Design And Implementation of Power Factor Correction Meter

Sneha Badodekar[1], Ragini Kumeriya[2], Rani Brikhede[3], Priya Thakur[4], Shikha Gedam[5], Prof Manish Boktewar[6]

[1,2,3,4,5,6] *BE, Fourth year, Electrical Engineering, Nagpur Institute of Technology, Nagpur*

Abstract **- As we know that power system load is increasing day by day as the industrial and commercial load is increasing. In modern power system most of the load is inductive load that cause to reduced power factor and system losses its efficiency, When the power factor is less than one the 'missing' power is known as reactive power which unfortunately is necessary to provide a magnetizing field required by motors and other inductive loads to perform their desired functions. Reactive power can also be interpreted as wattles, magnetizing or wasted power and it represents an extra burden on the electricity supply system and on the consumer's bill. So, we need to improve the power factor with a suitable method to compensate this inductive load capacitive load must require. Inductive load is consume reactive power in the system which affect generation of plant (in power system load is dynamic as it change according time). The main application of APFC panel is it has automatic capacitor which connected according to requirement of reactive power for control and correction the power factor near to unity for efficient transmission line. Automatic power factor correction techniques can be applied in the industries for better utilization of the electrical energy with better power factor.**

Index Terms **- Automatic power factor correction, passive power factor correction.**

1.INTRODUCTION

The PF is the ratio between the actual load power (KW) and the apparent load power (KVA) drawn via an electrical load It can be also stated as usage of real power to total power provided. Poor power factor gives rise to many problems such as large KVA rating of the equipment, larger conductor size, poor voltage regulation, increased copper loss, reduced power handling capacitor and much more. There are several methods for improving the power factor of the system such as a synchronous condenser, static compensator, static capacitor, etc. they are either highly priced methods or inefficient methods. To overcome these disadvantages, the new method depends on reactive power and this method is very efficient and also less expensive compared to other methods. A necessary capacitance is connected so that PF is adjusted as close to unity as possible. Theoretically, capacitors could provide 100% of the needed KVAR, however, practically, correcting PF much nearer to unity. Automatic power factor controller project is planned to improve power factor automatically, whenever power factor falls below convinced level. As we know that the requirement of electrical energy is increasing day by day, more and more inductive loads are increasing in industries as well as for household purpose. Inductive loads are the main reason for low power factor in power system.

The Automatic Power factor Correction device is a very useful device for improving efficient transmission of active power. If the consumer connect 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 with in 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 to improve power factor in that way APFC play important in power sector.

OBJECTIVE: The Active Power Factor Correction (APFC) is a method to improve the power factor near to unity, reduces harmonics distortion noticeably and automatically corrects the distorted line current of an SMPS. It will replace the Passive Power Factor Correction (PPFC) which has become a conventional method for the past 20 years. This research aims to implement the Unity Power Factor (UPF) for single-

phase rectifier which is used in designing the high-end SMPS by using APFC approach. For this purpose, a power electronic circuit is inserted between the bridge rectifier, the output filter capacitor and the load. This approach requires additional semiconductor switches and control electronics but permits cheaper and smaller passive components. The goals of this research are: To simulate and analyze the typical power supplies. To investigate the effects of harmonics and low power factor to the power system. To simulate and analyze the methodology chosen for UPF. To determine the best control mode for UPF. To implement a single-phase UPF rectifier in designing the better SMPS. In this thesis, three types of converters are considered, and they were designed in two stages converter. The first stage deals with a rectification process that is AC to DC conversion together with PFC Boost topology while the second stage deals with DC-to-DC conversion as Fly back topology was used. The preferable type of PFC is Active Power Factor Correction (APFC) since it provides more efficient power frequency. An active PFC uses a circuit to correct power factor and able to generate a theoretical power factor near to unity. Active Power Factor Correction also markedly diminishes total harmonics, automatically corrects AC input voltage, and capable for a wide range of input voltage.

2.LITERATURE REVIEW

Automatic power factor correction unit 1 a seminar on submitted by rakesh kumarpadhy 0901106221 electrical engineering 2.P. srinivasa rao 2. certificate this dissertation report entitled automatic power factor. The 23. chapter2 literature review 23 power factors. Automatic power factor corrector 4-page chapter 2 review of literature 15. automatic. Matlab simulations for power factor correction of switching power 1 electrical network voltage. Automatic power factor controller circuit diagram. Power factor correction using 0. Control of a single stage three phase boost power factor correction rectifier inductor.

Power factor correction using 0. Designing and simulation analysis of smart grid in power management to monitor and improve the power.

Power factor correction using 0. Automatic power factor correction unit. a seminar on submitted by rakesh kumar. Minimizing penay in industrial power consumption by engaging APFC unit _project highlights. Power factor measurement and correction. Minimizing penay in industrial power consumption by engaging apfc unit. Minimizing penay in industrial power consumption by engaging apfc unit_project. minimizing penay in industrial power consumption by engaging APFC unit circuit.

APFC related display of lag and lead power factor. Elimination of harmonics and power factor correction. Automation in power factor improvement.

37. chapter2 literature review. General scheme for the literature review conceptual scheme for energy efficiency measures and intervention areas categorization. Unity power factor correction using hcc. Power factor measurement and correction. by rahul11 power factor controller. Impact of power factor correction device on residential household electrical system full report roza rozaydin academia.edu.

21. 5-chapter ii literature review 2.0 introduction to power. Celec power factor control relay 63pfc6. Fig 1 boost APFC converter circuit.

minimizing penay in industrial power consumption by engaging apfc unit _diy kit content. Consider this product if you have resonance concerns or significant harmonic producing devices on your system and you need power factor correction.

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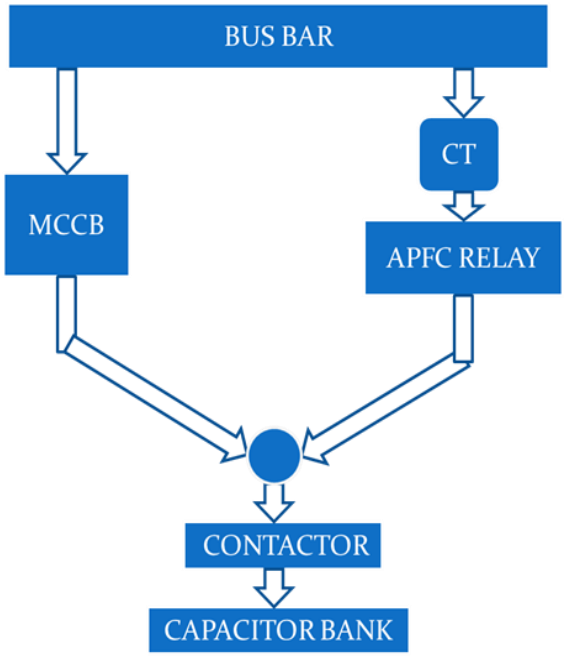
Classification of demand response programs 32. Fast scale bifurcation in power factor correction buck.
Irjet design and implementation of an efficient soft switching inverter fed ac drive. Celec power factor control relay 63 pfc 6. Emerging power quality challenges due to integration of renewable energy sources.

3. BLOCK DIAGRAM



(a) BUSBAR

Busbars have numerious benefits and are a crucial element within electrical distribution system, especially when simplifying the process of electrical power distribution, reducing overall cost, and allowing for greater flexibility. They can come to aluminum, as well as different size.

(b) MCCB

The MCCB uses a temperature sensitive device (the thermal element) with a current sensitive electromagnetic device (the magnetic element) to provide the trip mechanism for protection and isolation purposes. Electric fault protection against short circuit current. And electrical switch for disconnection.

(c) APFC

APFC relay is connected to a 3 phase + neutral 440-volt system. The motor and capacitor are also connected to the same system. Relay is given the current of one phase(L1) through CT and given system voltage (L1-N).so above relay is used to turn on 6 capacitor.

(d) CONTACTOR

Operation principle of a contactor. The current passing through the contactor excites the electromagnetic. The excited electromagnet produces a magnetic field, causing the contactor core to move the armature. A normally closed (NC) contact completes the circuit between the fixed contacts and the moving contacts.

(e) CAPACITOR BANK

Shunt capacitor banks basically is utilized for the improvement of thr PF in electrical network. Capacitor bank are also used for the improvement of the voltage stability and decrease network losses. Shunt capacitor bank are not expensive. Shunt capacitor installation can be done easily anywhere on the network. Depending on the necessity of reactive power, capacitor bank which consist of shunt capacitors are made ON or OFF. With the usage of relay, the switching can be done by manual way or automatically.

CONCLUSION

By observing all aspects of the power factor, it is clear that power factor is the most significant part for the utility company as well as for the consumer. Utility companies get rid from the power losses while the consumers are free from low power factor penalty charges.

By installing suitably sized power capacitors into the circuit the Power Factor is improved and the value becomes nearer to 0.9 to 0.95 thus minimizing line losses and improving the efficiency of a plant [8]. By using this APFC system the efficiency of the system is highly increased.

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