World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:18, No:07, 2024

Experimental Validation of a Mathematical Model for Sizing End-of-Production-Line Test Benches for Electric Motors of Electric Vehicle

Authors : Emiliano Lustrissimi, Bonifacio Bianco, Sebastiano Caravaggi, Antonio Rosato

Abstract : A mathematical model has been developed to optimize the design of an end-of-production-line (EOL) for testing and validating the performance and functionality of newly manufactured electric motors (EMs) for electric vehicles. The model has been developed to predict the behaviour of EOL test benches and EMs under various boundary conditions, eliminating the need for extensive physical testing, with the main target of reducing the corresponding power consumption. The maximum performance to be guaranteed by the EMs according to the carmaker specifications is taken as inputs. Then, the required performance of each main EOL test bench component is calculated and the corresponding systems available on the market are selected based on manufacturers' catalogues. According to the model outputs, an EOL test bench has been designed for testing a low-power (about 22 kW) EM. The performance of the designed EOL test bench has been measured and used to validate the proposed model to assess both the consistency of the constraints as well as the accuracy of predictions in terms of electric demands. The comparison between experimental and predicted data exhibited a reasonable agreement, allowing to demonstrate that, despite some discrepancies, the model gives an accurate representation of the EOL test benches' performance.

Keywords : electric motors, electric vehicles, end-of-production-line test bench, mathematical model, field tests
Conference Title : ICEMDS 2024 : International Conference on Electric Machines and Drive Systems
Conference Location : Vienna, Austria
Conference Dates : July 29-30, 2024