Design and implementation of Single-Phase Power Converter for Frequency Changing of AC Voltage

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Abstract

This paper proposes a new single-phase power converter topology for changing the frequency of AC voltage. The proposed single-phase frequency converter (SFC) includes a T-type multi-level power converter (TMPC), a frequency decoupling transformer (FDT) and a digital signal processor (DSP). The TMPC can convert a 60 Hz AC voltage to a DC voltage and then convert the DC voltage to a 50 Hz AC voltage. Therefore, the output currents of the two T-type power switch arms have 50 Hz and 60 Hz components. The FDT is used to decouple the 50 Hz and 60 Hz components. The salient feature of the proposed SFC is that only one power electronic converter stage is used since the functions of the AC-DC and DC-AC power conversions are integrated into the TMPC. Therefore, the proposed SFC can simplify both the power circuit and the control circuit. In order to verify the functions of the proposed SFC, a hardware prototype is established. Experimental results verify that the performance of the proposed SFC is as expected.

Key words: Frequency decoupling transformer, Frequency converter, Multi-level, Power converter