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Experimental Study on Power Saver Establishment for Commercial Purpose

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Abstract:-

This paper is employed for the aim of power saving for industrial and commercial establishment. Power factor is defined increase because the ratio of real power to apparent power. Where real power is that the time integral of the instantaneous power measured over a full period and therefore the apparent power is just the merchandise of the RMS voltage and RMS current measured over the whole period. The delay between the zero-voltage pulse and 0 current pulse duly generated by suitable operational dual amplifier circuits are fed to 2 interrupted pins of the microcontroller where the program takes over to actuate appropriate number of relays at its output for bringing shunt capacitors into the load circuit to urge the facility factor till it reaches 0.97. Shunt capacitor ratio are going to be change a current and voltage thanks to the facility efficiency define and power its changed a circuit power thanks to high and current. Measure a unit pulse count and current transformer thanks to show the rating and increasing power factor value are going to be change show the display which device perform like "LED BULB, BULB, MOTOR, AC, TV" all using this system power factor increasing thanks to easily saving energy of an influence.

Introduction: -

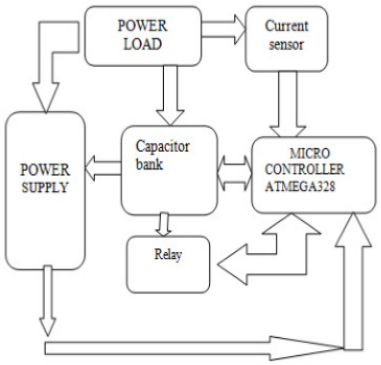
This paper presents the planning and implementation of designed to scale back the facility loss in industries by power factor compensation through variety of shunt capacitors. This leads to reduction in amount of electrical load for industries and commercial establishments. Power factor increase may be a defined because the ratio of Real power to apparent power. This principal at a is typically mathematically represented as KW/KVA, where the numerator is that the active (real) power and thus the denominator is that the (active + reactive) or apparent power. Reactive power is that the non-working power generated by the magnetic and inductive loads, to urge magnetic flux. the rise in reactive power increases the apparent power, therefore the facility factor also decreases. Having low power factor, the industry needs more energy to satisfy its demand, therefore the efficiency decreases. This implemented design will help at utility to enhance fault restoration time and that we can utilize transformers for long period of your time. during this technique for system the delay between the zero-voltage pulse and 0 current pulse duly generated by suitable dual operational amplifier circuits in comparator mode are fed to 2 interrupt pins of the microcontroller.

Working and Principal: -

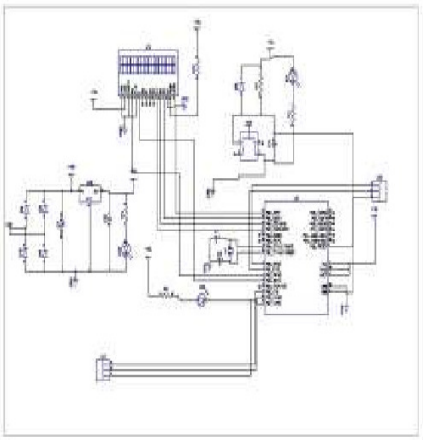
In project of power saver, we use the Microcontroller Atmega328. A microcontroller may be a small computer on one microcircuit containing a processor core, memory, and programmable input/output peripherals. Program memory within the sort of Ferroelectric RAM, NOR flash or OTP ROM is additionally often included on chip, also as a typically bit of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors utilized in personal computers or other general-purpose applications. Firstly, we give 230v AC power supply to the transformer. Here we are using 12V,1 A step down transformer that convert 230v AC into 12v AC. From the output of the transformer ,3 lines i.e. R, Y and B goes on rectifier circuit (Signal conditioning circuit). Each line having 2 wires, one is phase, and another is neutral. Diodes are connected in H pattern. Here we are using 1N4007 diode. It works as a rectifier that convert 12v AC into 12v DC. Capacitors are utilized in power

supplies for smooth the output of a rectifier circuit. Here we are using three 7805 transformer IC'S that fixed the voltage at 5V. Register having 1k value and LED'S also are connected together serial for fault indication. Now 3 phase wires from this board goes to LCD board. Where these 3 wires are connected from three pin connectors. This LCD board need an external power supply to work this board, so we connect 9v battery from it. Here we used 16x2 LCD DISPLAY and ATMEGA 328 microcontroller which is 28 pins. LCD and Microcontroller are interfaced together. Microcontroller's first pin is reset. It's second pin hook up with GPS i.e. global positioning system and third pin is connected to GSM i.e. global system for mobile communication. Microcontroller's 4th pin hook up with LCD's 4th pin i.e. register select. It's 5th pin hook up with LCD's 6th pin i.e. enable. It's 7th pin hook up with 5v supply. 8th pin of microcontroller hooks up with ground. 9th and 10th pin of microcontroller hooks up with quartz oscillator and ceramic capacitor. 11th ,12th and 13th pin of microcontroller hooks up with three phases i.e. R, Y & B. 14th,15th,16th& 17th pin of microcontroller hook up with LCD's 14th,13,12th& 11th pin simultaneously these are data lines. 18th and 19th pin of microcontroller is open. 20th& 21st pin hook up with VCC i.e.5 V. 22nd pin goes to ground & 23rd-28th pin is open. When system works properly LCD get initialized and display welcome massage thereon. If fault occurs in anybody of the road, it indicates on LCD DISPLY within the sort of transformer line1 fault, "transformer" line2 fault or transformer line3 fault with longitude and latitude. This current sensor LM 1172 connect inside the transformer. Microcontroller sends high signal to relay driver IC whenever power factors falls but 0.9. First, the phase difference between voltage and current waveforms are measured then power factor is calculated. just in case of low power factor capacitors are added to enhance it.

Hardware Design:-



Circuit Diagram:-



Result:-

Micro controller, current transformer is employed to urge current wave form from of load current and current transformer also step-down ac current. LM358 is employed as a comparator during this circuit. similarly, voltage transformer is employed to urge current wave form and fed this wave to LM358 comparator. LM358 is employed as zero crossing detector during this project. After LM358 both current and voltage waveforms are fed to Atmega328 microcontroller. microcontroller measures zero crossing detection and power factor by measuring time difference between current and voltage wave form. Time difference between current and voltage waveform is employed to live power factor using pic-microcontroller.

In most commercial and industrial facilities, a majority of the electrical equipment acts as a resistor or an inductor. Resistive loads include incandescent lights, baseboard heaters and cooking ovens.

Inductive loads include fluorescent lights, AC induction motors, arc welders and transformers. Typical power factor values for a few inductive loads

Different loads and their power factors

LOAD	POWER FACTOR(PF)%
SMALL ADJUSTABLESPEED DRIVE	85-98
ELECTRONIC BALLAST	85-90
FLUORESCENT LIGHT	100
ARC WELDERS	30-75
MAGNETIC BALLAST	60-70
INDUCTION MOTOR	60-80

Effect of different capacitor ratings on the current and power factor

POWER FACTOR		CURRENT (AMPS)		CAPACITOR (MICRO FARAD)
Before	After	Before	After	
0.76	0.78	1.83	1.7995	1.2878
0.76	0.82	1.83	1.7169	4.0193
0.76	0.85	1.83	1.659	6.356
0.76	0.88	1.83	1.605	9.375

Conclusion:-

By observing all aspects of the facility factor it's clear that power factor is that the most vital part for the utility company also as for the buyer. Utility companies get rid from the facility losses while the consumers are free from low power factor penalty charges. By installing suitably sized power capacitors into the circuit the facility Factor is improved and therefore the value becomes nearer to 0.9 to 0.95 thus minimizing line losses and improving the efficiency of a plant. By using this PFC system, the efficiency of the system is very increased.

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