ABSTRACT

Technological advancements have driven innovation in the global transportation industry, including the development of motorcycles, which are becoming increasingly popular due to their practicality. In Indonesia, motorcycle usage continues to rise each year, from 120,042,298 units in 2021 to 125,305,332 units in 2022 (BPS, 2022). However, this increase also raises concerns about fuel consumption and air pollution. As a solution, the government promotes the Battery Electric Motorized Vehicle (KBLBB) program through Presidential Regulation No. 55 of 2019. One of the key technologies in electric vehicles is the use of Brushless DC (BLDC) motors, known for their high efficiency, dynamic response, and longer lifespan. The electric vehicle drivetrain consists of three main components: the battery, controller, and BLDC motor, which is classified into two main types: wheel-hub motors and mid-drive motors. This study aims to analyze the performance of an in-wheel hub BLDC motor as the powertrain of an electric motorcycle with variations in magnet parameters using Ansys Motor-CAD. Additionally, it evaluates the effect of cogging torque and compares simulation results with experimental findings. The results indicate that the simulated torque for the QS motor is 49 Nm, while the designed dynamo achieves 59 Nm. The dyno test results also show significant improvements, with the designed dynamo producing a maximum torque of 350 Nm compared to 300 Nm for the QS motor, along with higher efficiency (89% vs. 85%) within the optimal operating range of 390–590 RPM.

Keywords: BLDC, Cogging Torque, Electric Vehicle, Magnet