

# Reduction of Energy Consumption for Corporation and Commercial Establishment

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**Abstract**–This project is mainly used for power saving in industrial and commercial areas. This project focuses on power factor technique, where it is defined as a ratio of real power to apparent power. Apparent power means product of RMS voltage and RMS current, Real power is time integral of instantaneous power measured at a full period. The output for bringing shunt capacitors into the load circuit to get the power factor up to 0.95, by this we can reduce high electricity bills.

**Keywords**– Power Supply, Microcontroller, Relays, Capacitor bank

## I. INTRODUCTION

Industries function on inductive loads such as transformers, induction motors, ballast-type lightning which has a low power factor and draws more reactive power from the supply, this reactive power is measured as used power but its inefficient and not used by the industry, this power is useless but drawn from the supply, measured causing industries/commercial establishments to spend more on electricity bill.

By using this concept, industries reduces the consumption of electric power by enhancing the power factor of inductive loads, commercial establishments which does not make use of this power saver by use of coupling capacitors, phase advancers or synchronous condensers will end up spending a huge amount on power thereby increasing manufacturing cost of products and also management cost of the establishment.

The major problem which this project solves is the issue of low power factor which affects the bill of industries, it also provides capacitor banks which allows for extra inclusion of loads by auto switching through relays and relay drivers according to the rating of the load added.

Other problems include:

- Increased harmonic distortion caused by saturation of inductive loads such as transformers.
- Reduced efficiency in output of industries and commercial establishments which do not make use of these compensators/enhancers.

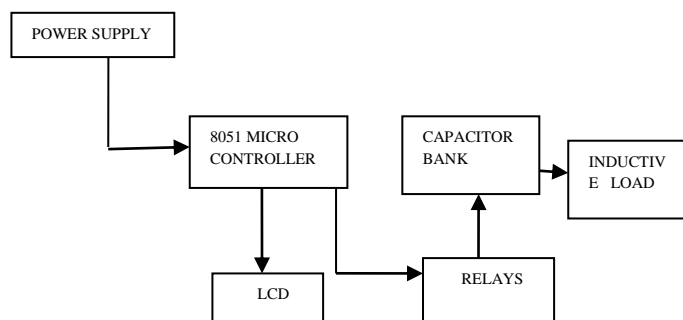
## II. METHODOLOGY

Power saver is mainly used because they use extra circuit for the energy saving as they need a high load in industries and commercial purpose by the reduced reactive power. The project is designed to reduce the power loss in industries by power factor compensation through a number of shunt capacitors. Magnetic and inductive loads generate magnetic flux, which is generated by non working reactive power. The power decreases with increase in the apparent power and reactive power. The corporation and commercial establishments require more energy, so efficiency reduces.

In our concept, the delay is given by pulsating D.C voltage which is achieved by amplifier circuits in comparator mode and fed it to the microcontroller. Power losses are displayed on the LCD screen with the use of microcontroller. This project can be extended with thyristor switches rather than relays to avoid contend by using capacitors due to high rush current

## III. BLOCK DIAGRAM

The block diagram of the project is explained below:



**Fig 1** Block Diagram

**Power supply:** The input to the circuit is applied from the regulated power supply. The ac. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating dc voltage. So in order to get a pure dc voltage, the output voltage from the rectifier is fed to a filter to remove any ac components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

**Micro Controller:** 8051 is an 8 – bit Microcontroller i.e. the data bus of the 8051 Microcontroller (both internal and external) is 8 – bit wide. 8051 Microcontrollers were developed using N-MOS Technology but the use of battery powered devices and their low power consumption lead to usage of CMOS Technology (which is famous for its low power consumption). Because of their low power consumption, smaller size and simple architecture.

**Some applications of 8051:**

- Consumer Appliances (TV Tuners, Remote controls, Computers, Sewing Machines, etc.)
- Industrial Process and Flow Control
- Radio and Networking Equipment
- Remote Sensing

**Capacitor Bank:** A Capacitor Bank is a group of several capacitors of the same rating that are connected in series or parallel with each other to store electrical energy. The resulting bank is then used to counteract or correct a power factor lag or phase shift in an alternating current (AC) power supply. They can also be used in a direct current (DC) power supply to increase the ripple current capacity of the power supply or to increase the overall amount of stored energy.

**Relays:** A **relay** is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal



**Fig.2** Relay

**Inductive Load:** An electrical load that needs a magnetic field to function is called an inductive load. An inductive load uses coil to produce magnetic field. Major appliances in the house like fans, washing machine, blenders, air conditioner etc are inductive loads. In short, all the appliances having electrical motors inside them are inductive loads.

**Working Model:**

The aim of this project is to design and construct a microcontroller based power saver system by power factor correction with LCD display. In this project a feasible solution for the improvement of power quality and saving of power in inductive load systems. The primary motivation for the work is based on the ability of the system to reduce industrial electricity bills and also save power/energy drawn from electricity utilities for inductive loads.

- To achieve an apparent reduction in current drawn by connecting a capacitor to an inductive load
- Opposing reactive power resulting from the correction of a correctively sized capacitor can compensate for the reactive power required by the load, this ensures that only a small amount of reactive power is drawn from the power supply.
- This system is designed for power factor improvement.
- Enhancement of power quality in closed loop operation.
- Reduction of voltage drop in cables.
- Extend equipment life



**Fig 2** Snapshot of power saver

#### IV. Conclusion

The program takes over to actuate appropriate number of relays at its output to bring shunt capacitors into the load circuit to get zero power loss. This is designed to reduce the power loss in industries by power factor compensation through a number of shunt capacitors. Mainly by adding more of shunt capacitors we can reduce the power. Hence the power can be saved easily. This results in reduction in amount of electrical bill for industries and commercial establishments.

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