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Control Design of a Two Degree of Freedom Combined with Repetitive Controller Applied to a Single Phase Inverter Power Generation in the Context of Microgrids.

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Abstract- This paper present the design, analysis and implementation of a control scheme Two Degrees Of Freedom 2DOF combined with a Repetitive Control. This reduces Total Harmonics Distortion in voltage (*THDv*), when inverters that operates as voltage sources in microgrids. The controller is designed to be applied to inverters operating in island mode. The goal is to keep the waveform, frequency and amplitude of the grid voltage, when it has linear or nonlinear loads. The analysis and design of the control system is presented in detail.

Keywords

Two Degree of Freedom, Repetitive Control, Microgrids

1. Introduction

Currently, as a result of increased electricity demand, they are promoting new forms of generation. Based on renewable energy such as wind, solar and fuel cell. These systems can work injected energy to the grid or to a separate load, it depends on the needs to be taken. In this context, this requires that you have systems that allow flexible work both ways. These new generation schemes, called Distributed Generation (DG) [1], [2].

In this scheme of generation, it is necessary to implement interfaces for the connection of these small units. These can be connected to the grid (operation in connection to grid). As well as, providing power to loads in the absence of the grid (island operation mode). These interfaces are known microgrids [3].

Considering that one of the ways to operate the inverter is in island mode, driving local loads without a grid connection. Must, ensure the quality of supply ensuring the waveform, amplitude and frequency of the signal to the load. To achieve this, it is proposed to implement a Two Degrees of Freedom (2DOF) control combined with a repetitive controller, which in the presence of nonlinear loads reduce the Total Harmonics Distortion in voltage (*THDv*) to be supplied the charge. Its application is justified, because the harmonic currents increase the loss, damage the quality of the voltage waveform, produce extra power for neutral, and can also cause resonance and interference [4].

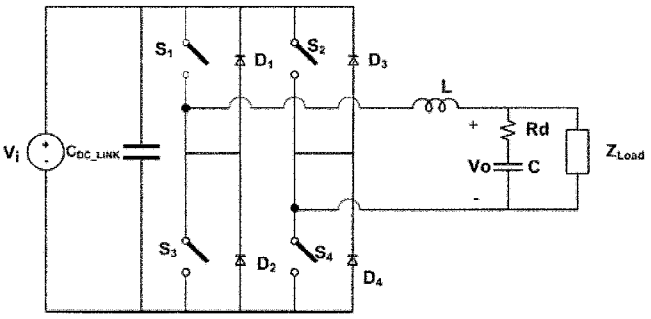

Fig. 1. Circuit scheme of the inverter for operation in island mode.

2. System Description

The topology of the system under study is using a diagram of a single-phase full-bridge inverter as shown in Fig. 1. The input is an array of panels, with a power of 2kW and a voltage of 400V. The output voltage waveform is sine, with the amplitude 230 V_{rms} Vrms.

For analysis, the inverter can approach a Buck circuit [5], taking into account that the point of operation, periodic signals are handled time-varying.

The expression that relates the output voltage to input voltage in terms of duty cycle D is presented in equation (1).