Read Book Thermal Management Of Electric Vehicle Coolingzone Llc


Presents basic and advanced techniques in the
analytical and numerical modeling of various heat pipe systems under a variety of operating conditions and limitations. It describes the variety of complex and coupled processes of heat and mass transfer in heat pipes. The book consists of fourteen chapters, two appendices, and over 400 illustrations, along with numerous references and a wide variety of technical data on heat pipes.

If battery packs for electric vehicles (EVs) and hybrid electric vehicles (HEVs) are to operate effectively in all climates, thermal management of the packs is essential. In this paper, we will review a systematic approach for designing and evaluating battery pack thermal management systems. A thermal management system using air as the heat transfer medium is less complicated than a system using liquid cooling/heating. Generally, for parallel HEVs, an air thermal management system is adequate, whereas for EVs and series HEVs, liquid-based systems may be required for optimum thermal performance. Further information on battery thermal management can be found on the Web site www.ctts.nrel.gov/BTM.

Thermal Management of Electric Vehicle Battery Systems provides a thorough examination of various conventional and cutting edge electric vehicle (EV) battery
thermal management systems (including phase change material) that are currently used in the industry as well as being proposed for future EV batteries. It covers how to select the right thermal management design, configuration and parameters for the users’ battery chemistry, applications and operating conditions, and provides guidance on the setup, instrumentation and operation of their thermal management systems (TMS) in the most efficient and effective manner. This book provides the reader with the necessary information to develop a capable battery TMS that can keep the cells operating within the ideal operating temperature ranges and uniformities, while minimizing the associated energy consumption, cost and environmental impact. The procedures used are explained step-by-step, and generic and widely used parameters are utilized as much as possible to enable the reader to incorporate the conducted analyses to the systems they are working on. Also included are comprehensive thermodynamic modelling and analyses of TMSs as well as databanks of component costs and environmental impacts, which can be useful for providing new ideas on improving vehicle designs. Key features: Discusses traditional and cutting edge technologies as well as research directions Covers thermal management systems and their selection for different vehicles and applications Includes case studies and practical examples from the industry Covers thermodynamic analyses and
assessment methods, including those based on energy and exergy, as well as exergoeconomic, exergoenvironmental and enviroeconomic techniques. Accompanied by a website hosting codes, models, and economic and environmental databases as well as various related information. Thermal Management of Electric Vehicle Battery Systems is a unique book on electric vehicle thermal management systems for researchers and practitioners in industry, and is also a suitable textbook for senior-level undergraduate and graduate courses.


A method for the evaluation of military hybrid electric vehicle thermal management systems has been developed. The approach
allows for the generation of a set of evaluation metrics for determination of the effectiveness of existing systems and the means to assess alternative concepts and advanced approaches. Further, through the use of a set of deterministic performance metrics the methodology allows for evaluation of performance margins for adverse boundary conditions and system operations. The thermal management systems of military hybrid electric vehicles can face challenging performance goals under the burden of unfavorable operating conditions. The cooling requirements of engines, motors, and power electronics impose specific requirements on thermal management system performance in terms of threshold temperatures and heat rejection capability. In addition, vehicle packaging concerns impose restrictions in terms of both volumetric occupancy and system weight. Acknowledgement of these concerns has led to thermal management system evaluation metrics in two separate classes: performance-based metrics and packaging-based metrics. Performance-based metrics allow for a means to determine whether a vehicle thermal management system can meet maximum thermal demands at the worst case boundary conditions. Further, this methodology establishes a design metric for quantifying thermal management system hotel loads. Performance metrics allow for a structured approach to identify system over-design and/or functional margin deficiencies under a
Advances in Battery Technologies for Electric Vehicles provides an in-depth look into the research being conducted on the development of more efficient batteries capable of long distance travel. The text contains an introductory section on the market for battery and hybrid electric vehicles, then thoroughly presents the latest on lithium-ion battery technology. Readers will find sections on battery pack design and management, a discussion of the infrastructure required for the creation of a battery powered transport network, and coverage of the issues involved with end-of-life management for these types of batteries. Provides an in-depth look into new research on the development of more efficient, long distance travel batteries.

In the last few decades, electric drives have found their place in a considerable number of diverse applications. They are successfully replacing some other traditional types of drives owing to their better performance and excellent controllability. The introduction of electric drives is in most cases also
beneficial from the ecological point of view as they are not directly dependent on fossil fuels and an increasing part of electric energy they consume is generated in renewable energy sources. This book focuses on applications of electric drives that emerged only recently and/or novel aspects that appear in them. Particular attention is given to using electric drives in vehicles, aircraft, non-road mobile machinery, and HVAC systems.

This handbook serves as a guide to deploying battery energy storage technologies, specifically for distributed energy resources and flexibility resources. Battery energy storage technology is the most promising, rapidly developed technology as it provides higher efficiency and ease of control. With energy transition through decarbonization and decentralization, energy storage plays a significant role to enhance grid efficiency by alleviating volatility from demand and supply. Energy storage also contributes to the grid integration of renewable energy and promotion of microgrid.

Up to the sixtieth, automotive manufacturers didn’t worry about the cost of fuel. They had never heard of air pollution, and they had never thought about life cycle. Ease of operation with reduced cost maintenance costs meant everything back then. Times have changed. Nowadays, clean air mandates are driving the
market to embrace new propulsion systems to substitute or to assist the internal combustion engine. Within the same commitment, the alarming increase of the emissions of greenhouse gases associated with the drain in time of fuel reserves make it vital the investigation and the development of renewable energy systems. EVER 2019 is intended to be a forum of specialists coming from both universities and industries, involved in R&D projects in the area of ecological vehicles or renewable energies or both.

The ambitious objectives of future road mobility, i.e. fuel efficiency, reduced emissions, and zero accidents, imply a paradigm shift in the concept of the car regarding its architecture, materials, and propulsion technology, and require an intelligent integration into the systems of transportation and power. ICT, components and smart systems have been essential for a multitude of recent innovations, and are expected to be key enabling technologies for the changes ahead, both inside the vehicle and at its interfaces for the exchange of data and power with the outside world. It has been the objective of the International Forum on Advanced Microsystems for Automotive Applications (AMAA) for almost two decades to detect novel trends and to discuss technological implications and innovation potential from day one on. In 2012, the topic of the AMAA conference is “Smart Systems for
Safe, Sustainable and Networked Vehicles”. The conference papers selected for this book address current research, developments and innovations in the field of ICT, components and systems and other key enabling technologies leading to the automobile and road transport of the future. The book focuses on application fields such as electrification, power train and vehicle efficiency, safety and driver assistance, networked vehicles, as well as components and systems. Additional information is available at www.amaa.de

The book discusses the emerging topic of comprehensive energy management in electric vehicles from the viewpoint of academia and from the industrial perspective. It provides a seamless coverage of all relevant systems and control algorithms for comprehensive energy management, their integration on a multi-core system and their reliability assurance (validation and test). Relevant European projects contributing to the evolution of comprehensive energy management in fully electric vehicles are also included. This volume includes contributions on model based functional safety and fault-tolerant E/E architectures, advanced control making use of external information (from a cloud) as well and thermal management as a central part for energy optimization and finally some aspects on fuel cells. The second volume (ISBN ..) includes chapters on ECO driving
and ECO routing covering different approaches for optimal speed profiles for a given route (mostly interconnecting with cloud data).

This presentation examines the issues concerning thermal management in electric drive vehicles and management techniques for improving the life of a Li-ion battery in an EDV.

This book systematically introduces readers to the core algorithms of battery management system (BMS) for electric vehicles. These algorithms cover most of the technical bottlenecks encountered in BMS applications, including battery system modeling, state of charge (SOC) and state of health (SOH) estimation, state of power (SOP) estimation, remaining useful life (RUL) prediction, heating at low temperature, and optimization of charging. The book not only presents these algorithms, but also discusses their background, as well as related experimental and hardware developments. The concise figures and program codes provided make the calculation process easy to follow and apply, while the results obtained are presented in a comparative way, allowing readers to intuitively grasp the characteristics of different algorithms. Given its scope, the book is intended for researchers, senior undergraduate and graduate students, as well as engineers in the fields of electric vehicles and energy storage.
Researchers at NREL are providing new insight into how heating and cooling systems affect the distance that electric vehicles can travel on a single charge. Electric vehicle range can be reduced by as much as 68% per charge because of climate-control demands. NREL engineers are investigating opportunities to change this dynamic and increase driving range by improving vehicle thermal management. NREL experts are collaborating with automotive industry partners to investigate promising thermal management technologies and strategies, including zone-based cabin temperature controls, advanced heating and air conditioning controls, seat-based climate controls, vehicle thermal preconditioning, and thermal load reduction technologies.

Focusing on technical, policy and social/societal practices and innovations for electrified transport for personal, public and freight purposes, this book provides a state-of-the-art overview of developments in e-mobility in Europe and the West Coast of the USA. It serves as a learning base for further implementing and commercially developing this field for the benefit of society, the environment and public health, as well as for economic development and private industry. A fast-growing, interdisciplinary sector, electric mobility links engineering, infrastructure, environment, transport and sustainable
development. But despite the relevance of the topic, few publications have ever attempted to document or promote the wide range of electric mobility initiatives and projects taking place today. Addressing this need, this publication consists of case studies, reports on technological developments and examples of successful infrastructure installation in cities, which document current initiatives and serve as an inspiration for others.

The volumes includes selected and reviewed papers from the 2nd ETA Conference on Energy and Thermal Management, Air Conditioning and Waste Heat Recovery in Berlin, November 22-23, 2018. Experts from university, public authorities and industry discuss the latest technological developments and applications for energy efficiency. Main focus is on automotive industry, rail and aerospace.

The handbook focuses on a complete outline of lithium-ion batteries. Just before starting with an exposition of the fundamentals of this system, the book gives a short explanation of the newest cell generation. The most important elements are described as negative / positive electrode materials, electrolytes, seals and separators. The battery disconnect unit and the battery management system are important parts of modern lithium-ion batteries. An economical,
faultless and efficient battery production is a must today and is represented with one chapter in the handbook. Cross-cutting issues like electrical, chemical, functional safety are further topics. Last but not least standards and transportation themes are the final chapters of the handbook. The different topics of the handbook provide a good knowledge base not only for those working daily on electrochemical energy storage, but also to scientists, engineers and students concerned in modern battery systems.

This book gathers the latest advances, innovations, and applications in the field of computational engineering, as presented by leading international researchers and engineers at the 24th International Conference on Computational & Experimental Engineering and Sciences (ICCES), held in Tokyo, Japan on March 25-28, 2019. ICCES covers all aspects of applied sciences and engineering: theoretical, analytical, computational, and experimental studies and solutions of problems in the physical, chemical, biological, mechanical, electrical, and mathematical sciences. As such, the book discusses highly diverse topics, including composites; bioengineering & biomechanics; geotechnical engineering; offshore & arctic engineering; multi-scale & multi-physics fluid engineering; structural integrity & longevity; materials design & simulation; and computer modeling methods in engineering. The
contributions, which were selected by means of a rigorous international peer-review process, highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaborations.

The market for electrified light-duty vehicles (also called passenger vehicles; including passenger cars, pickup trucks, SUVs, and minivans) has grown since the 1990s. During this decade, the first contemporary hybrid-electric vehicle debuted on the global market, followed by the introduction of other types of electric vehicles (EVs). By 2018, electric vehicles made up 4.2% of the 16.9 million new light-duty vehicles sold in the United States that year. Meanwhile, charging infrastructure grew in response to rising electric vehicle ownership, increasing from 3,394 charging stations in 2011 to 78,301 in 2019. However, many locations have sparse or no public charging infrastructure. Electric motors and traction battery packs—most commonly made up of lithium-ion battery cells—set EVs apart from internal combustion engine vehicles (ICEVs). The battery pack provides power to the motor that drives the vehicle. At times, the motor acts as a generator, sending electricity back to the battery. The broad categories of EVs can be identified by whether they have an internal combustion engine (i.e., hybrid vehicles) and whether the battery pack can be charged by external
electricity (i.e., plug-in electric vehicles). The numerous vehicle technologies further determine characteristics such as fuel economy rating, driving range, and greenhouse gas emissions. EVs can be separated into three broad categories: *

- Hybrid-electric vehicles (HEVs): The internal combustion engine primarily powers the wheels. The battery pack and electric motor provide supplemental power.
- Plug-in hybrid-electric vehicles (PHEVs): The battery pack can be charged by an external source of electricity. Depending on the model, primary power to the wheels may be supplied by the battery pack and electric motor, the internal combustion engine, or a combination.
- All-electric vehicles (AEVs; also called battery-electric vehicles or BEVs): The battery pack must be charged via an external source of electricity. The battery pack and electric motor power the wheels. Current technology offers three levels of charging for plug-in EVs. Level 1 and Level 2 are currently the most widely accessible with standardized vehicle connectors and charge ports that can be set up for at-home charging. Level 3 (also called DC fast charging) offers the fastest charging rates on the market but is not available for at-home installation due to high voltage. Vehicle connectors and corresponding charge ports for Level 3 are also not standardized, with three different systems currently in use by different vehicle manufacturers. Some research has raised
concerns regarding the potential impact of fast charging on battery performance, resulting in technology development aimed at addressing potential capacity loss and decreased charging cycles. As an emergent technology area, EVs present a number of issues for consideration. The fuel sources used to generate the electricity to charge PHEVs and AEVs are a major factor in determining EV greenhouse gas emissions relative to ICEVs. Per-mile EV emissions vary geographically and with the time of day and year that charging takes place. Growing demand for lithium-ion batteries also shifts the material requirements of the vehicle market from fuels for combustion to minerals and other materials for battery production. A growing EV market may encourage new strategies around the supply and refining of raw materials, ability to manufacture batteries, and end-of-life management for batteries that are no longer suitable for use in vehicles. Support for EV deployment stems from, among other things, federal and state policies establishing manufacturing rebates, tax credits for purchases, funding for research and development, and standards for fuel economy and emissions. These policies include the Plug-In Electric Vehicle Tax Credit, and the coordinated Corporate Average Fuel Economy (CAFE) standards and emissions standards for vehicles.

Several socioeconomic factors are leading
governments to encourage electric powered vehicles. Currently, the bottleneck for electric vehicles mass production lies in the high voltage battery technology. One of the main challenges to ensure batteries safety, comfort, performance and durability requirements is thermal management, since operating at temperatures outside the range specified by the manufacturer, they age prematurely, lead to dangerous and uncontrolled exothermic reactions and/or be incapable of delivering the electric energy demand to move the vehicle. The tendency in the solutions design for thermal management is to use cooling circuits with more and more sophisticated architectures governed by an increasing number of electrical actuators like pumps, fans and solenoid valves. The control of these systems is complex due to their nonlinear behavior, the high number of inputs and outputs and the need of accomplishing multiple goals, usually contradictory, at the same time. In front of this class of problems, conventional control methods are taken to their limit and new optimization based methods, like model predictive control, capable of exploiting the full potential in this kind of systems, are attracting the attention of the sector. The present thesis deals with the design of a predictive control for the battery and power electronics cooling circuit in a Plug-In Hybrid Electric Vehicle. The main merit of the proposed solution is that the method
validation takes places in a prototype on real-time, which, as it will be seen in the state of the art, is one of the usual lacks in most model predictive control publications in the automotive sector. For reaching this settlement, the development of a suitable model of the system and optimization problem definition together with the use of an efficient and robust numerical tool, have been essential and therefore will be addressed exhaustively in this document. Additionally, the validation by means of simulation as well as the design of repeatable driving conditions for comparing the proposed control with the original one in the vehicle will be shown before reaching the final validation and discussion.

Heavy-Duty Electric Vehicles: From Concept to Reality presents a step-by-step design and development guide for heavy-duty electric vehicles. It also offers practical insights based on the commercial application of an electric city bus. Heavy-duty electric vehicle design is challenging due to a lack of clear understanding of the government policies, R&D directions and uncertainty around the performance of various subsystems in an electric powertrain. Therefore, this book discusses key technical aspects of motors, power electronics, batteries and vehicle control systems, and outlines the system integration strategies necessary for design and safe operation of electric
vehicles in practice. This comprehensive book serves as a guide to engineers and decision makers involved in electric vehicle development programs and assists them in finding the suitable electric powertrain solution for a given heavy-duty vehicle application. Offers an overview of various standards and regulations that guide the electric vehicle design process and a comprehensive discussion on various government policies and incentive schemes propelling the growth of heavy electric vehicle markets across the world; Provides a comparative evaluation of different electric drivetrain concepts and a step-by-step power calculation guide for heavy-duty electric powertrain; Explains material selection and manufacturing methods for next generation batteries; Discusses key elements and design rules for creating a robust high voltage energy storage system, appropriate packaging and its support systems including charging network; Includes a concise description of torque mapping, power management and fault handling strategies for inverter drive and control systems; Features case studies to better understand complex topics like charging system requirements and vehicle control system diagnostics.

The book presents interesting topics from the area of modeling and simulation of electric vehicles application. The results presented by the authors of the book chapters are very
interesting and inspiring. The book will familiarize the readers with the solutions and enable the readers to enlarge them by their own research. It will be useful for students of Electrical Engineering; it helps them solve practical problems.

A comprehensive examination of advanced battery management technologies and practices in modern electric vehicles. Policies surrounding energy sustainability and environmental impact have become of increasing interest to governments, industries, and the general public worldwide. Policies embracing strategies that reduce fossil fuel dependency and greenhouse gas emissions have driven the widespread adoption of electric vehicles (EVs), including hybrid electric vehicles (HEVs), pure electric vehicles (PEVs) and plug-in electric vehicles (PHEVs). Battery management systems (BMSs) are crucial components of such vehicles, protecting a battery system from operating outside its Safe Operating Area (SOA), monitoring its working conditions, calculating and reporting its states, and charging and balancing the battery system. Advanced Battery Management Technologies for Electric Vehicles is a compilation of contemporary model-based state estimation methods and battery charging and balancing techniques, providing readers with practical knowledge of both fundamental concepts and practical applications. This timely and
highly-relevant text covers essential areas such as battery modeling and battery state of charge, energy, health and power estimation methods. Clear and accurate background information, relevant case studies, chapter summaries, and reference citations help readers to fully comprehend each topic in a practical context. Offers up-to-date coverage of modern battery management technology and practice Provides case studies of real-world engineering applications Guides readers from electric vehicle fundamentals to advanced battery management topics Includes chapter introductions and summaries, case studies, and color charts, graphs, and illustrations Suitable for advanced undergraduate and graduate coursework, Advanced Battery Management Technologies for Electric Vehicles is equally valuable as a reference for professional researchers and engineers.

This best-selling book in the field provides a complete introduction to the physical origins of heat and mass transfer. Noted for its crystal clear presentation and easy-to-follow problem solving methodology, Incropera and Dewitt's systematic approach to the first law develop readers confidence in using this essential tool for thermal analysis.

Introduction to Conduction· One-Dimensional, Steady-State Conduction· Two-Dimensional, Steady-State Conduction· Transient Conduction· Introduction to Convection· External Flow· Internal Flow· Free
Convection· Boiling and Condensation· Heat Exchangers· Radiation: Processes and Properties· Radiation Exchange Between Surfaces· Diffusion Mass Transfer

A new edition of the bestseller on convection heat transfer A revised edition of the industry classic, Convection Heat Transfer, Fourth Edition, chronicles how the field of heat transfer has grown and prospered over the last two decades. This new edition is more accessible, while not sacrificing its thorough treatment of the most up-to-date information on current research and applications in the field. One of the foremost leaders in the field, Adrian Bejan has pioneered and taught many of the methods and practices commonly used in the industry today. He continues this book’s long-standing role as an inspiring, optimal study tool by providing: Coverage of how convection affects performance, and how convective flows can be configured so that performance is enhanced How convective configurations have been evolving, from the flatplates, smooth pipes, and single-dimension fins of the earlier editions to new populations of configurations: tapered ducts, plates with multiscale features, dendritic fins, duct and plate assemblies (packages) for heat transfer density and compactness, etc. New, updated, and enhanced examples and problems that reflect the author's research and advances in the field since the last edition A solutions
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manual Complete with hundreds of informative and original illustrations, Convection Heat Transfer, Fourth Edition is the most comprehensive and approachable text for students in schools of mechanical engineering.

This book contains the papers presented at the IMechE and SAE International, Vehicle Thermal Management Systems Conference (VTMS10), held at the Heritage Motor Centre, Gaydon, Warwickshire, 15-19th May 2011. VTMS10 is an international conference organised by the Automobile Division and the Combustion Engines and Fuels Group of the IMechE and SAE International. The event is aimed at anyone involved with vehicle heat transfer, members of the OEM, tier one suppliers, component and software suppliers, consultants, and academics interested in all areas of thermal energy management in vehicles. This vibrant conference, the tenth VTMS, addresses the latest analytical and development tools and techniques, with sessions on: alternative powertrain, emissions, engines, heat exchange/manufacture, heating, A/C, comfort, underhood, and external/internal component flows. It covers the latest in research and technological advances in the field of heat transfer, energy management, comfort and the efficient management of all thermal systems within the vehicle. Aimed at anyone working in or involved with vehicle heat transfer.
Covers research and technological advances in
heat transfer, energy management, comfort and efficient management of thermal systems within the vehicle

Thermal Management of Electric Vehicle Battery Systems provides a thorough examination of various conventional and cutting edge electric vehicle (EV) battery thermal management systems (including phase change material) that are currently used in the industry as well as being proposed for future EV batteries. It covers how to select the right thermal management design, configuration and parameters for the users’ battery chemistry, applications and operating conditions, and provides guidance on the setup, instrumentation and operation of their thermal management systems (TMS) in the most efficient and effective manner. This book provides the reader with the necessary information to develop a capable battery TMS that can keep the cells operating within the ideal operating temperature ranges and uniformities, while minimizing the associated energy consumption, cost and environmental impact. The procedures used are explained step-by-step, and generic and widely used parameters are utilized as much as possible to enable the reader to incorporate the conducted analyses to the systems they are working on. Also included are comprehensive thermodynamic modelling and analyses of TMSs as well as databanks of component costs and environmental impacts, which can be useful
for providing new ideas on improving vehicle designs. Key features: Discusses traditional and cutting edge technologies as well as research directions Covers thermal management systems and their selection for different vehicles and applications Includes case studies and practical examples from the industry Covers thermodynamic analyses and assessment methods, including those based on energy and exergy, as well as exergoeconomic, exergoenvironmental and enviroeconomic techniques Accompanied by a website hosting codes, models, and economic and environmental databases as well as various related information Thermal Management of Electric Vehicle Battery Systems is a unique book on electric vehicle thermal management systems for researchers and practitioners in industry, and is also a suitable textbook for senior-level undergraduate and graduate courses.

This Brief reviews contemporary research conducted in university and industry laboratories on thermal management in electrochemical energy storage systems (capacitors and batteries) that have been widely used as power sources in many practical applications, such as automobiles, hybrid transport, renewable energy installations, power backup and electronic devices. Placing a particular emphasis on supercapacitors, the authors discuss how supercapacitors, or ultra capacitors, are
complementing and replacing, batteries because of their faster power delivery, longer life cycle and higher coulombic efficiency, while providing higher energy density than conventional electrolytic capacitors. Recent advances in both macro- and micro capacitor technologies are covered. The work facilitates systematic understanding of thermal transport in such devices that can help develop better power management systems.

The increasing demand for electronic devices for private and industrial purposes lead designers and researchers to explore new electronic devices and circuits that can perform several tasks efficiently with low IC area and low power consumption. In addition, the increasing demand for portable devices intensifies the call from industry to design sensor elements, an efficient storage cell, and large capacity memory elements. Several industry-related issues have also forced a redesign of basic electronic components for certain specific applications. The researchers, designers, and students working in the area of electronic devices, circuits, and materials sometimes need standard examples with certain specifications. This breakthrough work presents this knowledge of standard electronic device and circuit design analysis, including advanced technologies and materials. This outstanding new volume presents the basic concepts and fundamentals
behind devices, circuits, and systems. It is a valuable reference for the veteran engineer and a learning tool for the student, the practicing engineer, or an engineer from another field crossing over into electrical engineering. It is a must-have for any library.

This Special Edition of Energies on “Energy Storage and Management for Electric Vehicles” draws together a collection of research papers that critically evaluates key areas of innovation and novelty when designing and managing the high-voltage battery system within an electrified powertrain. The addressed topics include design optimisation, mathematical modelling, control engineering, thermal management, and component sizing.

Electric Vehicle Battery Systems provides operational theory and design guidance for engineers and technicians working to design and develop efficient electric vehicle (EV) power sources. As Zero Emission Vehicles become a requirement in more areas of the world, the technology required to design and maintain their complex battery systems is needed not only by the vehicle designers, but by those who will provide recharging and maintenance services, as well as utility infrastructure providers. Includes fuel cell and hybrid vehicle applications. Written with cost and efficiency foremost in mind, Electric Vehicle Battery Systems offers
essential details on failure mode analysis of VRLA, NiMh battery systems, the fast-charging of electric vehicle battery systems based on Pb-acid, NiMh, Li-ion technologies, and much more. Key coverage includes issues that can affect electric vehicle performance, such as total battery capacity, battery charging and discharging, and battery temperature constraints. The author also explores electric vehicle performance, battery testing (15 core performance tests provided), lithium-ion batteries, fuel cells and hybrid vehicles. In order to make a practical electric vehicle, a thorough understanding of the operation of a set of batteries in a pack is necessary. Expertly written and researched, Electric Vehicle Battery Systems will prove invaluable to automotive engineers, electronics and integrated circuit design engineers, and anyone whose interests involve electric vehicles and battery systems.

- Addresses cost and efficiency as key elements in the design process
- Provides comprehensive coverage of the theory, operation, and configuration of complex battery systems, including Pb-acid, NiMh, and Li-ion technologies

The light-duty vehicle fleet is expected to undergo substantial technological changes
over the next several decades. New powertrain designs, alternative fuels, advanced materials and significant changes to the vehicle body are being driven by increasingly stringent fuel economy and greenhouse gas emission standards. By the end of the next decade, cars and light-duty trucks will be more fuel efficient, weigh less, emit less air pollutants, have more safety features, and will be more expensive to purchase relative to current vehicles. Though the gasoline-powered spark ignition engine will continue to be the dominant powertrain configuration even through 2030, such vehicles will be equipped with advanced technologies, materials, electronics and controls, and aerodynamics. And by 2030, the deployment of alternative methods to propel and fuel vehicles and alternative modes of transportation, including autonomous vehicles, will be well underway. What are these new technologies - how will they work, and will some technologies be more effective than others? Written to inform The United States Department of Transportation's National Highway Traffic Safety Administration (NHTSA) and Environmental Protection Agency (EPA) Corporate Average Fuel Economy (CAFE) and greenhouse gas (GHG) emission standards, this new report from the National Research Council is a technical evaluation of costs, benefits, and implementation issues of fuel reduction technologies for next-generation light-duty vehicles.
vehicles. Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles estimates the cost, potential efficiency improvements, and barriers to commercial deployment of technologies that might be employed from 2020 to 2030. This report describes these promising technologies and makes recommendations for their inclusion on the list of technologies applicable for the 2017-2025 CAFE standards.

7.5 Case Study 4: Heat Transfer and Thermal Management of Electric Vehicle Batteries with Phase Change Materials -- 7.5.1 Introduction -- 7.5.2 System Description -- 7.5.3 Analysis -- 7.5.4 Results and Discussion -- 7.5.5 Closing Remarks -- 7.6 Case Study 5: Experimental and Theoretical Investigation of Novel Phase Change Materials For Thermal Applications -- 7.6.1 Introduction -- 7.6.2 System Description -- 7.6.3 Analysis -- 7.6.4 Results and Discussion -- 7.6.5 Closing Remarks -- Nomenclature -- References -- Chapter 8 Alternative Dimensions and Future Expectations -- 8.1 Introduction -- 8.2 Outstanding Challenges -- 8.2.1 Consumer Perceptions -- 8.2.2 Socio-Technical Factors -- 8.2.3 Self-Reinforcing Processes -- 8.3 Emerging EV Technologies and Trends -- 8.3.1 Active Roads -- 8.3.2 V2X and Smart Grid -- 8.3.3 Battery Swapping -- 8.3.4 Battery Second Use -- 8.4 Future BTM Technologies -- 8.4.1 Thermoelectric Materials -- 8.4.2