Automatic Power Factor Correction and Monitoring using Iot

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Abstract:
An experimental programme was carried out to monitor and maintain the power factor near to unity automatically. The quality of the power is highly affected by low power factor loads and even it result in penalty for the industrials. So in this project the Capacitor bank is used for the power factor correction to improve the power quality and efficiency. Power factor value is determined from the on time of the signal which is phase difference of voltage and current signal. Capacitance value is required to correct the power factor calculated mathematically by PIC. And also PIC is used for controlling of relay through relay driver. IOT technology is used for web monitoring of power factor. Thus the monitoring of power factor is also possible.

Keywords: PIC, IOT, Capacitor Bank, Power Factor.

1. INTRODUCTION

1.1 INTRODUCTION OF POWER FACTOR
Power factor is defined as the ratio between the real power used and the apparent power drawn by an electrical load. Any motor that operates on alternating current requires apparent power, but apparent power is addition of active power and reactive power. Active power is the power which is actually consumed by the load. Reactive power is the power demanded by the load and returned to the power source. Power factor is a measure of how effectively electrical power is used to perform a useful work from the supplied power. If the power factor is near to one, then the system is said be in high efficient.

1.2 ADVANTAGES OF POWER FACTOR
There are more advantages for the power factor correction. Those are

• Large amount of copper losses of transmission system is reduced.
• Easy to regulate the voltage and reactive control is also possible
• Efficiency increases due to Reduction of power consumption.
• Due to reduced power consumption there will be Less greenhouse gases
• Reduction of electricity bills
• Extra KVA available from the same existing supply

1.3 METHODS OF IMPROVING POWER FACTOR
To make the power factor high, there are several methods can be used those are

• Static capacitor method
• Synchronous condenser method
• Phase advancer method
• APFC method

1.4. STATIC CAPACITOR METHOD
In this method, the static capacitors are connected in parallel with the load for improving the power factor. Because the lagging current of the load is eliminated by the leading current of the static capacitor. Though it has some limitations like the inability to absorb harmonics and doesn’t provide step-less correction, it is a popular choice for PFC for its low cost of installation and maintenance.

1.5. SYNCHRONOUS CONDENSER METHOD
When a synchronous motor operates at no load and at over excited condition, it provides the leading current. It is called synchronous condenser. when it is connected in parallel with lagging load, it provides leading current like a capacitor. But it is not economic compared to other methods.

1.6 PHASE ADVANCER METHOD
When an AC exciter is used for improvement of the power factor then it is called as a phase advancer method. This helps by connecting it with rotor. The exciting ampere-turns at the slip frequency provide the leading power factor. But this method is only suitable for the power factor improvement of induction motor.

1.6 APFC METHOD
In this project we use this method only. In it the automating switching of capacitors by PIC ensures the correction and avoids over correction. And also it is convenient and economical. Compared to other methods it is more reliable and efficient.

2. LITERATURE SURVEY
N. D. Rao developed software called fkom which has the strengths of mathcad and excel spreadsheet. And it has a program determines the value of the series inductor in the harmonic filter bank that would shift the parallel resonant frequency to a value less than the lowest-order harmonic term of the load to correct the power factor. Nader Barsoum 2006, said that the design and development of a three-phase power factor corrector using PIC (Programmable Interface Circuit) micro-controlling chip. This involves sensing and measuring the power
factor value from the load using PIC and sensors, then using proper algorithm to determine and trigger sufficient switching capacitors to make power factor to unity. Yasin Kabir, Yusuf Mohammad Mohsin, and Mohammad Monirujjaman Khan are made a project to monitor the energy consumption of a system and automatically improve its power factor. An open source energy monitoring library was implemented in the design for accurate power calculation.

3. BLOCK DIAGRAM

3.1 OPERATION

- Power to the circuit is fed from a step down transformer where an rectifier is used for converting AC-DC and regulated.
- The time lag between the zero voltage pulse and zero current pulse duly generated by suitable operational amplifier circuits in comparator mode are fed to two interrupt pins of the controller.
- The time lag between the current and voltage are displayed on LCD which is interfaced with controller.
- Depending upon the delay the program which has been dumped in the controller brings appropriate number of relays through relay driver IC from its output to bring shunt capacitors into the load circuit to get the power factor , till it reaches nearest to unity.
- By using the IOT, the power factor monitored values are send through the web link over the internet and the continuously data's are stored for the future analysis and operation.
4. CONCLUSION

The paper discusses a power factor correction in low power factor loads by delivering reactive power factor from capacitor bank. Moreover, based on this analysis, a corrective algorithm was established to achieve power factor close to unity. This algorithm incorporates switching capacitances connected across the power supply automatically through solid state relays in order to compensate the lagging power factor by use of PIC. The IOT units give the continuous monitoring of the power factor over Wi-Fi.

5. REFERENCE

[1]. Uptal, Rishav, Madhu Tiwari (2016), “Automatic Power Factor Correction Using Capacitor Banks”, IJIREEICE, Smart and innovative technologies in engineering and sciences, Volume: 4, Special Issue :4,


