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Power Factor Correction Based on Facts

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Abstract:

The objective of this paper is to compensate the reactive power in the line, by using the Static VAR Compensator (SVC). Large rotating machines like synchronous condensers and switched capacitor banks were used before implementation of the SVC. As they are dynamic devices it proves to be inefficient in terms of power loss and power consumption due windage losses and friction losses. Also, the damage quickly and has a short life as compared to the static devices like SVC.

Keywords*: SVC, Reactive Power, Power Factor, Transmission, FACTS.*

Introduction:

Due to rapidly growing population, the utilization of the power and electrical appliances are increasing. Also, there is shortage of power generation as till now millions of houses are still in the dark. A major part of generated electricity is consumed by the industries and the large-scale factories generally having the inductive load in it. Due to it high penalty charges are applied to them also this causes the high voltage drop in transmission lines, transformers, alternators, etc. Resulting is the larger line current drown by the electrical equipment. The overall product of it is Low Voltage Regulation.

Need of Power Factor Improvement

- For better utilization of Electrical and electronic devices.
- For increasing system capacity.
- For reducing system losses.
- For better regulation of the voltage in the system.

In A.C. circuit the power factor is defined as the ratio of the real (active) power to the apparent power. Active power is the power consumed by the resistive loads and apparent power is the combination of true power and reactive power without any phase angle.

Advantages of the unity power factor:

1) No large current in the transmission line.

2) Losses will be less in the System.

3) No heating problem in motors, generators or alternators and transformers.

4) Low losses resulting in the increasing in the life span of the cables.

5) No wastage of power.

Disadvantage of the poor power factor:

1) Initial cost of transmission line increases.

2) Transmission losses will be greater resulting in poor efficiency.

3) Penalty for large amount of power consumers.

4) Poor voltage regulation in the transmission system.

To overcome these disadvantages there are various methods to improve the power factor, one of them is by using Power factor correction by using Static VAR Compensator.

Working of Methodology:

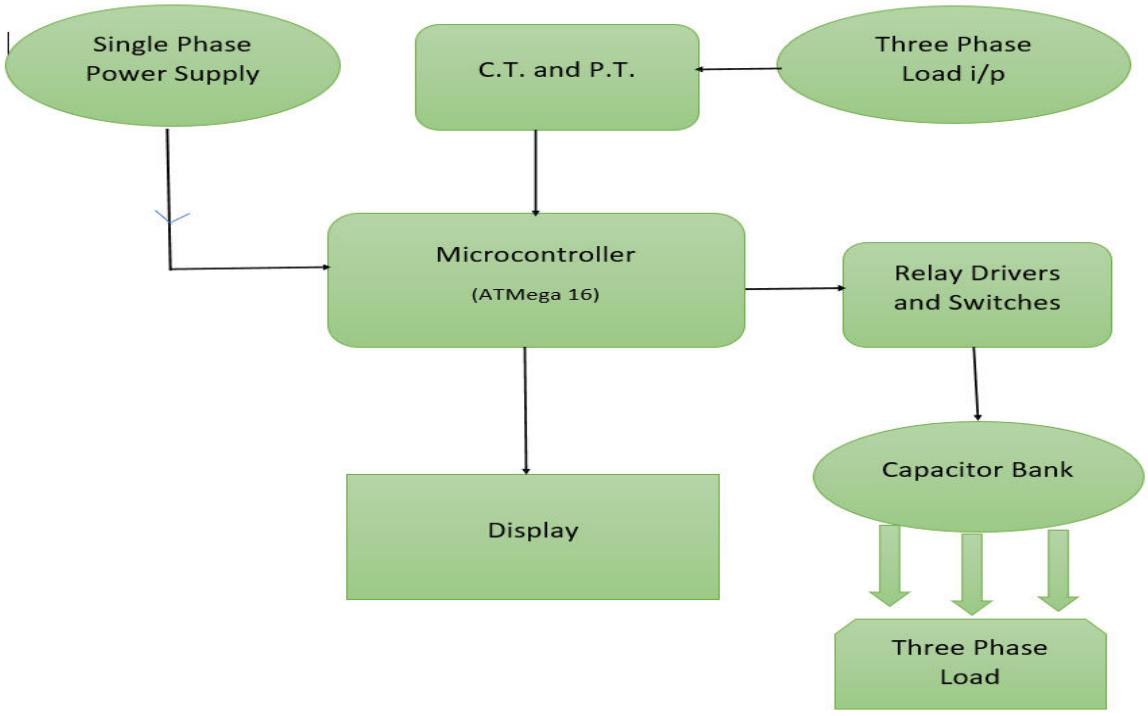

Figure (1). Block Diagram

For the use of Microcontroller, the power is rectified and regulated at the 5V. The input as well as output is detected by using the zero-crossing detector and it gives signal to the microcontroller. Zero crossing detector is a voltage comparator that compares the output voltage with reference to the input voltage. If Inductive load is connected in the system, then the zero-crossing detectorwill give signal to the microcontroller. Microcontroller will give the signal to the relay drivers or the thyristor Switches through the optocoupler. These switches are directly connecting the load to the capacitor bank. Capacitor bank will compensate the reactive power in the output that will result in the power factor correction in the system. Capacitor bank is consisting of the number of capacitors that are connected to the load in parallel. The LCD Display will display the power factor of the output side. SVC is an impedance comparing device which comes in the family of FACTS, that is used to compensate the reactive power and correct the power factor in the system.

Facts

Flexible AC Transmission system is a system that is applicable to enhance the flexibility, reliability, efficiency, and controllability of the Transmission system. It consist of static components used for AC Power. Its aim is to control the parameters of the AC Transmissionsystem like capacitance and inductance. It improves the power quality of the system and decreases the transmission cost of the transmission system.

Shunt Compensation

In this system the power system of the transmission system relates to the capacitor banks or the compensating devices. Capacitor bank are connected inn parallel with it. There are two types of compensation, these are **shunt inductive compensation** and **shunt capacitive compensation**.

Capacitor Bank

Capacitor Bank consist of the number of capacitors in it. It is used for the power factor improvement and the reactive power compensation. It is generally used in colleges, commercial buildings, large residential communities, etc.

Result

This paper helps in improving the power factor and to compensate the reactive power in the system automatically. SVC in the FACTS is the most important factor in improving the power factor. It is very reliable and efficient as compared to the techniques that were used before the SVC. Also, the capital cost of this system is very less in the FACTS. It improves the stability and transmission capacity of the system and ensure the better power quality.

Conclusion

The main aim of this paper is to study the SVC in the FACTS (Flexible AC Transmission System). Also, to create a microcontroller device that will improve the power factor and power quality is the main objective of this paper. This paper is flexible in terms of the area of application like small-scale or large-scale areas. With the use of this paper, we can improve the transmission capacity of the power lines resulting in more economic conditions for power supply.

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