Analysis and Optimization of Fault-Tolerant Behaviour of Motors in Electric Vehicular Systems

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Abstract: The advent of electrification in vehicular drives has proven to be challenging over time. An increase in electronics in drive systems has demonstrated escalation in performance efficiency but has, in turn, escorted extensive concerns regarding internal electric faults and safety. Failure of the drive caused by the abnormal conditions will ultimately cause the failure of the entire electric vehicle system. Thus, the fault tolerance capability of a motor drive is of utmost importance for enhancing motor speed limit range and safety. Several methods of fault detection have already been worked upon. The scope of this research includes analyses of torque ripple values, State of Charge (SOC) decline rate and minimum-maximum torque acquired by Switch Reluctance Motor (SRM) and Permanent Magnet Synchronous Motor (PMSM) drives under varied fault conditions. Furthermore, a solution to increase the fault tolerance capability of the PMSM motor drive will be discussed.

Keywords: PMSM, SRM, electric vehicle system, EV drives, fault-tolerance, state of charge, efficiency, torque

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