricity costs.
- Improve power factor.
- Increases energy efficiency.

1.3 EXISTING SYSTEM

The most common used device is capacitor bank which are switched on and off manually based on the requirement. The work carried out is concerned with developing power factor correction equipment based on embedded system which can automatically monitor the power factor in the electrical system and take care of the switching process to maintain a desired level of power factor which fulfils the standard norms. The voltage and current signal from the system is sampled and taken as input to measure the power factor and if it falls short of the specified value by utility.

1.4 DRAWBACKS

- Higher current is required by the equipment, due to which the economic cost of theequipment is increased.
- At low power factor, the current is high which gives rise to high copper losses in thesystem and therefore the efficiency of the system is reduced.

IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 4, April 2021

DOI 10.17148/IJIREEICE.2021.9419

1.5 PROPOSED SYSTEM

The work carried out is concerned with developing power factor correction equipment based on embedded system which can automatically monitor the power factor in the electrical system and take care of the switching process to maintain a desired level of power factor which fulfils the standard norms. The voltage and current signal from the system is sampled and taken asinput to measure the power factor and if it falls short of the specified value by utility, then the device automatically switch on the capacitor banks to compensate for the reactive power. The number of capacitors switched on or off is decided by the microcontroller based on the system power factor and the targeted power factor. The measurement and monitoring of three different possible load types suggested that only the inductive loads required power factor correction.

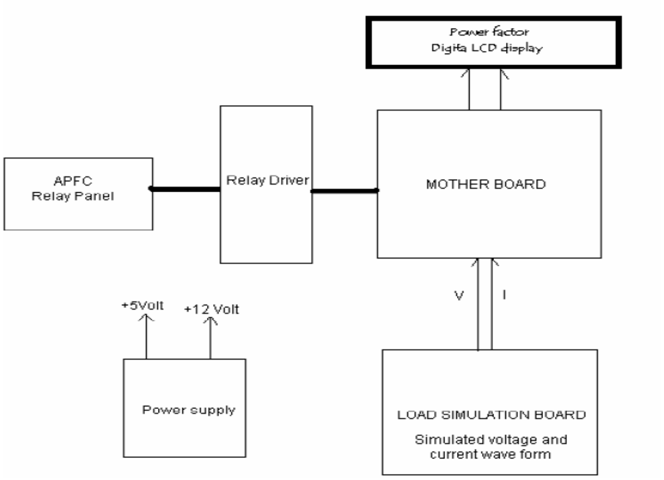

Fig 1.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

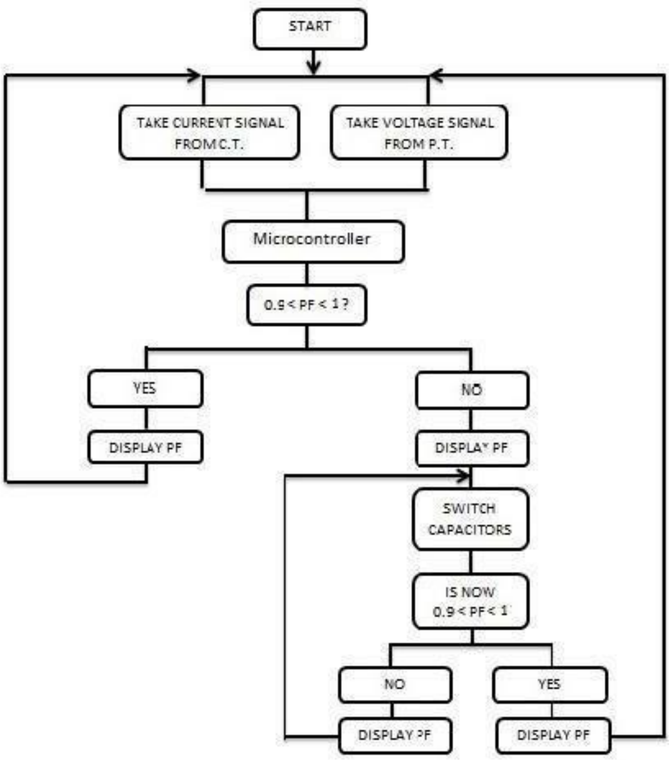

Fig 1.2 FLOWCHART

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 4, April 2021

DOI 10.17148/IJIREEICE.2021.9419

1.6 ADVANTAGES

- Increase in efficiency due to Reduction of power consumption.
- Reduction in power consumption leads to a reduction in greenhouse gasses.
- Reduction of electricity bills.
- Availability of extra KVA from the same existing supply.

1.7 APPLICATIONS

1.7.1 PFC at Motor

This way is the most advantageous power factor correction location but it is expensive if it is not prepared at early construction. One good thing about this is that, when the motor is turned off, the capacitor that is not required removes from the circuit.

1.7.2 PFC at Motor control center

This can dismiss the equipment upstream of power factor correction location from having to supply the magnetizing current. Which can cause less amperage on the components that carry power to the motor control center. But the drawback is the capacitors may deliver too much reactive load when some of the loads are turned off. 3 MATEC Web of Conferences 150, 01004 (2018)

1.7.3 PFC at Utility meter

This method is to simply cut down the need to pay large reactive demand charges (TNB power factor surcharge) where the capacitor bank is installed at the service entrance. This will profit the utility line because they no longer need to deliver magnetizing current and they have more current carrying capacity to be sold to others.

1.7.4 PFC at Substation transformer

Placing the power factor compensating device at the substation transformer can help to re-feed the loads from another source. The position of the capacitors needs to be on the correct side of the transformer, so it is better to link it on the secondary side. By this way, the equipment upstream of the link in point will be benefited.

2.1 DESIGN AND DEVELOPMENT

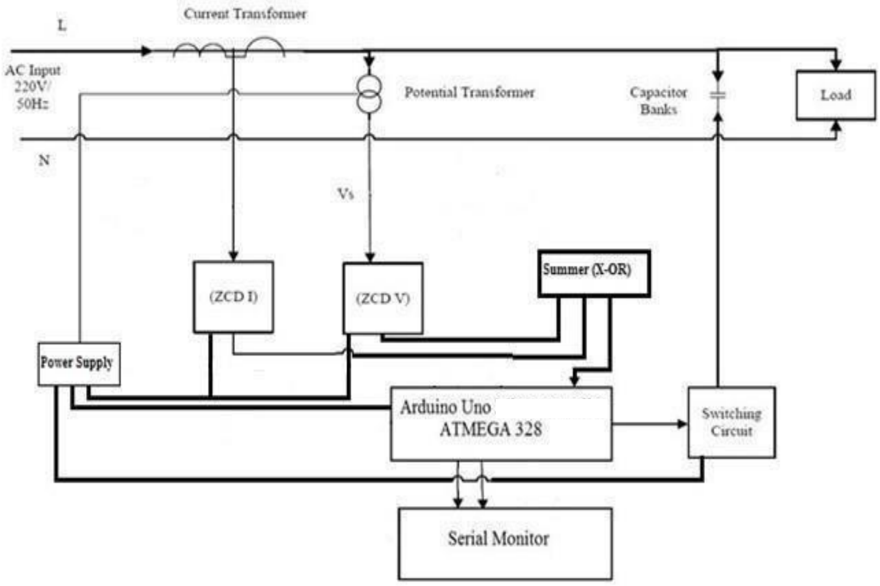

FIG 2.1 BLOCK DIAGRAM OF AUTOMATIC POWER FACTOR CORRECTION CIRCUIT

IJIREEICE
ISSN (Online) 2321-2004
ISSN (Print) 2321-5526
International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering
Vol. 9, Issue 4, April 2021
DOI 10.17148/IJIREEICE.2021.9419

The above given circuit for Automatic Power Factor detection and correction operates on the principal of constantly monitoring the power factor of the system and to initiate the required correction in case the power factor is less than the set value of power factor.

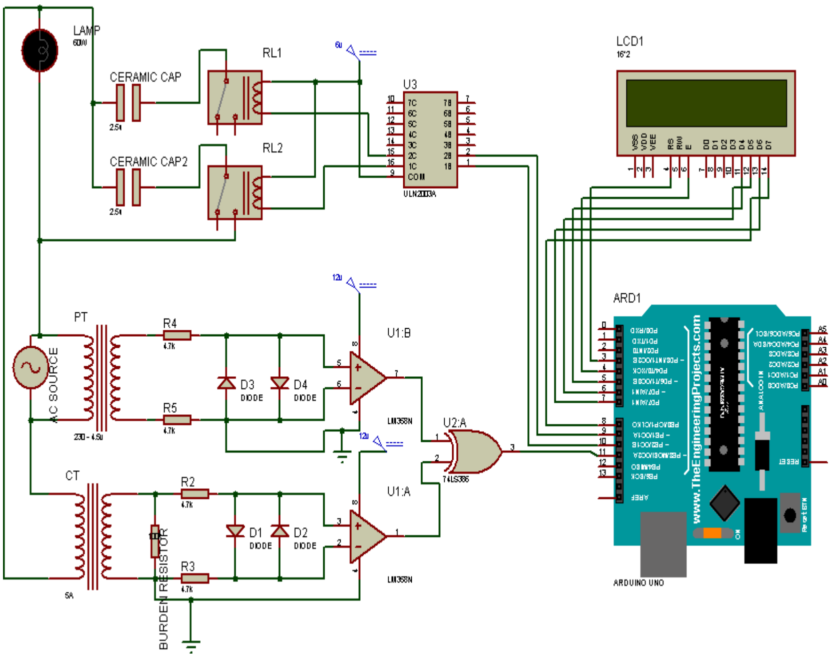

FIG 2.2 CIRCUIT DIAGRAM OF THE SYSTEM

3.1 RESULT DISCUSSION

The expected outcome of this project is to measuring the power factor value displaying it in the LCD and to improve power factor using capacitor bank and reduce current draw by the load using microcontroller and proper algorithm to turn on capacitor automatically, determine and trigger sufficient switching of capacitor in order to compensate excessive reactive components, thus bringing power factor near to unity ,there by improving the efficiency of the system and reducing the electricity bill.

FIG 3.1 PROJECT KIT

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 4, April 2021

DOI 10.17148/IJIREEICE.2021.9419

Prototype is verified using, an inductive load. Which initially gives a lagging power factor, which by than gives an improved power factor close to unity by the proper working of the APFC unit.

REFERENCES

[1]. Minimizing Penalty in Industrial Power Consumption by Engaging APFC Unit. By Yash Shinge, Nikhil Shetty, Satyansh Tiwari, Pushpak Patil, Priyanka Tripathi. IOSR Journal of Engineering (IOSRJEN) ISSN(e): 2250-3021, ISSN (p): 2278-8719 Volume 9, PP 05-08, March-2018.
[2]. AUTOMATIC POWER FACTOR CONTROL USING ARDUINO UNO. Ravi Dhameliya, Kaushik Domadiya, Pratik Miyani, Hiren Savaliya, Pratik Jariwala. International Journal of Advance Engineering and Research Development Volume 4, Issue 4, April -2017. e- ISSN: 2348 - 4470, print-ISSN: 2348-