Jae Hun Choi et al., Expert Opin Environ Biol 2017, 6:4
DOI: 10.4172/2325-9655-C1-017

The cooling technologies for effective performance of brushless direct current motor

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The growing demand for high efficient energy utilization of vehicles replaces hydraulic systems with electro-hydraulic actuators. The benefits of the electro-hydraulic system are energy recovery/storage, variable speed, power on demand and reduced emission. In era of electric vehicle, the electronic components (motor, power electronics and battery) for the electro-hydraulic system requires effective, reliable and long-life time technologies. The authors present a recent research on the cooling technology applied for the development of an effective brushless direct current (BLDC) motor which electronically performs rectification without brushes. In general, BLDC motor is well-known to low noise, high durability and reliability. Nonetheless, unavoidable temperature increase during operation reduces the efficiency of the motor due to increased losses. The critical loss is resolved into iron and copper losses in accordance with the mechanisms. In this regard, a numerical model has been developed to simulate the losses induced by temperature increase. The numerical model is validated by conducting experimentation which presents excellent agreement with the simulation results. During the operation of the motor for 20 minutes, the temperatures increase up to 62.3°C and 32.2°C for stator and magnet respectively. The authors also demonstrate air cooling structure to reduce the temperatures resulting in reduced losses, increased motor efficiency and durability.

Biography

Jae Hun Choi transferred from a community college to a Changwon National University and changed the major to Mechanical Engineering. He has studied about the Lithium-ion battery for a graduation thesis. So far, he has participated in several conferences with his Professor Park and he was awarded a prize at the conference held at his university. Currently, he is studying lithium-ion battery and BLDC motor in Nano Thermofluidic Energy Transfer Laboratory with Professor Heesung Park.

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