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A new control strategy to parallel operation of three-phase three-wire inverter and three-phase four-wire inverter

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Abstract

In this paper, parallel operation of three-phase three-wire inverter and three-phase four-wire inverter in the presence of unbalanced and nonlinear loads is investigated. The proposed control method has two current internal and voltage external control loops. Current internal loop has a proportional-resonant controller. The voltage external loop has two parts including voltage controller and load current sharing. In the current sharing part, first output of voltage controller is broken to harmonic and then is shared between the inverters with the new strategy: 1) Supply of zero sequence load current by four-leg inverter and sharing the rest of orders evenly between two inverters. 2) Supply harmonic orders of load current by four-leg inverter and sharing load current positive orders evenly between the inverters. The proposed system is capable to feed balanced, unbalanced and nonlinear loads and provides proper sinusoidal voltage at both ends of the loads by exact sharing of power between parallel inverters. The simulation results show the proper functioning of the proposed system.

Key words: Four-leg inverter, Parallel inverter, Harmonic current sharing, Total Harmonic Distortion

1. Introduction

Due to increasing electronic equipment, much of uninterrupted power supply loads are formed by non-linear and unbalanced loads. These nonlinear and unbalanced loads cause voltage disturbances that would directly affect the proper functioning of loads and inverters.

Three-phase three-wire inverters are widely used in different applications, but these inverters are capable of providing zero-sequence current. Four-leg Inverters due to a leg more than three leg inverters have the ability to pass zero-sequence currents of nonlinear are unbalanced loads through the fourth leg [13].

Generally, there are two configurations for the four-wire inverters: three-leg inverters with Split capacitors and four-leg inverters as neutral point of load is connected to the fourth leg. Comparison of these two types of four-wire inverter shows that the four-leg inverters have better performance for low voltage applications, particularly in cases with neutral