

中 文 摘 要

單相直交流轉換器之應用相當廣泛，然而受限於每個功率半導體開關元件之耐壓耐流能力，所以單台單相直交流轉換器之容量也受到限制。因此可利用單相直交流轉換器之並聯運轉以提升容量，應用於較大功率需求之系統中。因此本論文所研究的內容主要聚焦於有關於單相直交流轉換器之並聯控制技術。

基本上，本論文的主要貢獻可歸納成以下三點：首先針對單相直交流轉換器提出一新型的控制策略，可以改進現有文獻中控制器之對於非線性負載之暫態響應性能較差的缺失；此新型的控制策略係巧妙地採用簡單且無時間延遲之比例控制作為電壓調節器與電流調節器，即可達到快速的暫態響應以及零穩態誤差。其次，再基於吾人所提新型控制策略之原理加以擴充，提出一能使並聯各子系統達到均流控制目標之新型並聯控制策略；此控制策略不僅可以不受電路參數變化影響，而且仍能有效達到均流之目標，並且可以保留輸出電壓快速的暫態響應與零穩態誤差等優點。最後，並將吾人所提之並聯控制策略，採用德州儀器公司新上市之 DSPTMS320F2812 加以實現；其中參考均流命令係在 DSP 內部經由數位運算產生，因此不需“分享匯流排”(Share Bus)作為各轉換器間控制連接，可以增加系統之可靠度。經由製作完成之硬體雛形實測結果顯示，本論文所提之新型並聯控制策略，確實可以達到預期的效果。

Abstract

The application of single-phase DC to AC converters is quite popular. However, due to the limited voltage/current rating of power semiconductor components, the capacity of a single inverter is also constrained. A simple strategy to increase the output power capacity is by parallel operation of several inverters. In fact, the content of this thesis is focused on the research of parallel control techniques.

Basically, the major contributions of this thesis may be summarized as follows. First, a novel control strategy is proposed to enhance greatly the dynamic performance of a single inverter. Only simple proportioned controls are adopted for the voltage regulator and the current regulator as well as for the feedforward and feedback controllers. The enhanced dynamic performance can be observed clearly from the transient response to a nonlinear load. Second, based on the previous control, a novel parallel control strategy is proposed to achieve the goal of uniform sharing of the output current for each inverter. Again, in addition to the uniform current sharing characteristic, the merits of fast response and with zero steady state error of a single inverter control can be preserved for the compound system. Finally, a prototype system is successfully constructed by using a high speed digital signal processor, namely DSPTMS320F2812. Experimental results show that the proposed parallel control strategy can indeed achieve the desired performance.