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Buck Boost Inverter to Improve the Efficiency and Performance of E-Motor by Reducing the Influence of Voltage Sag of Battery on the Performance of E-Motor

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Abstract : This paper researches the impact of battery voltage sag on the performance and efficiency of E-motor in electric cars. Terminal voltage of battery reduces with the S.o.C. This results in the downward shift of torque-speed curve of E-motor and increased copper losses in E-motor. By introducing a buck-boost inverter between the battery and E-motor, an additional degree of freedom was achieved. By boosting the AC voltage, the dependency of voltage sag on the performance of E-motor was eliminated. A strategy was also proposed for the operation of the buck-boost inverter to minimize copper and iron losses in E-motor to maximize efficiency. MATLAB-SIMULINK model of E-drive was used to obtain simulation results. The temperature rise in the E-motor was reduced by 14% for a 10% increase in AC voltage. From the results, it was observed that a 20% increase in AC voltage can result in improvement of running torque and maximum torque of E-motor by 44%. Hence it was concluded that using a buck-boost inverter for E-drive significantly improves both performance and efficiency of E-motor.

Keywords : buck-boost, E-motor, battery, voltage sag
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