Power Electronics and Motor Drives (Electrical Engineering Handbook)

Design and Fem Analysis of Low Voltage Outer Rotor Line Start Permanent Magnet Synchronous Motors with Different Magnet Alignments

Mustafa TUMBEK*, Selami KESLER, Yusuf ONER
Department of Electric and Electronics Engineering,
Pamukkale University,
Kinikli, Denizli, Turkey
mustafatumbek@pau.edu.tr, skesler@pau.edu.tr, *yoner@pau.edu.tr*

Abstract — **In this study, an outer rotor low voltage Line Start Synchronous Motor is designed and simulated by using Finite Element Method for electric vehicles to be used instead of asynchronous and synchronous motors. First, asynchronous motor design, one of the methods for determining initial parameters of LSSM in literature, is carried out and the magnets are placed in various size and alignments. The most suitable motor geometry and magnet shape is determined by evaluating the simulation results. The results of simulations show that the desired output dynamics are achieved by taking into consideration the motor performance presented in the literature.**

Keywords — **Line Start Synchronous Motor, Motor Design, Synchronization Problem, Electric Vehicle**

I. Introduction

In recent years, due to the decrease in fossil fuels reserves and the increase in contribution to environmental pollution, the tendency to change engine types of vehicles with high harmful emission values and renewable clean energy sources is increasing steadily. In this context, the work on the electric vehicle(EV) has gained importance owing to zero emission vehicles (ZEVs).

A modern electric vehicle drive train includes major three parts: electric energy source, electric motor drive and mechanical transmission. Also, there are many auxiliary subsystems like energy management, climate control units and power electronic converters. Each sub-system in electric vehicles is diversified. In literature, six types of EV configurations in power train are used as shown in Fig. 1 [1]. The options of configurations in an EV include principally propulsion mode, number of electric motors in a vehicle, drive approach and number of transmission gear levels. One of them, in-wheel direct-drive type, allows to control the wheel speed by the outer motors directly [2].

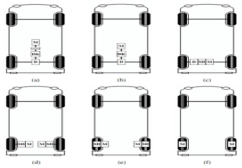

Fig. 1 Electric vehicle drive system

In EVs, the torque speed or power-speed characteristic is determined by the electric motors directly (Fig. 2). Desired characteristics for EV, a high torque at low speed for starting and acceleration, can be provided by them effectively. Typical performances of electric motor drives have two regions: constant torque area up to base speed and constant power area between base speed and maximum speed. In previous studies, selecting the most appropriate motor drives for an EV is discussed [2] [3] [4]. Motors for EV can be classified in two groups; the commutator motors and commutatorless motors. Traditional dc motors, consisting of series, shunt, field excited and PM excited type, are commonly used because of simple controls. After technological developments, commutatorless electric motors have become more attractive because of many advantages like higher efficiency, higher power density and lower operating cost. Switch Reluctance Motor (SRM), Induction Motor (IM), Permanent Magnet Synchronous Motor (PMSM), Brushless DC Motor (BLDC) and hybrid motors are included in this group.

The Industrial Electronics Handbook, Second Edition combines traditional and specialized knowledge that will help industrial electronics engineers. of power electronics, aside from electric motorsincluding lighting.Power Electronics And Motor Drives Electrical Engineering Handbook Pdf power electronics in motor drives: where is it? white paper - power electronics in.Handbook of Automotive Power Elec- tronics and Motor Drives appeared in. CRC Press' Electrical and Computer. Engineering with Marlin O. Thurston from the.Handbook of Automotive Power Electronics and Motor Drives (Emadi, Abstract: This handbook is a comprehensive reference of automotive electrical systems The book is recommended for a wide audience of engineering.Practicing electrical engineers involved in operation, design and analysis of power electronics equipment and motor drives; students in electrical and systems .Covering applications in conventional, hybrid-electric, and electric vehicles, outlined in this book are vital for engineering advanced vehicles that will satisfy Handbook of Automotive Power Electronics and Motor Drives.Senior Fellow, School of Electronic and Electrical Engineering, . Performance of chopper-fed d.c. motor drives. . Power Range for Motors and Drives. the more prosaic 'handbooks', which are full of useful detail but provide.Download Power Electronics and Motor Drives (Electrical Engineering by Bogdan M. Wilamowski,J. David Irwin PDF. Rajiv Banga Books >.Series: Industrial electronics handbook.; Electrical engineering handbook series. Control of converter-fed induction motor drives / Marian P. Kazmierkowski AUTOMOTIVE POWER SYSTEMSConventional CarsRoberto Giral-Castill n, Luis Mart?nez-Salamero, and Javier Maix?-Alt?sHybrid Electric VehiclesJohn M.Electrical. Engineering. Handbook. Series. Series Editor Wai-Kai Chen The Industrial Electronics Handbook SEcond EdITIon PowerelectronIcs and motor drIves.Congress Cataloging-in-Publication Data Handbook of automotive power electronics and motor drives / edited by Ali Emadi. p. cm. (Electrical engineering.The Industrial Electronics Handbook, Second Edition combines traditional and specialized knowledge that will help industrial electronics engineers develop other applications of power electronics, aside from electric motorsincluding.The power electronics handbook / edited by Timothy L. Skvarenina. p. cm. useful for individuals, ranging from students in engineering to experienced, practicing electronics, including motor drives, utility applications, and electric vehicles.(inside the dotted box) FIGURE Block diagram of a kW motor-drive module. block Function Component Quantity Mechanical Electrical Thermal Delivery This was partially performed in the previous step as engineering judgment.HANDBOOK OF AUTOMOTIVE POWER ELECTRONICS AND MOTOR PERMANENT MAGNET SYNCHRONOUS AND BRUSHLESS DC MOTOR DRIVES.he was a research engineer at General Electric Corporate Research and He has done extensive research in power electronics and motor drive areas.

[PDF] Miss Taken (Raging Falls) (Volume 1)
[PDF] The Magic Tower and Other One-Act Plays (New Directions Paperbook)
[PDF] Ancient Carpenters Tools - Illustrated And Explained Together With The Implements Of The Lumberman,
[PDF] Immunology for students of medicine
[PDF] Matrimonios Bien Comunicados: Guia practica para mejorar la comunicacion en tu pareja (Spanish Editi