1. A Study on the Reactive Power Compensation using Instantaneous Power for Self-Commutated Static Var Compensator

전기제어공학과 엄 상 오
지도교수 김 윤 식

The static var compensator(SVC) plays an important role in larger and more complex electric power systems. Rapid and continuous reactive compensation by the SVC contributes to voltage stabilization, power oscillation damping, overvoltage suppression, minimization of transmission losses and so on.

The multilevel inverters connected in series are suitable for high voltage systems because of their circuit structure. They are capable of reducing harmonic component in the AC source side currents without requiring high frequency switching to the devices.

The main problem of multilevel inverters without independent DC voltage source is the unbalance of DC capacitor voltage. Problems in using SVC are the voltage unbalance at each stage of DC capacitor and uncontrollability of reactive power in its low region. DC capacitor voltage equalization is required to ensure the even sharing of voltage stresses in the power devices, and to compensate accurately reactive power.

In this paper, harmonic current components were analyzed to solve these problems and it was found that the voltage distortion of the DC capacitor is caused by the harmonics in resistive mode operation and/or low reactive power.

In addition, the zero point of DC capacitor voltage deviation is investigated by analyzing resistive mode operation and/or low reactive power. It gives a control table for DC capacitor voltage equalization. Asymmetrical Pulse

Amplitude Modulation(PAM) switching pattern is suggested to equalize DC capacitor voltage. The principle of asymmetrical PAM switching pattern is time

shifting of charging or discharging period of DC capacitor by controlling angle.

By using the control table, asymmetrical PAM switching pattern is realized to equalize DC capacitor voltage.

Instantaneous power vector theory which can expresses the instantaneous apparent power vector is proposed to control reactive power. The validity of the proposed method is confirmed by simulation studies and experiments.