World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:13, No:06, 2019

Design and Development of Tandem Dynamometer for Testing and Validation of Motor Performance Parameters

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Abstract : The project aims at developing a cost-effective test bench capable of testing and validating the complete powertrain package of an electric vehicle. Emrax 228 high voltage synchronous motor was selected as the prime mover for study. A tandem type dynamometer comprising of two loading methods; inertial, using standard inertia rollers and absorptive, using a separately excited DC generator with resistive coils was developed. The absorptive loading of the prime mover was achieved by implementing a converter circuit through which duty of the input field voltage level was controlled. This control was efficacious in changing the magnetic flux and hence the generated voltage which was ultimately dropped across resistive coils assembled in a load bank with all parallel configuration. The prime mover and loading elements were connected via a chain drive with a 2:1 reduction ratio which allows flexibility in placement of components and a relaxed rating of the DC generator. The development will aid in determination of essential characteristics like torque-RPM, power-RPM, torque factor, RPM factor, heat loads of devices and battery pack state of charge efficiency but also provides a significant financial advantage over existing versions of dynamometers with its cost-effective solution.

Keywords : absorptive load, chain drive, chordal action, DC generator, dynamometer, electric vehicle, inertia rollers, load bank, powertrain, pulse width modulation, reduction ratio, road load, testbench
Conference Title : ICEMEMD 2019 : International Conference on Electric Motors and Electric Motor Design
Conference Location : Barcelona, Spain
Conference Dates : June 11-12, 2019

Open Science Index, Electrical and Computer Engineering Vol:13, No:06, 2019 publications.waset.org/abstracts/107603.pdf