ABSTRACT

Transformer-isolated inverters are widely used in ac/dc power conversion that requires galvanic isolation between the source and load. The main applications for these inverters are the uninterruptible power supply, AC motor drives and renewable energy systems. Besides providing electrical isolation, the transformer is used to match the input-output voltage levels requirement. The conventional inverter normally utilises the line-frequency (50Hz) transformer. This circuit is very attractive because it requires minimum number of power switches and therefore exhibits low on-state conduction losses. Furthermore this inverter is inherently bidirectional, i.e. the power can flow from source to load and vice versa. This is mandatory for inverter with inductive loads, as during certain parts of the sinusoidal cycle, the current direction is reversed. The bidirectional capability is accomplished by the diodes which are placed in anti-parallel to the main power transistors. Despite its simplicity and inherent bidirectional capability, there remains one drawback of this topology, i.e. the 50Hz transformer. This component constitutes a significant portion of the inverter's weight and space. An alternative to this topology is the high frequency (HF) transformer link inverter. This type of inverter is compact and lightweight due to the size of the ferrite transformer operated at high frequency. However, the overall inverter is significantly more complex in terms of circuit design and construction. Nevertheless, in applications where weight and size is the major limitation, this inverter can be a cost-effective choice. In a previous work, the dc-dc converter type bidirectional HF link inverter has been described [1]. One of the main concerns of this topology is the occurrence of large spike across the active rectifier's switches. Its presence is caused by the leakage inductance at the transformer's secondary. Although this is important, it was not adequately explained in [1] as the focus was on the topological and modulation aspect of the inverter. This work is intended to address the problem by proposing a modification to the inverter. The spike is suppressed by introducing a regenerative snubber network at the transformer's secondary circuit. By employing the snubber, the voltage spike is effectively reduced to a very low value. In addition, the energy contained in the spike is converted back to the main power stage. This will further increase the efficiency of the inverter.