中文摘要

本文發展一三相/單相電能轉換系統，該三相/單相電能轉換系統由一電能轉換器、一零序變壓器組及一濾波電容器組成。本文所發展之三相/單相電能轉換系統應用於三相配電系統作爲單相電能調節器，從三相系統吸收實實功，且維持三相電流平衡，低諧波失真及單位功因，避免三相系統受單相負載之影響，而造成三相不平衡及諧波污染，且能提供一高品質的單相電壓以提供負載。另一方面，該三相/單相電能轉換系統亦可應用於小型風力發電系統，將三相風力發電機所產生之頻率及振幅不固定之三相電能轉換成單相電能饋入單相配電系統，它可以維持三相風力發電機側的三相平衡、低諧波失真及單位功因以維持風力發電機之運轉平順，此外，將發展一新式的最大功率追蹤方法，以從風力發電系統中擷取最大電能，而在單相配電系統端則產生一與電壓同相位之弦波電流饋入配電系統。由於本文所發展之三相/單相電能轉換系統只包含一級電能轉換器，所以具有電力架構及控制電路簡單之優點。

英文摘要

In this thesis, a three-phase/single-phase power conversion system is developed. The three-phase/single-phase power conversion system is configured by a power converter, a zero-sequence transformer set and a filter capacitor. The three-phase/single-phase power conversion system can be applied to the three-phase distribution power system to perform a single-phase power conditioner. In this application, the three-phase/ single-phase power conversion system absorbs a real power from the three-phase distribution power system, and it will perform the functions of three-phase balance, low harmonic distortion and unity power factor in spite of single-phase load used. Moreover, the three-phase/single-phase power conversion will supply a single-phase voltage with high power quality for supplying power to the single-phase load. The three-phase/ single-phase power conversion system can also be applied to the small capacity wind power generation system for converting the unregulated three-phase power to a high quality single-phase power and being injected to the single-phase distribution power system. In this application, the three-phase/single-phase power conversion system can perform the functions of three-phase current balance, low harmonic distortion and unity power factor for operating the three-phase power generator smoothly, and a new maximum power point tracking method is developed to extract the maximum power of small-capacity wind power system. Additionally, the three-phase/single-phase power conversion system can also generate a current which is sinusoidal and in phase with the voltage to the single-phase distribution power system. Since the proposed three-phase/single-phase power conversion system contains only one power converter, it has the advantages of simplifying the power circuit and control circuit.