Design and analysis of three phase inverter based Solar PV powered single switch Buck-Boost converter with reduced THD for industrial applications

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Abstract

The development of economical and sustainable eco-friendly renewable source powered power electronic converters have become more attractive in various areas such as automotive, household and industrial applications etc., Bucking and boosting of voltage according to the requirement is also much needed. So, this work proposes a solar PV powered single switch buck-boost converter which reduces implementation cost, minimal voltage and current stress across the capacitors and diodes and less switching power losses. The work structure comprises of solar PV source with modified P and O algorithm based MPPT, single switch buck-boost dc-dc converter, battery backup to store excess energy, three phase inverter with sinusoidal PWM to find optimal switching angles for harmonic control and 3Φ induction motor load. Here reduction of THD is applied to the line to line voltage of the inverter. Performance analysis of the proposed circuit is done using MATLAB/SIMULINK platform. A detailed steady state analysis of the dc-dc converter topology is also analyzed to system stability. The proposed single switch buck-boost converter is designed to provide an output voltage and current of 363V, 45.5A DC from 520V, 35A PV array. The designed converter is then employed to run a three phase full bridge inverter with 440V, 15A AC. From the simulation

results, it is found that the solar powered single switch buck-boost with MPPT is stable, efficient with minimal losses and less THD with better quality output.

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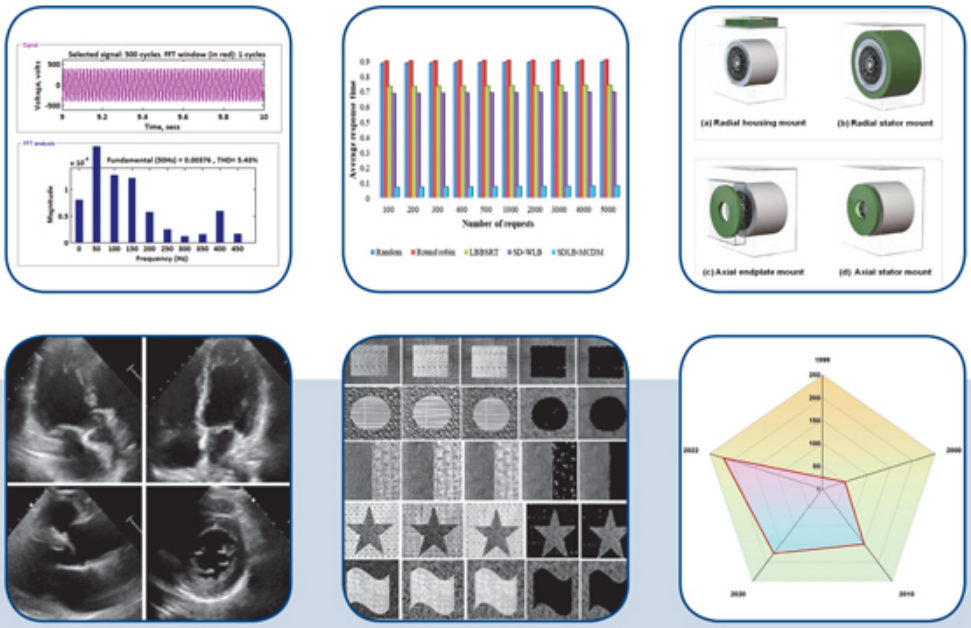

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