

1 Introduction

Aiming at the harmonic problem caused by nonlinear loads, the commonly used waveform control technologies at present includes repetitive control and resonant control, which both belong to internal model control technology. Resonant control can reduce the output impedance of three-phase inverter at the resonant frequency. This paper designs a resonant controller to suppress the harmonics of three-phase output voltage waveform.

2 Principle and Design

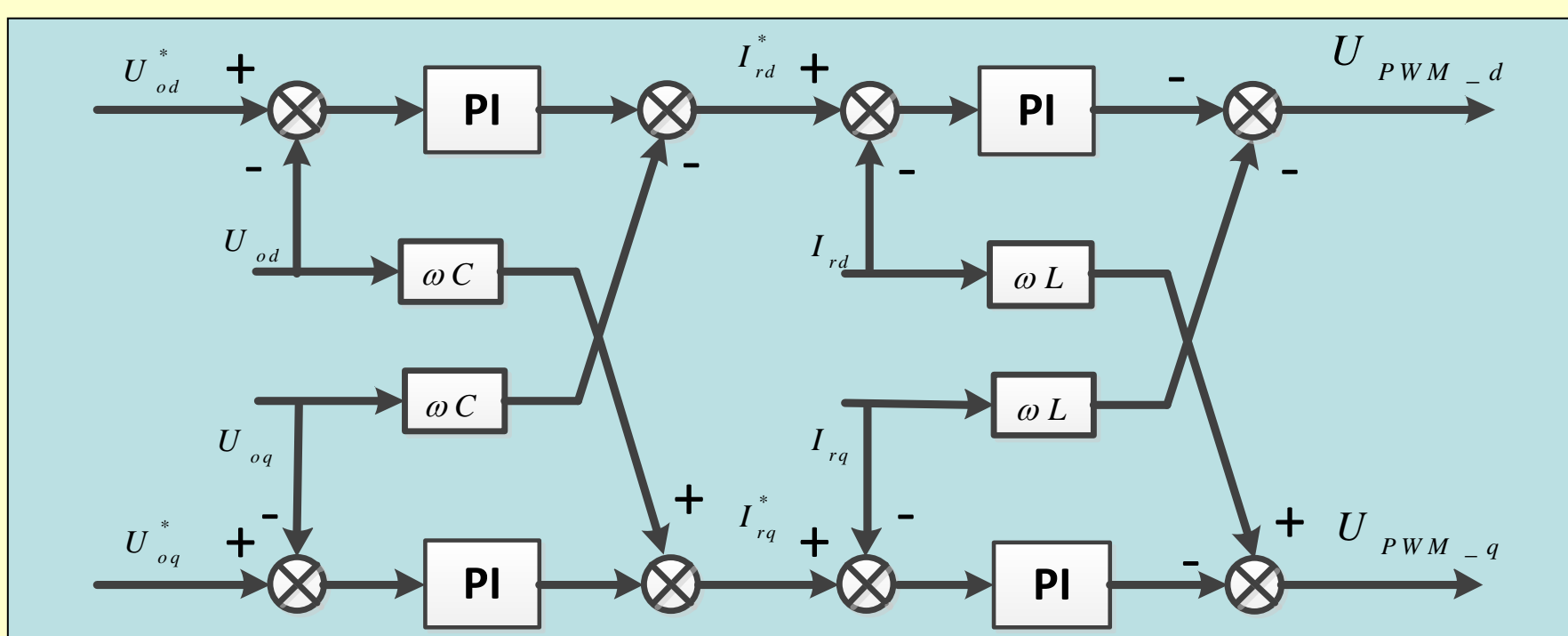


Fig. 1. Illustration of double closed loop control strategy for off-grid inverter power supply.

The voltage and current double closed-loop control strategy is adopted, and the control block diagram is as Fig. 1.

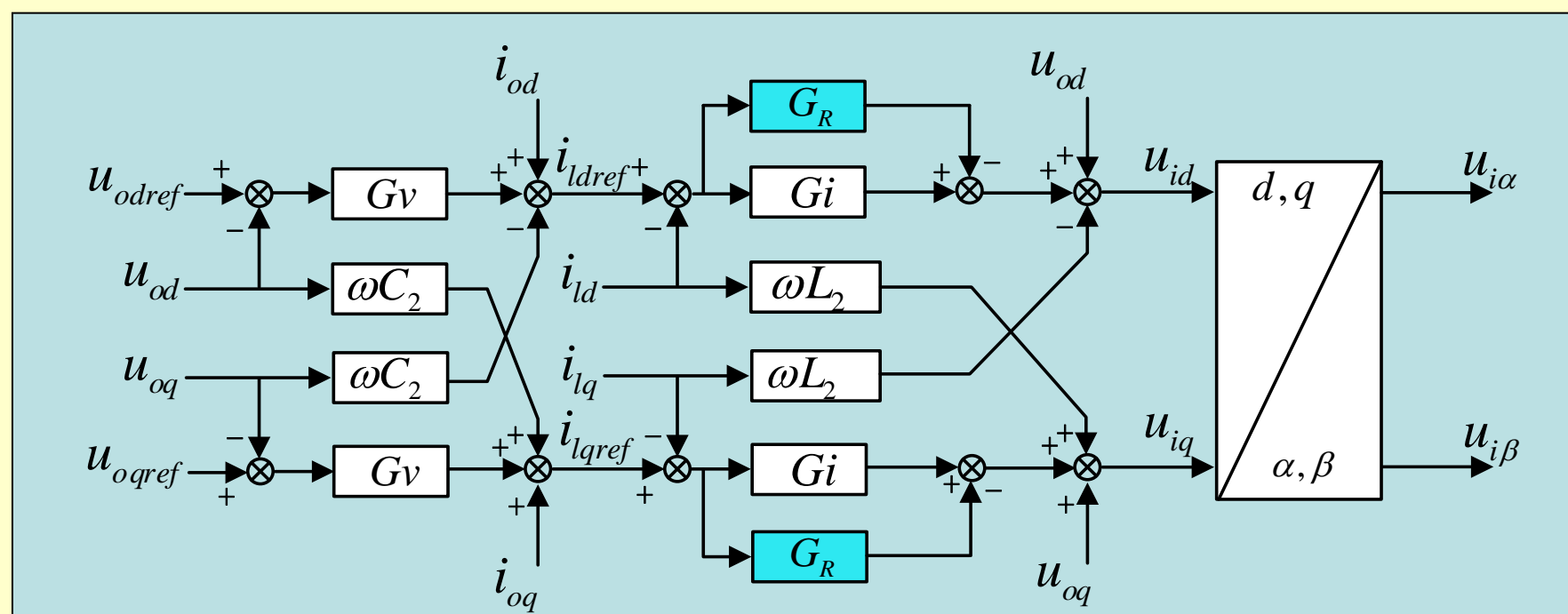


Fig. 2. The block diagram of the improved off-grid inverter controller.

A six-order resonant controller is added to the inner

loop of the original double closed-loop controller, which is showed in Fig. 2. The harmonic controller can significantly improve the gain at the resonant frequency point of 300 Hz.

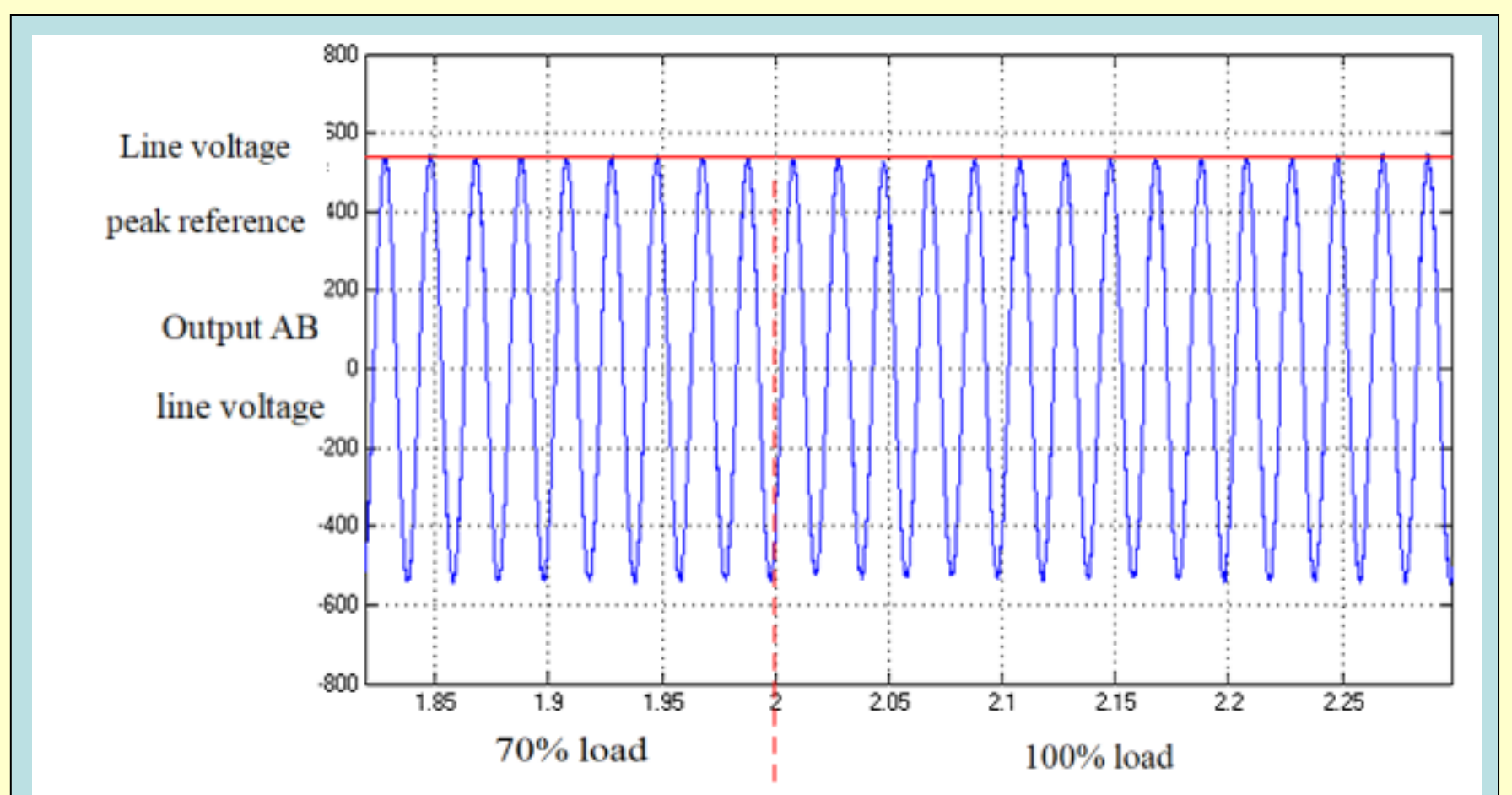


Fig. 3. Output voltage waveform when load suddenly changes from 70% of rated load to 100% of that.

The voltage waveforms are simulated when the system starts with a load and when the load changes suddenly, Simulation results show that in the dynamic process and steady-state process, output voltage waveforms have high sinusoidal degree and small distortion, and that the control strategy is stable and effective.

Summary

Through the analysis of the main circuit topology and control strategy of the three-phase inverter power supply, this paper proposes a voltage and current double closed-loop control strategy for the three-phase inverter power supply based on the resonant controller. The outer voltage loop controls the output AC voltage to be stable, and the current inner loop increases the system response speed and has the current limiting function at the same time. Through theoretical analysis, the adjustment parameters of the controller are obtained to realize the accurate control of the output voltage of the power supply. The application of resonant controller solves the possible distortion problem of output voltage, flexibly suppresses each harmonic, and ensures the sinusoidal degree of output voltage. The effectiveness of the control strategy is verified by simulations and experiments.