

A Novel Dynamic Reactive Power Compensator Based on PIC

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This article presents a novel real time compensation system with a synchronous motor controlled by a peripheral interface controller (PIC) to maintain a constant power factor in a system with constant or variable loads. The synchronous motor used as a dynamic reactive power compensator removes the step changes of reactive power and eliminates over or under compensation. The experimental results have shown that the novel system based on PIC successfully compensates constant or variable loads. Compared to the other methods with a group of capacitor or a static var compensator, the system developed in this study provides reliable, fast, flexible and low cost compensation since a synchronous motor is already available in the system for other purposes.

Keywords compensation, PIC, reactive power, synchronous motor

1. Introduction

Reactive power is a quantity that is normally only defined for alternating current (ac) electrical systems. In an ac system, the voltages and currents alternate up and down 50 times per second since the frequency of the voltage is 50 Hz. In that sense, these are pulsating quantities. Because of this, the power being transmitted down a single line also pulsates, although it goes up and down 100 times per second rather than 50. This power goes up and down around an average value that is called the real power. Over time, customers pay for this in kilowatt-hours of energy. If this average value is zero, then all of the power being transmitted is called reactive power. Customers would not normally be charged for using reactive power because they are consuming some energy half the time, and giving it all back the other half of the time, for a net use of zero. Voltage and current may not be in phase. When the voltage and current are in phase, only real power is transmitted. When the voltage and current are not in phase, reactive power is being transmitted [1].

In an electrical system, all inductive loads fed by alternating currents draw active and reactive powers from the line. The active power is converted into other types of energy,

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