

A Review on Minimizing Penalty in Industrial Power Consumption by Using APFC Unit

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Abstract - In the modern area the different motoring loads are consistently running and expanding the inductive burden. So the power factor in this framework get lessens due to the inductive receptive power. Be that as it may, the power board has a standard breaking point as to control factor esteems and assuming the power factor goes beneath as far as possible the power organization charges the punishment to the modern shoppers. APFC gadget understands power factor from line voltage and line current by deciding the delay in the appearance of the current sign concerning voltage signal from the capacity generator with high precision by utilizing an interior clock. This time esteems are the adjusted as stage point and relating power factor. Then, at that point, the values are shown in Liquid gem show modules. Then, at that point, the motherboard works out the remuneration necessity also likewise turns on various capacitor banks.

Key Words: Relay APFC, MCB, CT, Contactor, Capacitor, Selector Switch.

1. Introduction

In the nation like India, energy scratch is one of the significant nervousness. In the modern area different motoring load are habitually running and producing the inductive load. so the power factor in this framework get lessen because of the inductive reactor. Also the power factor is the imperceptible element, which causes an incredible loss of electrical energy and furthermore harms the electrical equipment. Power factor esteem measure how much principle effectiveness is impacted by both stage point in the middle of voltage also current and music of burden current. So the APFC (automatic power factor amendment) gadget is an exceptionally supportive gadget for improving productive transmission of dynamic power. The power factor is only the cosine point among voltage and current. Automatic power factor amendment gadget read power factor from the line voltage and line current by decisive the deferral in the approach of current sign with regard to voltage signal from the capacity generator with high exactness by utilizing an inner clock. This time esteem are aligned as stage point also particular power factor. Then, at that point, the worth are display in LCD module. Power factor is a proportion of KW and KVA. KW is a real burden power and KVA is the evident burden power. It is a significant of how adequately the current is being changed over into valuable work yield. The signicance of high power factor has been recognized by the residential and business area for their own benefits. The Reactive power does excluded from the electrical bill up to this point this reason scattering power misfortune at the heap which result to an increment of power charge. Penalty charge is one of the issue happening if the power framework is low. In any AC framework the current, and subsequently the power, is shaped of assortment of parts

in view of the nature of the heap consuming the power. These are the resistive, inductive and the capacitive components. If there should be an occurrence of a absolutely resistive burden, for example, electrical opposition warming, brilliant lighting, and so on, the flow and furthermore the voltage are in stage i.e. the current follows the voltage. While, if there should be an occurrence of inductive burdens, current falls behind the voltage i.e. the current is out of stage with the voltage. Practically the entirety of the gear and apparatuses in the present day are inductive in nature (Except not many simply resistive burdens and coordinated engines), for example, inductive engines of each sort, electric circular segment, welding machines, and enlistment heaters, stifle loops and attractive frameworks, transformers and controllers, and so forth On account of a capacitive burden the current and voltage are again out of stage but at this point the current leads the voltage. The chief normal capacitive burdens are the capacitors put in for the remedy of force component of the heap. As the vast majority of the heaps in present day electrical dissemination frameworks are inductive, it is important to improve power factor. The low power element of inductive burdens ransacks framework's ability and may influence the voltage level. Power factor revision by the utilization of capacitors is generally in practice at all framework voltages. As expansion in utilities results in punishments, the power organization charge clients for low power factor. The establishment of force factor adjustment capacitors will work on the presentation of the framework and will set aside cash.

Power factor hypothesis: Power is ordered into three sorts in particular dynamic power, receptive power and obvious power.

Dynamic Power: The real measure of the power utilized or on the other hand scattered in a circuit is called dynamic power or genuine power or then again obvious power. It's units are watts and is represented with the letter P.

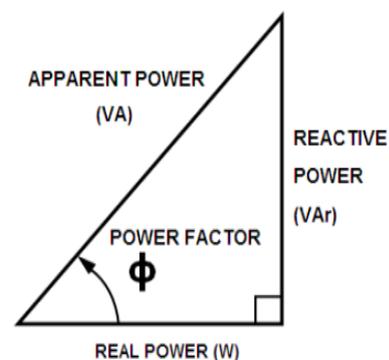


Fig -1: Power Triangle

Responsive Power: Reactive burdens like inductors and capacitors scatter zero power, yet the way that they drop voltage and draw current gives the discernment that they disseminate power. This disseminated power is called

responsive power. Its units are Volt-Amps-Reactive (VAR) and represented with the letter Q. It is the capacity of circuit's Reactance (X).

Clear Power: The mix of the dynamic what's more receptive power is called evident power. It is the item of voltage and current of a circuit, without reference to stage point. Its units are Volt-Amps (VA) and is represented with the letter S. Clear power is a component of absolute impedance (Z) of a circuit. Power factor: Power factor is characterized as the proportion between the dynamic power (KW) to the all-out evident power (KVA) consumed by an a.c. electrical gear or a total electrical establishment. Power Factor is additionally characterized as them cosine of the point among current and voltage.

Power Factor (PF) = Active Power/Reactive Power

2. Body of Paper

APFC Panel has microcontroller based programmable smart series APFC relay which switches the capacitor banks of appropriate limit consequently in different stages by straightforwardly perusing the responsive burden (RKVA) which works in the guideline of VAR detecting will in general keep up with the PF to 0.99 Lag. The capacitor banks might be chosen in number of stages as 4/6/8 as per the heap design.

APFC Panels come genuine convenient in the accomplishment of this reason Use of these control boards becomes key in those enterprises where electrical establishments are intended to supply to enormous electrical burden.

A dunk in Power Factor can draw in functional misfortunes and a punishment from power board, liable for power supply

The main features of our control panels are

- Maintains high Power Factor constantly
- Protection from excess power in the system.
- Prevents leading Power Factor in low load conditions
- Clearly marked buttons and indicators
- Minimizes harmonic current
- Avoid manual disruption
- Corrosion-resistant
- Long lasting
- Electrical insulation
- Protects electrical equipment's

2.1 TYPES OF APFC PANELS

[A] LT APFC SYSTEM

Reactive Power compensation system is designed to work automatically on LT power supply to measure, display & connect, disconnect the required capacitor banks through Thyristor /Capacitor Duty contactor with protection of MCB /

HRC Fuses & series reactors to each bank to achieve the set Target power factor. Thyristor /Contactor Switched Automatic power factor system is the highly accurate, properly designed system with required creep age distance as per required standards. APFC System equipped with advanced, Digital Microprocessor based relay to measure, calculate and display all electrical network parameters.

[B] HT APFC RELAY

An intelligent high speed DSP + Microprocessor Based device to measure, calculate, display and store all electrical network parameters. Voltage & Current Feedback is achieved through HT CT's & PT's. In built Intelligent Multi Method Switching (MMS) Algorithm enables user to get close control on network reactive power requirement. Multi Method Switching (MMS) Algorithm allows user to set different target power factor for Diesel Generators and Windmill Stations. A built in self test facility provided for checking calibration and operation of the relay without external load. The control functions even at low operating loads with great accuracy GB Control's APFC controller find usage and applications in all segments of industry viz. Automobile factories, Cement Plants, Chemical & Fertilizer Plants, Metal Industries etc. The other built in features viz. Over Voltage Protection, Low Voltage Protection, Under Load Protection, Over Load Protection High Temperature etc. provides nonstop operation of APFC System.

[C] Thyristor / Contactor Switched APFC System LT APFC SYSTEM: -

Reactive Power compensation system is designed to work automatically on LT power supply to measure, display & connect, disconnect the required capacitor banks through Thyristor /Capacitor Duty contactor with protection of MCB / HRC Fuses & series reactors to each bank to achieve the set Target power factor. Thyristor /Contactor Switched Automatic power factor system is the highly accurate, properly designed system with required creep age distance as per required standards. APFC System equipped with advanced, Digital Microprocessor based relay to measure, calculate and display all electrical network parameters. It accurately measures cycle to cycle reactive power requirement for required capacitors are connected to switching element / device installed in the system, so as required capacitors are connected / disconnected to the network. APFC Controllers close loop fast response multi method switching [MMS] algorithm helps system to have close & precise control on power factor. APFC Relay has memory storage model of capacity 45 Days on hourly basis with Rs 232 port for communication.

2.2 APPLICATIONS

- Automobile Industries, Cement Industries, Metal Industries.
- Chemical & Fertilizer Plant, Pharmaceutical Industries.
- Hospitals, Malls, Banks, IT Parks, Commercial Complexes.

- Windmill, Power Stations, DG Stations, Crushers.
- Railway / MES / Ordnance Workshops.

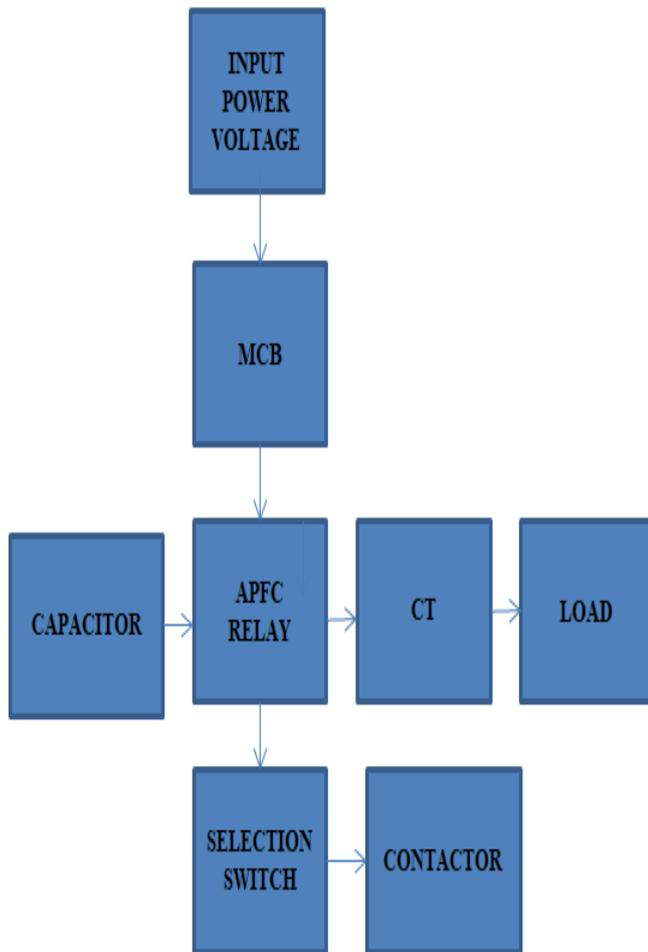


Fig -2: Working System Block Diagram

3. CONCLUSIONS

It very well may be inferred that power factor amendment strategies can be associated with businesses, power framework and besides families to make them stable and in light of that the structure ends up stable proficiency of the framework what's more what's more mechanical get together increments.

It administers the method used to defeat the punishment forced and power misfortune due to low influence factor endless with same private and little modern unit. The static capacitor is utilized in businesses to work on the power factor in industry and dispersion lines. Hence, it not just improves power factor yet in addition builds line capacity proficiency.

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