Design Of Brushless Permanent Magnet Machines

Brushless permanent magnet (PM) motors can be divided into the PM synchronous AC motor (PMSM) and PM brushless DC motor (PMBDCM). The former has sinusoidal airgap flux and the back EMF, thus has to be supplied with sinusoidal current to produce constant torque. The PMBDCM has the trapezoidal back EMF, so the rectangular current waveform in its armature winding is required to obtain the low torque ripple. Generally, the magnets with parallel magnetization are used in the PMSM while the magnets with radial magnetization are suitable for the BDCM. The interior PM (IPM) synchronous machine is being studied as a promising candidate for high-power starter/alternator in future internal combustion engine vehicles. The other many popular applications of IPM machine are traction, machine tool, spindle drives, air conditioning compressors and electrical vehicles. Torque ripple minimization in PM motors is conventionally obtained by either good motor design or appropriate control strategies. In design optimization programs, a reliable and detailed analysis of the torque and back-EMF of the machine should be performed.

Brushless permanent-magnet motors provide simple, low maintenance, and easily controlled mechanical
power. Written by two leading experts on the subject, this book offers the most comprehensive guide to the design and performance of brushless permanent-magnetic motors ever written. Topics range from electrical and magnetic design to materials and control. Throughout, the authors stress both practical and theoretical aspects of the subject, and relate the material to modern software-based techniques for design and analysis. As new magnetic materials and digital power control techniques continue to widen the scope of the applicability of such motors, the need for an authoritative overview of the subject becomes ever more urgent. Design of Brushless Permanent-Magnet Motors fits the bill and will be read by students and researchers in electric and electronic engineering.

Axial Flux Permanent Magnet (AFPM) brushless machines are modern electrical machines with a lot of advantageous merits over their conventional counterparts. They are increasingly used in power generation, domestic appliances, industrial drives, electric vehicles, and marine propulsion drives and many other applications. This book deals with the analysis, construction, design, optimisation, control and applications of AFPM machines. The authors present their own research results, as well as significant research contributions made by others. This monograph will be of interest to electrical engineers and other engineers involved in the design
and application of AFPM brushless machine drives. It will be an important resource for researchers and graduate students in the field of electrical machine and drives. An advanced introduction to the simulation and hardware implementation of BLDC motor drives A thorough reference on the simulation and hardware implementation of BLDC motor drives, this book covers recent advances in the control of BLDC motor drives, including intelligent control, sensorless control, torque ripple reduction and hardware implementation. With the guidance of the expert author team, readers will understand the principle, modelling, design and control of BLDC motor drives. The advanced control methods and new achievements of BLDC motor drives, of interest to more advanced readers, are also presented. Focuses on the control of PM brushless DC motors, giving readers the foundations to the topic that they can build on through more advanced reading. Systematically guides readers through the subject, introducing basic operational principles before moving on to advanced control algorithms and implementations. Covers special issues, such as sensorless control, intelligent control, torque ripple reduction and hardware implementation, which also have applications to other types of motors. Includes presentation files with lecture notes and Matlab 7 coding on a companion website for the book.
This dissertation, "Design, Analysis, Control and Application of Permanent Magnet Brushless Dual-memory Machines" by Fuhua, Li, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. Abstract: Conventional PM machines have fixed PM excitation and can only perform flux-weakening by controlling the d-axis current. This current incurs the power dissipation and reduces the efficiency during flux-weakening operations. Memory machines change this situation by introducing the memory function, namely magnetizing or reversely magnetizing Al-Ni-Co PMs to change the air-gap flux density. This provides another new way to realizing flux-weakening. And the elimination of the flux-weakening d-axis current improves the overall efficiency. But the single-memory machines have lower power density due to the low-energy Al-Ni-Co PMs. By incorporating the memory concept and with the intention of improving the power density, the DC-excited PMBL dual-memory machines have been proposed and implemented, based on two kinds of PMs which are high-coercivity Nd-Fe-B PMs and low-
coercivity Al-Ni-Co PMs. The Nd-Fe-B PMs provide a strong magnetic field to excite high air-gap flux density; while the Al-Ni-Co PMs can be forward magnetized to strengthen the magnetic field produced by Nd-Fe-B PMs or can be reversely magnetized to cancel that field. Consequently the air-gap flux density can be controlled within a wide range. A series of design principles on such kind of dual-memory machine are devised for guidance. The key design principles involve how to determine the number of salient poles on the stator and rotor, how to choose the surface areas and thicknesses of the two kind of PM pieces and how to size the rotor dimension. Generally, increase on the proportion of Nd-Fe-B PMs will raise the base field and the load capacity. On the other hand, increment on the proportion of Al-Ni-Co PMs will extend the controllable flux range. Analysis is also carried out on the equivalent magnetic circuit to formulate the magnetizing force exerted on Al-Ni-Co PMs. The machine model is analyzed by using time-stepping FEM (TS-FEM) and co-simulation of FEM software and Matlab Simulink. The dynamic reverse magnetizing processes are simulated and presented in details under different magnetizing current. In addition the effect of adding iron bridges between the two kinds PMs is also evaluated by simulations. Furthermore, the control methods are evaluate by simulations and experiments. The direct torque
control (DTC) scheme is adapted to this doubly-salient dual-memory machine and a torque estimator is proposed to facilitate the DTC method. Both of the simulation results and the experimental results confirm the validity of the proposed design principles and the effectiveness of the control methods. Eventually, this dual-memory machine is proposed as a pole-changing wind power generator and a pole-changing EV machine. Simulation and experimental results have verified the validity of the pole-changing scheme and the pole-protection scheme. DOI: 10.5353/th_b5387979 Subjects: Electric motors, Brushless - Design and construction Permanent magnet motors

There is a growing number of applications that require fast-rotating machines; motivation for this thesis comes from a project in which downsized spindles for micro-machining have been researched. The thesis focuses on analysis and design of high-speed PM machines and uses a practical design of a high-speed spindle drive as a test case. Phenomena, both mechanical and electromagnetic, that take precedence in high-speed permanent magnet machines are identified and systematized. The thesis identifies inherent speed limits of permanent magnet machines and correlates those limits with the basic parameters of the machines. The analytical expression of the limiting quantities does not only impose solid constraints on the
machine design, but also creates the way for design optimization leading to the maximum mechanical and/or electromagnetic utilization of the machine. The models and electric-drive concepts developed in the thesis are evaluated in a practical setup.

A presentation of the theory of brushless d.c. drives to help engineers appreciate the potential of such motors and apply them more widely, by taking into account developments in permanent-magnet materials, power semiconductors, electronic control and motor design.

This dissertation, "Design, Analysis and Control of Multiphase Flux Regulated Permanent Magnet Brushless DC Motor Drives" by Jinyun, Gan, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. DOI: 10.5353/th_b3124530 Subjects: Electric motors, Permanent magnet - Design and construction Electric motors, Brushless - Design and construction Electric motors, Direct current - Electric motors, Direct current

Despite two decades of massive strides in research and development on control strategies and their
subsequent implementation, most books on permanent magnet motor drives still focus primarily on motor design, providing only elementary coverage of control and converters. Addressing that gap with information that has largely been disseminated only in journals and at conferences, Permanent Magnet Synchronous and Brushless DC Motor Drives is a long-awaited comprehensive overview of power electronic converters for permanent magnet synchronous machines and control strategies for variable-speed operation. It introduces machines, power devices, inverters, and control, and addresses modeling, implementation, control strategies, and flux weakening operations, as well as parameter sensitivity, and rotor position sensorless control. Suitable for both industrial and academic audiences, this book also covers the simulation, low cost inverter topologies, and commutation torque ripple of PM brushless DC motor drives. Simulation of the motor drives system is illustrated with MATLAB® codes in the text. This book is divided into three parts—fundamentals of PM synchronous and brushless dc machines, power devices, inverters; PM synchronous motor drives, and brushless dc motor drives. With regard to the power electronics associated with these drive systems, the author: Explores use of the standard three-phase bridge inverter for driving the machine, power factor correction, and inverter control
Introduces space vector modulation step by step and contrasts with PWM Details dead time effects in the inverter, and its compensation Discusses new power converter topologies being considered for low-cost drive systems in PM brushless DC motor drives This reference is dedicated exclusively to PM ac machines, with a timely emphasis on control and standard, and low-cost converter topologies. Widely used for teaching at the doctoral level and for industrial audiences both in the U.S. and abroad, it will be a welcome addition to any engineer’s library. Power electronics, which is a rapidly growing area in terms of research and applications, uses modern electronics technology to convert electric power from one form to another, such as ac-dc, dc-dc, dc-ac, and ac-ac with a variable output magnitude and frequency. Power electronics has many applications in our every day life such as air-conditioners, electric cars, sub-way trains, motor drives, renewable energy sources and power supplies for computers. This book covers all aspects of switching devices, converter circuit topologies, control techniques, analytical methods and some examples of their applications. * 25% new content * Reorganized and revised into 8 sections comprising 43 chapters * Coverage of numerous applications, including uninterruptable power supplies and automotive electrical systems * New content in power generation and distribution, including solar power, fuel cells,
wind turbines, and flexible transmission

This dissertation, "Design, Analysis and Control of Flux-
mnemonic Permanent Magnet Brushless Machines" by
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Permanent magnet - Design and construction Electric
motors, Brushless - Design and construction

Permanent magnet synchronous (PMS) motors stand at
the forefront of electric motor development due to their
energy saving capabilities and performance potential.
The motors have been developed in response to
mounting environmental crises and growing electricity
prices, and they have enabled the emergence of motor
drive applications like those found in electric and hybrid
vehicles, fly by wire, and drones. Control of Permanent
Magnet Synchronous Motors is a timely advancement
along that path as the first comprehensive, self-
contained, and thoroughly up-to-date book devoted
solely to the control of PMS motors. It offers a deep and
extended analysis, design, implementation, and
performance evaluation of major motor control methods,
including Vector, Direct Torque, Predictive, Deadbeat,
and Combined Control, in a systematic and coherent
manner. All major Sensorless Control and Parameter
Online Library Design Of Brushless Permanent Magnet Machines

Estimation methods are also studied. The book places great emphasis on energy saving control schemes. This dissertation, "A New Phase Decoupling Permanent Magnet Brushless DC Motor and Its Control" by ??, Wei, Xia, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. DOI: 10.5353/th_b3123542

Subjects: Electric motors, Permanent magnet - Design and construction Electric motors, Brushless - Design and construction

The importance of permanent magnet (PM) motor technology and its impact on electromechanical drives has grown exponentially since the publication of the bestselling second edition. The PM brushless motor market has grown considerably faster than the overall motion control market. This rapid growth makes it essential for electrical and electromechanical engineers and students to stay up-to-date on developments in modern electrical motors and drives, including their control, simulation, and CAD. Reflecting innovations in the development of PM motors for electromechanical drives, Permanent Magnet Motor Technology: Design and Applications, Third Edition demonstrates the construction of PM motor drives and supplies ready-to-implement solutions to common roadblocks along the way. This edition supplies fundamental equations and
calculations for determining and evaluating system performance, efficiency, reliability, and cost. It explores modern computer-aided design of PM motors, including the finite element approach, and explains how to select PM motors to meet the specific requirements of electrical drives. The numerous examples, models, and diagrams provided in each chapter facilitate a lucid understanding of motor operations and characteristics. This 3rd edition of a bestselling reference has been thoroughly revised to include: Chapters on high speed motors and micromotors Advances in permanent magnet motor technology Additional numerical examples and illustrations An increased effort to bridge the gap between theory and industrial applications Modified research results The growing global trend toward energy conservation makes it quite possible that the era of the PM brushless motor drive is just around the corner. This reference book will give engineers, researchers, and graduate-level students the comprehensive understanding required to develop the breakthroughs that will push this exciting technology to the forefront. Written for electrical, electronics, & mechanical engineers responsible for designing & specifying motors, the book provides details of brushless DC & synchronous motors, as well as both radial & axial motor topologies. Beginning with a discussion of the fundamentals of generic motor design, it logically progresses to a set of more advanced, yet easily understandable, concepts for designing brushless permanent-magnet motors. In addition, the author fully explains techniques for magnetic modeling & circuit
analysis, shows how magnetic circuit analysis applies to motor design, describes all major aspects of motor operation & design in simple mathematical terms, develops rigorous design equations for radial flux & axial flux motors, & illustrates basic motor drive schemes. All common motor design terms are clearly defined & a wealth of charts, tables & equations are included.

Design of Brushless Permanent-magnet Motors  
Oxford University Press on Demand

This dissertation, "Design, Control and Application of Double-stator Permanent Magnet Brushless Machines" by Shuangxia, Niu, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong) and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. DOI: 10.5353/th_b4284167 Subjects: Permanent magnet motors Electric motors, Brushless - Design and construction

A 2kw high-efficiency alternator system and its control board system are also designed, analyzed and fabricated applying to the truck auxiliary power unit (APU). The alternator system has two stages. The first stage is that the alternator three-phase outputs are connected to the three-phase active rectifier to get 48V DC. An advanced Sliding model control (SMO) is used to get an alternator position. The buck is used for the second stage to get 14V DC output. The whole system
efficiency is much higher than the traditional system using induction motor. Brushless Motors: Magnetic Design, Performance and Control is an outgrowth of the author’s two previous books on this subject. This book contains significant additional material covering further aspects of magnetic design, performance, and electrical control. The primary goal of this book is to meet the needs of working engineers who have little or no experience in electric motor design and control. The book starts with basic concepts, provides intuitive reasoning for them, and gradually builds a set of understandable concepts that foster the development of usable knowledge. This book strives to provide a basis of knowledge that non-experts can use to develop practical expertise, making them more productive in their work and allowing them to productively explore other approaches to motor design, performance, and electrical control.

Axial Flux Permanent Magnet (AFPM) brushless machines are modern electrical machines with a lot of advantages over their conventional counterparts. This timeless and revised second edition deals with the analysis, construction, design, control and applications of AFPM machines. The authors present their own research results, as well as significant research contributions made by others.

Rapidly Solidified Neodymium-Iron-Boron Permanent Magnets details the basic properties of melt spun NdFeB materials and the entire manufacturing process for rapidly solidified NdFeB permanent magnets. It covers the manufacturing
process from the commercial production of the melt spun or rapidly solidified powder, to the production and properties of both isotropic bonded Nd and hot deformed anisotropic NdFeB magnets. In addition, the book discusses the development and history of bonded rare earth transition metal magnets and the discovery of the NdFeB compound, also covering melt spun NdFeB alloys and detailing the magnetization process and spring exchange theory. The book goes over the production of melt spinning development, the operation of a melt spinner, the processing of melt spun powder, commercial grades of NdFeB magnetic powder and gas atomized NdFeB magnetic powders. Lastly, the book touches on the major application and design advantages of bonded Nd Magnets. Features a unique perspective as the author is not only the inventor of NdFeB magnetic powder, but also played a key role in developing many of the technologies covered. Provides a comprehensive look at the history, fundamental properties, production processes, design and applications of bonded NdFeB magnets. Includes discussion of the rare earth supply challenge, politics, and systems as it impacts bonded NdFeB magnets. This dissertation, "Design, Analysis, Control and Application of Permanent-magnet Hybrid Brushless Machines" by Chunhua, Liu, ???, was obtained from The University of Hong Kong (Pokfulam, Hong Kong).
and is being sold pursuant to Creative Commons: Attribution 3.0 Hong Kong License. The content of this dissertation has not been altered in any way. We have altered the formatting in order to facilitate the ease of printing and reading of the dissertation. All rights not granted by the above license are retained by the author. DOI: 10.5353/th_b4284166 Subjects: Permanent magnet motors Electric motors, Brushless - Design and construction

Wat doe je, als je erachter komt dat een moordenaar jou in het vizier heeft? De vriendinnen van de Women’s Murder Club laten zich niet zomaar afschrikken en proberen een brute seriemoordenaar in de val te lokken. Op steun van haar collega’s hoeft inspecteur Lindsay niet te rekenen, want niemand ziet in dat een serie nieuwe moorden verdacht veel op elkaar lijken. Ze lappen alle regels en procedures aan hun laars... alles om de moordenaar te vinden! Maar zijn de vrouwen op het goede spoor? Laat je in ‘Mijn wil geschiede’ compleet overdonderen door wie de dader is! Heb je genoten van Pattersons ‘De eerstverloren’? Maak je dan klaar voor het bloedstollende vervolg van de ‘Women’s Murder Club’-reeks. James Patterson (1947) is een wereldberoemde Amerikaanse auteur en filantroop, die tot 1996 eveneens werkzaam was als reclamemaker. Sinds 1976 heeft hij meer dan tweehonderd boeken gepubliceerd, waarvan er in totaal meer dan 300 miljoen exemplaren zijn
verkocht. 76 titels stonden op nummer één op de bestsellerlijst van de New York Times, waaronder President vermist, dat hij samen met Bill Clinton schreef. Deze cijfers maken hem een van de meest succesvolle en best verkopende auteurs ooit. Patterson is het meesterbrein achter de Alex Cross en Women’s Murder Club thrillerreeksen, die beide zijn verfilmd. Daarnaast heeft hij meerdere romans en kinderboeken op zijn naam staan. Zowel voor zijn schrijven als voor zijn liefdadigheidswerk heeft hij verscheidene prijzen gewonnen en onderscheidingen gekregen, waaronder de Edgar Award van de Mystery Writers of America en de Literarian Award van de National Book Foundation.