Design Of A Permanent Magnet Synchronous Generator For A


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.

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.

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-magnet 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.

In one complete volume, this essential reference presents an in-depth overview of the theoretical principles and techniques of electrical machine design. This timely new edition offers up-to-date theory and guidelines for the design of electrical machines, taking into account recent advances in permanent magnet machines as well as synchronous reluctance machines. New coverage includes: Brand new material on the ecological impact of the motors, covering the eco-design principles of rotating electrical machines An expanded section on the design of permanent magnet synchronous machines, now reporting on the design of tooth-coil, high-torque permanent magnet machines and their properties Large updates and new material on synchronous reluctance machines, air-gap inductance, losses in and resistivity of permanent magnets (PM), operating point of loaded PM circuit, PM machine design, and minimizing the losses in electrical machines> End-of-chapter exercises and new direct design examples with methods and solutions to real design problems> A supplementary website hosts two machine design examples created with MATHCAD: rotor surface magnet permanent magnet machine and squirrel cage induction machine calculations. Also a MATLAB code for optimizing the design of an induction motor is provided Outlining a step-by-step sequence of machine design, this book enables electrical machine designers to design rotating electrical machines. With a thorough treatment of all existing and emerging technologies in the field, it is a useful manual for professionals working in the diagnosis of electrical machines and drives. A rigorous introduction to the theoretical principles and techniques makes the book invaluable to senior electrical engineering students, postgraduates, researchers and university lecturers involved in electrical drives technology and electromechanical energy conversion.

Commences with a review of the fundamental concepts of magnetostatics and the analysis of solutions to problems in simple geometrics, followed by the design of magnetic structures. The third section analyzes two major aspects of the magnetic structures and demagnetization properties of actual magnetic material. Offers a number of practical uses for permanent magnets, particularly to Magnetic Resonance Imaging and also includes industrial machinery, high energy accelerators and free electron lasers.

"A comprehensive and self-contained exposition of the theory and methods used in the analysis and design of permanent magnet and electromechanical devices."--Back cover.

Several alternative designs for a magneton/gyrotron, permanent- magnet solenoid are analyzed with regard to magnetic field uniformity and magnitude, structural weight, susceptibility to heating, and access hole size. Structural masses were found to range from about 10 kilograms to 60 kilograms depending on details of design and or the type of permanent magnet tube. Recommendations are made as to the best choices for the intended purpose Permanent-magnet solenoids, Magnetrons, Gyrotrons, Magnetic cladding, Azimuthal dependence of field.

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

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.

This dissertation, “Design, Analysis and Control of Doubly Salient Permanent Magnet Motor Drives” by Ming, Cheng, 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_b3124154 Subjects: Permanent magnet motors - Design and construction
Covering the design and applications of permanent magnets, this study lists properties of over 400 materials and presents diverse magnet information needed to design products rather than present theory. Appendices provide demagnetisation curves and magnetic/physical properties.

This book is a comprehensive design text on permanent magnets and their applications. The author begins with a brief overview of the theory of magnetism and explains the behavior of the different classes of permanent magnets and the various production processes that lead to quite diverse material characteristics. The core of the book is a detailed treatment of the methods used to design permanent magnets, including assessments of the changes they experience under practical operating conditions. The volume also describes modern analytical techniques including the finite element method, with reference to the accurate simulation of permanent magnetic materials. Electrical engineers, condensed matter physicists and materials scientists will find this book useful.

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 modelling & 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.

This book introduces and illustrates modeling, sensing, and control methods for analyzing, designing, and developing spherical motors. It systematically presents models for establishing the relationships among the magnetic fields, position/orientation and force/torque, while also providing time-efficient solutions to assist researchers and engineers in studying and developing these motors. In order to take full advantage of spherical motors’ compact structure in practical applications, sensing and control methods that utilize their magnetic fields and eliminate the need to install external sensors for feedback are proposed. Further, the book investigates for the first time spherical motors’ force/torque manipulation capability, and proposes algorithms enabling the ball-joint-like end-effector for haptic use based on these motors’ hybrid position/force actuation modes. While systematically presenting approaches to their design, sensing and control, the book also provides many examples illustrating the implementation issues readers may encounter.

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

This dissertation, "Design, Analysis and Control of Flux-mnemonic Permanent Magnet Brushless Machines" by Chuang, Yu, 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_b4476902 Subjects: Electric motors, Permanent magnet - Design and construction Electric motors, Brushless - Design and construction