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Fuzzy logic controller of five levels active power filter

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Abstract

This paper presents five-level inverter as a shunt active power filter (SAPF) to compensate reactive power and suppresses harmonics drawn from a diode rectifier supplying RL load under distorted voltage conditions. The harmonic current extraction is based on the use of self tuning filter (STF) and fuzzy logic controller employed to control harmonic current and inverter DC voltage. The aim of the present work is to obtain a perfect compensation by extracting accurate harmonic currents to improve the performances of the five-levels active power filters.

The proposed scheme is validated by computer simulation using MATLAB Fuzzy Logic Toolbox in order to show the effectiveness and ability of this method. The results have demonstrated that the proposed shunt active power filter with STF and Fuzzy Logic Controller (FLC) have produced a sinusoidal supply current with low harmonic distortion and in phase with the line voltage.

Keywords: Shunt active power filter, Five-level inverter, Fuzzy logic control, self tuning filter, Harmonics, Reactive power compensation, PWM control.

1. Introduction

The intensive use of static converters in the industry has lead to an increase in harmonic injection in the power system and a lower power factor. The harmonics causes problems in power systems and in consumer products such as equipment overheating, capacitor blowing, motor vibration, excessive neutral currents and low power factor.

Conventional active power filter was deeply explored and used to eliminate harmonics and compensate reactive power [1–3]. These active power filters are limited in medium power applications. Multilevel configuration were introduced and employed to achieve high power filters.