

## Simulation Of Active Front End Converter Based Vfd For

The energy transition initiated in recent years has enabled the growing integration of renewable production into the energy mix. Microgrids make it possible to maximize the efficiency of energy transmission from source to consumer by bringing the latter together geographically and by reducing losses linked to transport. However, the lack of inertia and the micro-grid support system makes it weak, and energy storage is necessary to ensure its proper functioning. Current storage technologies do not make it possible to provide both a large capacity of energy and power at the same time. Hybrid storage is a solution that combines the advantages of several technologies and reduces their disadvantages. Modeling and Control of Static Converters for Hybrid Storage Systems covers the modeling, control theorems, and optimization techniques that solve many scientific problems for researchers in the field of power converter control for renewable energy hybrid storage and places particular emphasis on the modeling and control of static converters for hybrid storage systems. Covering topics ranging from energy storage to power generation, this book is ideal for automation engineers, electrical engineers, mechanical engineers, professionals, scientists, academicians, master's and doctoral students, and researchers in the disciplines of electrical and mechanical engineering.

This book reports on cutting-edge findings regarding harmonic stability assessment for offshore wind power plants (OWPPs). It presents a timely investigation of the harmonic stability interaction between OWPPs on the one hand, and associated control systems in the wind turbines and other power electronic devices in the transmission system on the other. The book particularly focuses on voltage-sourced converter high-voltage direct current (VSC-HVDC) and static compensator (STATCOM) systems. From a practical perspective, the book reports on appropriate models for power electronic devices. It describes how the frequency domain evaluation approach can be assessed by comparing results obtained with the Nyquist stability criterion against the more detailed electromagnetic transient based model realized in the PSCAD/EMTDC simulation program. The book also provides a concise yet complete overview of large OWPPs that incorporate power electronic devices on a broad scale, and highlights selected challenges and opportunities in the context of real-world applications.

Spearheading the promotion of international technology transfer in the fields of mine planning, mining systems design, equipment selection and operation techniques, the International Symposium on Mine Planning and Equipment Selection is recognised by the mining society as a key annual event in highlighting developments within the field. Here in this volume, proceedings from the thirteenth annual symposium concentrate on the following major topics: \* open pit and underground mine planning, modelling and design \* geomechanics \* mining and processing methods \* design, monitoring and maintenance of mine equipment \* simulation, optimization and control of technological processes \* management, mine economics and financial analysis \* health, safety and environmental protection. Including 147 papers from leading experts and authorities, Mine Planning and Equipment Selection undoubtedly provides valuable information and insight for a range of engineers, scientists, researchers and consultants involved in the planning, design and operation of underground and surface mines.

Power quality (PQ) is receiving more and more attention from consumers, distribution system operators, transmission system operators, and other entities related to electrical power systems. As PQ problems have direct implications for business productivity, causing high economic losses, the research and development monitoring technologies and power electronics solutions that ensure the PQ of the power systems are matters of utmost importance. This book is a collection of high quality papers published in the "Power Electronics and Power Quality" Special

Issue of the journal Energies. It reflects on the latest investigations and the new trends in this field.

This book is a collection of scientific papers concerning multilevel inverters examined from different points of view. Many applications are considered, such as renewable energy interface, power conditioning systems, electric drives, and chargers for electric vehicles. Different topologies have been examined in both new configurations and well-established structures, introducing novel and particular modulation strategies, and examining the effect of modulation techniques on voltage and current harmonics and the total harmonic distortion.

Responding to recent developments and a growing VLSI circuit manufacturing market, Technology Computer Aided Design: Simulation for VLSI MOSFET examines advanced MOSFET processes and devices through TCAD numerical simulations. The book provides a balanced summary of TCAD and MOSFET basic concepts, equations, physics, and new technologies related to TCAD and MOSFET. A firm grasp of these concepts allows for the design of better models, thus streamlining the design process, saving time and money. This book places emphasis on the importance of modeling and simulations of VLSI MOS transistors and TCAD software. Providing background concepts involved in the TCAD simulation of MOSFET devices, it presents concepts in a simplified manner, frequently using comparisons to everyday-life experiences. The book then explains concepts in depth, with required mathematics and program code. This book also details the classical semiconductor physics for understanding the principle of operations for VLSI MOS transistors, illustrates recent developments in the area of MOSFET and other electronic devices, and analyzes the evolution of the role of modeling and simulation of MOSFET. It also provides exposure to the two most commercially popular TCAD simulation tools Silvaco and Sentaurus.

- Emphasizes the need for TCAD simulation to be included within VLSI design flow for nano-scale integrated circuits
- Introduces the advantages of TCAD simulations for device and process technology characterization
- Presents the fundamental physics and mathematics incorporated in the TCAD tools
- Includes popular commercial TCAD simulation tools (Silvaco and Sentaurus)
- Provides characterization of performances of VLSI MOSFETs through TCAD tools
- Offers familiarization to compact modeling for VLSI circuit simulation

R&D cost and time for electronic product development is drastically reduced by taking advantage of TCAD tools, making it indispensable for modern VLSI device technologies. They provide a means to characterize the MOS transistors and improve the VLSI circuit simulation procedure. The comprehensive information and systematic approach to design, characterization, fabrication, and computation of VLSI MOS transistor through TCAD tools presented in this book provides a thorough foundation for the development of models that simplify the design verification process and make it cost effective.

This book gathers papers presented during the 4th International Conference on Electrical Engineering and Control Applications. It covers new control system models, troubleshooting tips and complex system requirements, such as increased speed, precision and remote capabilities. Additionally, the papers discuss not only the engineering aspects of signal processing and various practical issues in the broad field of information transmission, but also novel technologies for communication networks and modern antenna design. This book is intended for researchers, engineers and advanced postgraduate students in the fields of control and electrical engineering, computer science and signal processing, as well as mechanical and chemical engineering.

The worldwide petroleum industry is facing a dilemma: the production level of heavy petroleum is higher than that of light petroleum. Heavy crude oils possess high amounts of impurities (sulfur, nitrogen, metals, and asphaltenes), as well as a high yield of residue with consequent low production of valuable distillates (gasoline and diesel). These characteristics, in turn, are responsible for the low price of heavy petroleum. Additionally, existing refineries are designed to process light crude oil, and heavy oil cannot be refined to 100 percent. One solution to this problem is the installation of plants for heavy oil upgrading before sending this raw material to a refinery. Modeling of Processes and

Reactors for Upgrading of Heavy Petroleum gives an up-to-date treatment of modeling of reactors employed in the main processes for heavy petroleum upgrading. The book includes fundamental aspects such as thermodynamics, reaction kinetics, chemistry, and process variables. Process schemes for each process are discussed in detail. The author thoroughly describes the development of correlations, reactor models, and kinetic models with the aid of experimental data collected from different reaction scales. The validation of modeling results is performed by comparison with experimental and commercial data taken from the literature or generated in various laboratory scale reactors. Organized into three sections, this book deals with general aspects of properties and upgrading of heavy oils, describes the modeling of non-catalytic processes, as well as the modeling of catalytic processes. Each chapter provides detailed experimental data, explanations of how to determine model parameters, and comparisons with reactor model predictions for different situations, so that readers can adapt their own computer programs. The book includes rigorous treatment of the different topics as well as the step-by-step description of model formulation and application. It is not only an indispensable reference for professionals working in the development of reactor models for the petroleum industry, but also a textbook for full courses in chemical reaction engineering. The author would like to express his sincere appreciation to the Marcos Moshinsky Foundation for the financial support provided by means of a Cátedra de Investigación.

Modern power and energy systems are characterized by the wide integration of distributed generation, storage and electric vehicles, adoption of ICT solutions, and interconnection of different energy carriers and consumer engagement, posing new challenges and creating new opportunities. Advanced testing and validation methods are needed to efficiently validate power equipment and controls in the contemporary complex environment and support the transition to a cleaner and sustainable energy system. Real-time hardware-in-the-loop (HIL) simulation has proven to be an effective method for validating and de-risking power system equipment in highly realistic, flexible, and repeatable conditions. Controller hardware-in-the-loop (CHIL) and power hardware-in-the-loop (PHIL) are the two main HIL simulation methods used in industry and academia that contribute to system-level testing enhancement by exploiting the flexibility of digital simulations in testing actual controllers and power equipment. This book addresses recent advances in real-time HIL simulation in several domains (also in new and promising areas), including technique improvements to promote its wider use. It is composed of 14 papers dealing with advances in HIL testing of power electronic converters, power system protection, modeling for real-time digital simulation, co-simulation, geographically distributed HIL, and multiphysics HIL, among other topics.

Artificial neural networks (ANNs) present many benefits in analyzing complex data in a proficient manner. As an effective and efficient problem-solving method, ANNs are incredibly useful in many different fields. From education to medicine and banking to engineering, artificial neural networks are a growing phenomenon as more realize the plethora of uses and benefits they provide. Due to their complexity, it is vital for researchers to understand ANN capabilities in various fields. The Research Anthology on Artificial Neural Network Applications covers critical topics related to artificial neural networks and their multitude of applications in a number of diverse areas including medicine, finance, operations research, business, social media, security, and more. Covering everything from the applications and uses of artificial neural networks to deep learning and non-linear problems, this book is ideal for computer scientists, IT specialists, data scientists, technologists, business owners, engineers, government agencies, researchers, academicians, and students, as well as anyone who is interested in learning more about how artificial neural networks can be used across a wide range of fields.

In the digital age, technological solutions are being developed and integrated into every aspect of our everyday lives. The ever-changing scope of research in systems and software advancements allows for further improvements and applications. Systems and Software

Development, Modeling, and Analysis: New Perspectives and Methodologies presents diverse, interdisciplinary research on topics pertaining to the management, integration, evaluation, and architecture of modern computational systems and software. Presenting the most up-to-date research in this rapidly evolving field, this title is ideally designed for use by computer engineers, academicians, graduate and post-graduate students, and computer science researchers.

This book collects a selection of papers presented at ELECTRIMACS 2019, the 13th international conference of the IMACS TC1 Committee, held in Salerno, Italy, on 21st-23rd May 2019. The conference papers deal with modelling, simulation, analysis, control, power management, design optimization, identification and diagnostics in electrical power engineering. The main application fields include electric machines and electromagnetic devices, power electronics, transportation systems, smart grids, electric and hybrid vehicles, renewable energy systems, energy storage, batteries, supercapacitors and fuel cells, and wireless power transfer. The contributions included in Volume 1 are particularly focused on electrical engineering simulation aspects and innovative applications.

Describes the general principles and current research into Model Predictive Control (MPC); the most up-to-date control method for power converters and drives The book starts with an introduction to the subject before the first chapter on classical control methods for power converters and drives. This covers classical converter control methods and classical electrical drives control methods. The next chapter on Model predictive control first looks at predictive control methods for power converters and drives and presents the basic principles of MPC. It then looks at MPC for power electronics and drives. The third chapter is on predictive control applied to power converters. It discusses: control of a three-phase inverter; control of a neutral point clamped inverter; control of an active front end rectifier, and; control of a matrix converter. In the middle of the book there is Chapter four - Predictive control applied to motor drives. This section analyses predictive torque control of industrial machines and predictive control of permanent magnet synchronous motors. Design and implementation issues of model predictive control is the subject of the final chapter. The following topics are described in detail: cost function selection; weighting factors design; delay compensation; effect of model errors, and prediction of future references. While there are hundreds of books teaching control of electrical energy using pulse width modulation, this will be the very first book published in this new topic. Unique in presenting a completely new theoretic solution to control electric power in a simple way Discusses the application of predictive control in motor drives, with several examples and case studies Matlab is included on a complementary website so the reader can run their own simulations

### Modeling and Analysis of Active Front-end Induction Motor Drive for Reactive Power Compensation

In an effort to contribute to global efforts by addressing the marine pollution from various emission types, this Special Issue of Ship Lifecycle for Journal of Marine Science and Engineering was inspired to provide a comprehensive insight for naval architects, marine engineers, designers, shipyards, and ship-owners who strive to find optimal ways to survive in competitive markets by improving cycle time and the capacity to reduce design, production, and operation costs while pursuing zero emission. In this context, this Special Issue is devoted to providing insights into the latest research and technical developments on ship systems and operation with a life cycle point of view. The goal of this Special Issue is to bring together researchers from the whole marine and maritime community into a common forum to share cutting-edge research on cleaner shipping. It is strongly believed that such a joint effort will contribute to enhancing the sustainability of the marine and maritime activities. This Special Issue features six novel publications dedicated to this endeavor. First of all, as a proactive response to transitioning to cleaner marine fuel sources,

numerous aspects of the excellence of fuel-cell based hybrid ships were demonstrated through four publications. In addition, two publications demonstrated the effectiveness of life cycle assessment (LCA) applicable to marine vessels.

*Modeling and Control of Power Electronics Converter Systems for Power Quality Improvements* provides grounded theory for the modeling, analysis and control of different converter topologies that improve the power quality of mains. Intended for researchers and practitioners working in the field, topics include modeling equations and the state of research to improve power quality converters. By presenting control methods for different converter topologies and aspects related to multi-level inverters and specific analysis related to the AC interface of drives, the book helps users by putting a particular emphasis on different control algorithms that enhance knowledge and research work. Present In-depth coverage of modeling and control methods for different converter topology Includes a particular emphasis on different control algorithms to give readers an easier understanding Provides a results and discussion chapter and MATLAB simulation to support worked examples and real-life application scenarios

*Architectures* BABAK MATINPOUR and JOY LASKAR \* Describes the actual implementation of receiver architectures from the initial design to an IC-based product \* Presents many tricks-of-the-trade not usually covered in textbooks \* Covers a range of practical issues including semiconductor technology selection, cost versus performance, yield, packaging, prototype development, testing, and analysis \* Discusses architectures that are employed in modern broadband wireless systems

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The proceedings of the 2nd International Congress on Energy Efficiency and Energy Related Materials include 73 peer-reviewed technical papers, submitted by leading academic and research institutions from over 20 countries and representing some of the most cutting-edge research available. The 73 papers are grouped into the following sections: - General Issues - Wind Energy - Solar Energy - Nuclear Energy - Biofuels and Bioenergy - Fossil Energy - Hydropower - Energy Storage, Conservation and Efficiency - Environmental Issues - Carbon Capture and Storage - Bio-Assessment and Toxicology - Air Pollution from Mobile and Stationary Sources - Transport of Air Pollutants - Environmentally Friendly Construction and Development - Energy Management Systems - Materials for Sustainable Energy - Materials for Renewable Energy Storage and Conversion - Fuel Cells - Hydrogen

Storage - Photovoltaics and Solar Cells - Hydrogen Production and Fuel Generation from Renewables (Catalysis) - Carbon Dioxide Sequestration and Conversion - Energy-Saving Materials - Thermoelectrics - Saving Energy in Buildings - Modeling and Theoretical Aspects in Energy-Related Materials

This book investigates solutions, benefits, limitations, and costs associated with multi-standard operation of RF front-ends and their ability to adapt to variable radio environments. Next, it highlights the optimization of RF front-ends to allow maximum performance within a certain power budget, while targeting full integration. Finally, the book investigates possibilities for low-voltage, low-power circuit topologies in CMOS technology.

The subject of this book is an important and diverse field of electric machines and drives. The twelve chapters of the book written by renowned authors, both academics and practitioners, cover a large part of the field of electric machines and drives. Various types of electric machines, including three-phase and single-phase induction machines or doubly fed machines, are addressed. Most of the chapters focus on modern control methods of induction-machine drives, such as vector and direct torque control. Among others, the book addresses sensorless control techniques, modulation strategies, parameter identification, artificial intelligence, operation under harsh or failure conditions, and modelling of electric or magnetic quantities in electric machines. Several chapters give an insight into the problem of minimizing losses in electric machines and increasing the overall energy efficiency of electric drives.

In this original book on model predictive control (MPC) for power electronics, the focus is put on high-power applications with multilevel converters operating at switching frequencies well below 1 kHz, such as medium-voltage drives and modular multi-level converters. Consisting of two main parts, the first offers a detailed review of three-phase power electronics, electrical machines, carrier-based pulse width modulation, optimized pulse patterns, state-of-the art converter control methods and the principle of MPC. The second part is an in-depth treatment of MPC methods that fully exploit the performance potential of high-power converters. These control methods combine the fast control responses of deadbeat control with the optimal steady-state performance of optimized pulse patterns by resolving the antagonism between the two. MPC is expected to evolve into the control method of choice for power electronic systems operating at low pulse numbers with multiple coupled variables and tight operating constraints it. Model Predictive Control of High Power Converters and Industrial Drives will enable to reader to learn how to increase the power capability of the converter, lower the current distortions, reduce the filter size, achieve very fast transient responses and ensure the reliable operation within safe operating area constraints. Targeted at power electronic practitioners working on control-related aspects as well as control engineers, the material is intuitively accessible, and the mathematical formulations are augmented by illustrations, simple examples and a book companion website featuring animations. Readers benefit from a concise and comprehensive treatment of MPC for industrial power electronics, enabling them to understand, implement and advance the field of high-performance MPC schemes.

Over the past century, the number of species that have been transported to areas outside their native range has increased

steadily. New pests and pathogens place biological pressure on valuable resident species, but strict bans may conflict with trading and travel needs. An overview of how the conflict can be managed using pest risk mapping and modelling, this book uses worked examples to explain modelling and help development of tool kits for assessment.

Filling a gap in the literature, *Electrotechnical Systems: Simulation with Simulink® and SimPowerSystems™* explains how to simulate complicated electrical systems more easily using SimPowerSystems™ blocks. It gives a comprehensive overview of the powerful SimPowerSystems toolbox and demonstrates how it can be used to create and investigate models of both classic and modern electrotechnical systems. Build from Circuit Elements and Blocks to System Models Building from simple to more complex topics, the book helps readers better understand the principles, features, and detailed functions of various electrical systems, such as electrical drives, power electronics, and systems for production and distribution of electrical energy. The text begins by describing the models of the main circuit elements, which are used to create the full system model, and the measuring and control blocks. It then examines models of semiconductor devices used in power electronics as well as models of DC and AC motors. The final chapter discusses the simulation of power production and transmission systems, including hydraulic turbine, steam turbine, wind, and diesel generators. The author also develops models of systems that improve the quality of electrical energy, such as active filters and various types of static compensators. Get a Deeper Understanding of Electrical Systems and How to Simulate Them A companion CD supplies nearly 100 models of electrotechnical systems created using SimPowerSystems. These encompass adaptations of SimPowerSystems demonstrational models, as well as models developed by the author, including many important applications related to power electronics and electrical drives, which are not covered by the demonstrational models. In addition to showing how the models can be used, he supplies the theoretical background for each. Offering a solid understanding of how electrical systems function, this book guides readers to use SimPowerSystems to create and investigate electrical systems, including those under development, more effectively.

This book presents select proceedings of the International Conference on Advances in Electrical Control and Signal Systems (AECSS) 2019. The focus is on the current developments in control and signal systems in electrical engineering, and covers various topics such as power systems, energy systems, micro grid, smart grid, networks, fuzzy systems and their control. The book also discusses various properties and performance of signal systems and their applications in different fields. The contents of this book can be useful for students, researchers as well as professionals working in power and energy systems, and other related fields.

Energy efficiency and low-carbon technologies are key contributors to curtailing the emission of greenhouse gases that continue to cause global warming. The efforts to reduce greenhouse gas emissions also strongly affect electrical power systems. Renewable sources, storage systems, and flexible loads provide new system controls, but power system operators and utilities have to deal with their fluctuating nature, limited storage capabilities, and typically higher infrastructure complexity with a growing number of heterogeneous components. In addition to the technological change of new components, the liberalization of energy markets and

new regulatory rules bring contextual change that necessitates the restructuring of the design and operation of future energy systems. Sophisticated component design methods, intelligent information and communication architectures, automation and control concepts, new and advanced markets, as well as proper standards are necessary in order to manage the higher complexity of such intelligent power systems that form smart grids. Due to the considerably higher complexity of such cyber-physical energy systems, constituting the power system, automation, protection, information and communication technology (ICT), and system services, it is expected that the design and validation of smart-grid configurations will play a major role in future technology and system developments. However, an integrated approach for the design and evaluation of smart-grid configurations incorporating these diverse constituent parts remains evasive. The currently available validation approaches focus mainly on component-oriented methods. In order to guarantee a sustainable, affordable, and secure supply of electricity through the transition to a future smart grid with considerably higher complexity and innovation, new design, validation, and testing methods appropriate for cyber-physical systems are required. Therefore, this book summarizes recent research results and developments related to the design and validation of smart grid systems.

This book offers a collection of 30 scientific papers which address the problems associated with the use of power electronic converters in renewable energy source-based systems. Relevant problems associated with the use of power electronic converters to integrate renewable energy systems to the power grid are presented. Some of the covered topics relate to the integration of photovoltaic and wind energy generators into the rest of the system, and to the use of energy storage to mitigate power fluctuations, which are a characteristic of renewable energy systems. The book provides a good overview of the abovementioned topics.

Covering everything from signal processing algorithms to integrated circuit design, this complete guide to digital front-end is invaluable for professional engineers and researchers in the fields of signal processing, wireless communication and circuit design. Showing how theory is translated into practical technology, it covers all the relevant standards and gives readers the ideal design methodology to manage a rapidly increasing range of applications. Step-by-step information for designing practical systems is provided, with a systematic presentation of theory, principles, algorithms, standards and implementation. Design trade-offs are also included, as are practical implementation examples from real-world systems. A broad range of topics is covered, including digital pre-distortion (DPD), digital up-conversion (DUC), digital down-conversion (DDC) and DC-offset calibration. Other important areas discussed are peak-to-average power ratio (PAPR) reduction, crest factor reduction (CFR), pulse-shaping, image rejection, digital mixing, delay/gain/imbalance compensation, error correction, noise-shaping, numerical controlled oscillator (NCO) and various diversity methods.

This book constitutes the refereed proceedings of the 13th International Symposium on Neural Networks, ISNN 2016, held in St. Petersburg, Russia in July 2016. The 84 revised full papers presented in this volume were carefully reviewed and selected from 104 submissions. The papers cover many topics of neural network-related research including signal and image processing;



dynamical behaviors of recurrent neural networks; intelligent control; clustering, classification, modeling, and forecasting; evolutionary computation; and cognition computation and spiking neural networks.

The switched reluctance machine (SRM) is the least expensive electrical machine to produce, yet one of the most reliable. As such, research has blossomed during the last decade, and the SRM and variable drive systems using SRMs are receiving considerable attention from industry. Because they require a power electronic converter and controller to function, however, successful realization of an SRM variable drive system demands an understanding of the converter and controller subsystems and their integration with the machine. Switched Reluctance Motor Drives provides that understanding. It presents a unified view of the machine and its drive system from all of its system and subsystem aspects. With a careful balance of theory and implementation, the author develops the analysis and design of SRMs from first principles, introduces a wide variety of power converters available for driving the SRM, and systematically presents both low- and high-performance controllers. The book includes an in-depth study of acoustic noise and its minimization along with application examples that include comparisons between ac and dc drives and SRM drive. The result is the first book that provides a state-of-the-art knowledge of SRMs, power converters, and their use with both sensor-based and sensorless controllers. Switched Reluctance Motor Drives enables both students and engineers to learn all aspects of SRM drive systems and appreciate the interdependence of the various subsystems in performance optimization. This book presents the latest cutting-edge technology in high-power converters and medium voltage drives, and provides a complete analysis of various converter topologies, modulation techniques, practical drive configurations, and advanced control schemes. Supplemented with more than 250 illustrations, the author illustrates key concepts with simulations and experiments. Practical problems, along with accompanying solutions, are presented to help you tackle real-world issues.

Novel Algorithms and Techniques in Telecommunications, Automation and Industrial Electronics includes a set of rigorously reviewed world-class manuscripts addressing and detailing state-of-the-art research projects in the areas of Industrial Electronics, Technology and Automation, Telecommunications and Networking. Novel Algorithms and Techniques in Telecommunications, Automation and Industrial Electronics includes selected papers from the conference proceedings of the International Conference on Industrial Electronics, Technology and Automation (IETA 2007) and International Conference on Telecommunications and Networking (TeNe 07) which were part of the International Joint Conferences on Computer, Information and Systems Sciences and Engineering (CISSE 2007).

Control of Power Electronic Converters, Volume Two gives the theory behind power electronic converter control and discusses the operation, modelling and control of basic converters. The main components of power electronics systems that produce a desired effect (energy conversion, robot motion, etc.) by controlling system variables (voltages and currents) are thoroughly covered. Both small (mobile phones, computer power supplies) and very large systems (trains, wind turbines, high voltage power lines) and their power ranges, from the Watt to the Gigawatt, are presented and explored. Users will find a focused resource on how to apply innovative control techniques for power converters and drives. Discusses different applications and their control Explains the most

important controller design methods, both in analog and digital Describes different, but important, applications that can be used in future industrial products Covers voltage source converters in significant detail Demonstrates applications across a much broader context

In this book the authors first provide a comprehensive survey on the available studies on control, management, and optimization strategies in AC and DC microgrids. The authors then provide the design of a laboratory-scale microgrid system. Finally, a real-world implementation of the designed framework is provided. This book paves the way for researchers working on the smart microgrids spread over the fields of electrical engineering, power systems, and smart infrastructures. Furthermore, it provides the readers with a comprehensive insight to understand an in-depth big picture of smart microgrids as well as an all-inclusive framework for laboratory-scale implementation of a microgrid. It is suitable for senior undergraduate students, graduate students who are interested in research in areas related to future smart grids and microgrids, and the researchers working in the related areas. This book also can be used as a reference book for researchers who want to develop laboratories on smart microgrids for future research.

In this thesis, an active front end induction motor drive for reactive power compensation is analyzed. The classical vector control approach for high performance control of an induction motor drive is a well established industry standard today. The same idea of decoupled control is extended to the line-side PWM converter for achieving better dynamic performance. The system model is obtained using d-q rotating frame theory. The  $i_{qe}$  component of line currents is used to control the reactive power. The  $i_{de}$  component is used to control the dc-link voltage and also to supply active power required by the motor. A high gain feedback controller with input-output linearization is presented to remove coupling between  $i_{qe}$  and  $i_{de}$  currents. A load power feed-forward loop is added to the dc-link voltage controller for fast dynamic response. The drive performance is analyzed to define system specifications. The motor acceleration, deceleration, and variable power factor operation (reactive power compensation) of the active drive system are demonstrated. The motor load is varied from no load to full load in steps of 10% each. For each step the device currents, switching power loss, line harmonics, and dc-link ripples are plotted. This data is used to derive conclusions that define system specifications and also state operating limits. The control of the drive system is implemented in MATLAB-SIMULINK. The complete system hardware is implemented in commercially available simulation tool, PSIM. The two software packages are interlinked using an interface module.

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