Investigation of Active Power Filter for Three-Phase, Four-Wire Load

Hiroyuki Hanaoka and other

1. Introduction
Rectifiers consisting of diodes and thyristors have various harmonic components in their input current. Because these rectifiers are widely used in consumer products and industrial use, the troubles that are caused by the harmonic current, and affect the electric power system have been pointed out. In order to prevent the electric power system from the troubles, investigation on the countermeasures has made advancement. One countermeasure again harmonics is the use of an active filter for electric power systems. Harmonics are modeled using instantaneous space vector theory, and a three-phase, three-wire type active power filter is shown to produce sufficient effect.

In European countries, a singe-phase AC current is obtained using a central neutral wire of the three-phase AC system; this requires an active power filter that works on the three-phase, four-wire(3 ϕ 4W) AC power system. In Japan too, there are some examples in specific fields such as broadcasting station of built-in 3 ϕ 4W AC power systems. The theory for harmonics of three-phase, three-wire(3 ϕ 3W) systems cannot be used to accurately assess the harmonics of the active power filter developed for 3 ϕ 4W AC power systems, and no research on this problem has been done yet.

We investigated the active power filter for the 3 ϕ 4W load and simulated its effect. We demonstrated that the harmonics extraction method proposed in this report can be applied to the conventional the 3 ϕ 3W active power filter.

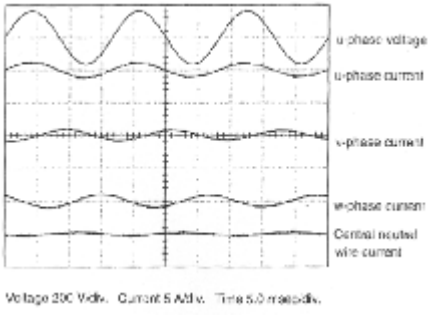

Fig. 8 Load current of three-phase, four-wire after compensation

SANYO DENKI
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