Civic Hybrid Engines

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2010 Honda Civic Hybrid UltraBattery Conversion 5577 - Hybrid Electric Vehicle Battery Test Results University-Press.org Hybrid energy systems integrate multiple sources of power generation, storage, and transport mechanisms and can facilitate increased usage of microgrids and various cleaner, renewable, and more efficient energy sources. Hybrid Power: Generation, Storage, and Grids discusses hybrid energy systems from fundamentals through applications and discusses generation, storage, and grids. Highlights fundamentals and applications of hybrid energy storage Discusses use in hybrid and electric vehicles and home energy

needs Discusses issues related to hybrid renewable energy systems connected to the utility grid Describes the usefulness of hybrid forms of off-grid energy such as mini-grids, nanogrids, and stand-alone systems Covers the use of hybrid renewable energy systems for rural electrification around the world Discusses various forms and applications of hybrid energy systems, hybrid energy storage. hybrid microgrids, and hybrid off-grid energy systems Details simulation and optimization of hybrid

renewable energy systems This book is aimed at advanced students and researchers in academia. government, and industry, seeking a comprehensive overview of the basics. technologies, and applications of hybrid energy systems. Lemon-Aid Used Cars and Trucks 2011 – 2012 CarTech Inc

Are you looking for a journey that will take you through this amazing obok, along with funny comments and a word puzzle? Then this book is for you. Whether you are looking at this book for curiosity, choices, options, or just for fun; this book fits any criteria. Writing this book did not happen quickly. It is thorough look at accuracy and foundation before the book was even started. This book was created to inform, entertain and maybe even test your knowledge. By the time you finish reading this book you will want to share it with others.

Challanges and advantages of alternative fuel vehicles SAE International The U.S. Department of

Energy Advanced Vehicle Testing Activity Program consists of vehicle, battery. and infrastructure testing on advanced technology related to transportation. The activity includes tests on hybrid electric vehicles (HEVs), including testing the HEV batteries when both the the Vehicle Technologies vehicles and batteries are new and at the conclusion of on-road fleet testing. This report documents battery testing performed for the 2010 Honda Civic HEV UltraBattery Conversion (VIN

JHMFA3F24AS005577). Battery testing was performed by the Electric Transportation Engineering Corporation dba ECOtality North America. The Idaho National Laboratory and **ECOtality North America** collaborate on the AVTA for Program of the DOE. An Analysis of U.S. Newspaper Coverage of Hybrid Vehicles AuthorHouse Seminar paper from the year 2002 in the subject

Business economics - twentieth century Marketing, Corporate Communication, CRM, any other invention community. The Market Research, Social Media. grade: AA, Middle East Technical University (Business Administration), course: Managing Technology and Innovation, 83 entries in the bibliography, language: English, abstract: In the

the automobile perhaps more than - profoundly changed the way we live. The Ford Model T, then the dominant design, accounted for 324 of all cars in America in 1912. Wheels, an engine and bodywork were sufficient to broaden our horizons, expand our opportunities

and dramatically redefined our definition of freedom and mobility that came with the new technology changed societies. This is true in the developed economies of North America and Europe as well as in the developing nations of the world. It is in the latter, the automobile is

arquably of even greater benefit to society, playing a the dwindling of key role in helping natural resources economies start up since the latter the difficult road toward prosperity and an improved quality of life. has achieved value it won't easy let go of it! However, alongside these benefits, we also have to witness the Since society emergence of global cannot or is not environmental

issues such as global warming and half of the 20th century until today. It is an undeniable fact environmental impact on the earth and hybrid. besides industry. willing to step

back, we must strive by all means to achieve a harmonious balance on earth. A greener car is a better idea. It is a new twist on familiar technologies, like And once society that the automobile gasoline and diesel has been one of the power. Moreover, it elements inflicting is new technologies - like fuel cell Nevertheless, it is not easy to achieve this. Automakers made progress in

reducing tailpipe emissions and making vehicles cleaner, supporting Global standards for cleaner fuel, increasing vehicles safety features, improving fuel efficiency and diversity, and building vehicles with less production waste and higher levels of recycling, but nevertheless the motor vehicle

industry is facing a faster pace than period of change and challenge. consolidation and alliances among companies continue to occur. Companies are fiercely competing for business and on environmental, vehicle safety and energy efficiency advances. Technological advances are occurring at a

ever before. Regulatory hurdles are set higher and higher. Partnerships with government and allies flourish. Consumers are demanding new features and enhanced performance as they choose new vehicles. [...] Advanced Hybrid Vehicle Systems Emereo Publishing Please note that the content of

this book primarily consists of articles available from online. Pages: 136. Chapters: Hybrid electric cars, Lexus LS, Toyota Camry, Honda Fit, Honda Insight, Mercedes-Benz S-Class, Chevrolet Malibu, Toyota Prius, Hyundai Sonata, Volkswagen Golf Mk5, Audi A4, Lexus GS, Ford Fusion Hybrid, Smart Fortwo, Nissan Altima, Saab 9-5, Honda Civic Hybrid, Mazda Demio, Honda CR-Z, Hyundai Santa Fe, Lexus RX, Lincoln MKZ, Saturn Aura, Kia Soul, Kia Optima, Lexus HS, Mercury Milan, Hyundai Elantra,

Kia Cee'd, Range Rover Wikipedia or other free sources Evoque, Toyota Prius v, Lexus CT, Chrysler Aspen, Porsche 918, Owen Magnetic, Dodge Intrepid ESX, Racing Green Endurance, Citroen C-Cactus, Toyota FT-HS, Chery A5, Chevrolet Sequel, Microdot, Obvio! 828, Volvo ECC, Suzuki Twin, Cadillac Urban Luxury Concept, Mazda Premacy Hydrogen RE Hybrid, Mazda RX-8 Hydrogen RE, Citroen C-Metisse, UltraCommuter, Toyota Sportivo Coupe, LiV DASH. Excerpt: The Lexus LS is a full- in 2006. A domestic-market

Volkswagen up!, Proton Gen-2, the flagship model of Lexus, the luxury division of Toyota. Four generations of the sedan have been produced, all equipped with V8 engines and rear-wheel drive, although since 2006 allwheel drive, hybrid, and longwheelbase variants have also been offered. The original Lexus LS 400, the first Lexus to be developed, was introduced as the premium marque's debut model in 1989. Subsequent redesigns included the second-generation LS 400 in 1995, the LS 430 in 2001, and the LS 460/LS 460 L series size luxury sedan that serves as version of the LS 400 and LS

430, badged as Toyota Celsior, was sold in Japan until the Lexus marque was introduced there in 2006. For the 2007. model year the fourthgeneration LS 460 debuted the first production eight-speed automatic transmission and an automatic parking system. In 2007, V8 hybrid powertrains were introduced on the LS 600h/LS 600h L sedans. Development of the Lexus LS began in 1983 as the F1... Honda Civic 172 Success Secrets - 172 Most Asked **Questions on Honda Civic -**What You Need to Know CreateSpace

Completely updated, the eighth offers many possible edition of 'Environmental Science' enlightens students on the fundamental causes of the current environmental crisis and offers ideas on how we, as a global community, can create a sustainable future. Fuel Economy Guide Jones & Bartlett Learning Updated throughout with the latest environmental information, issues, and facts, the new Eighth Edition of Environmental Science provides a clear introduction to the environmental topics facing society today and

solutions on how we can move towards a more sustainable way of life. The author focuses on the root cause of many environmental problems and takes care to presents both sides of the issues. Every chapter emphasizes critical analysis to teach students how to approach these complex topics and determine the merits of the debates for themselves. New Go Green tips offer suggestions for how students can be more environmentally conscious in

their daily lives. Cars CRC Press Hybrid cars, and indeed, all electric vehicles are playing a rôle in the salvation of the planet's eco-system. At least, in respect to the world supporting human life. However, hybrid cars will one day be replaced by vehicles that use no irreplaceable energy at at all, once the technology is there. It is likely that there will be at least two such power sources in the near future: electricity and hydrogen but who knows what else will be available? Hybrid and electric cars are revolutionizing combine an internal combustion enhances acceleration, making

the automotive landscape, offering a myriad of advantages optimizing fuel consumption that extend beyond the traditional internal combustion engine. One of the primary benefits is environmental sustainability. Electric cars produce zero tailpipe emissions, significantly reducing air pollution and carbon footprint. As the world grapples with climate change, the shift towards electric vehicles is a crucial step in mitigating environmental impact. Furthermore, these vehicles contribute to energy efficiency. Hybrid cars

engine with an electric motor, and reducing reliance on fossil fuels. Electric cars, relying solely on electric power, boast high energy efficiency and cost savings over time. With advancements in battery technology, electric cars now offer extended ranges and faster charging times, addressing concerns about range anxiety. Beyond environmental and economic advantages, hybrid and electric cars provide a smoother and quieter driving experience. The instant torque delivery in electric motors

these vehicles not only ecofriendly but also performanceoriented. As governments worldwide incentivise the adoption of cleaner technologies, the advantages of *Hybrid Electric Cars* hybrid and electric cars position McFarland them as the driving force in the The role of the modern future of sustainable and efficient transportation. The information in this ebook on various aspects of hybrid vehicles and related subjects is organised into 16 chapters of about 500-600 words each. I hope that it will interest those who are interested in hybrid vehicles. As an added bonus, I am granting you permission to

use the content on your own website or in your own blogs and newsletter, although it is better if you rewrite them in your own words first. automotive technician has changed drastically in the past decade. The job of today's vehicle specialist involves a deep knowledge of a wide variety of technical disciplines. Few professions encompass such a diverse understanding of technology. The automotive technician is now expected to know about chemistry,

electronics, mechanics, optics, as well as posses a deep analytical mind. The last only comes with time and experience. Advanced HYBRID Vehicle Systems (vol 1), Including Toyota & Honda models By Mandy Concepcion Table of Contents CHAPTER 1 (Hybrid Basics and Safety Procedures) The Need for Hybrid Systems Hybrid Do's and Dont's Here are some definite do's Hybrid basics and safety procedures Hybrid power down procedure and deactivation High voltage measurement and equipment Humidity and high-voltage

CHAPTER 2 (Hybrid Aerodynamics and Low Friction Tires) Low friction components and non-belt driven coolant pump, and air conditioning compressor The AC system EPS system, or electric power steering Replacement of the actual electric motor Performing a zero rest procedure CHAPTER 3 (Advanced Electronics for Hybrids) The dangers of amperage and High Current Circuits Current measurements using an electromagnetic probe (clamp on) Voltage measurement on hybrid vehicles (advanced concepts)

Measure the high voltage circuit regular AC motor The TRIAC at the orange cables after a power down procedure The Dropping Resistors CHAPTER Regenerative Breaking 4 (Basic Electric Motor and Induction Electric Motors and **Electric Alternating Current** Electric Motor Important facts about electric hybrid motor generator units Typical hybrid motor generator Dangers of **Inverter Internal Capacitors Motor Commutation Plates Hybrid Motor Position Sensor** Motor control techniques Difference between a hybrid vehicle electrical motor and a

and IGBT (Isolated Gate Bipolar Transistor) Hybrid CHAPTER 5 (AC and DC Power Generation) Principle of Power Units of Measurements) Frequency measurements Phase Measurement Voltage The DC Electric Motor The AC Measurements Using a Clamp-On AMP Probe The 3 Phases of a HYBRID Motor (U, V, W) The Inverter Unit on the Prius DC Brushless Motors CHAPTER 6 (basic battery technology) The nickel metal hydride battery The lithium ion battery Toyota Prius high Voltage battery Ultra-Capacitors V R L A or variable

regulation lead acid battery CHAPTER 7 (The 6 Hybrid Modes of Operation) HYBRID Computer System Control Light Acceleration Mode Regenerative Breaking Mode Deceleration Mode Normal Driving Mode STOP Mode M1's Biggest Contribution to the HYBRID Unit CHAPTER 8 (Parallel and Series Hybrid Systems) Series hybrid system Series, parallel, and series/parallel hybrid Inverter Power Management Parallel hybrid system Parallel/Series hybrid system Toyota motor Co. and AISIN CHAPTER 9 (The Prius CVT or

continuously variable transmission) THS or hybrid synergy Drive Transmission Planetary Gears Key point to understanding the way this transmission works HONDA **CVT Transmission Honda's** Cylinder Deactivation Honda's **Electric Balancing CHAPTER** 10 (Toyota specific hybrid system) Specific concepts on the Toyota hybrid Problems with the Coolant Pump Gas Tank Rubber Bladder Car Off AC System The Scanner and the HYBRID System High Voltage Battery MG1 and MG2 Lemon-Aid Used Cars and Power Output The Toyota auxiliary 12 V battery How to

Jump Start a HYBRID A Word About Toyota's Keyless Entry Dangers of Electric Mode Driving CHAPTER 11 (Honda specific hybrid system) The Honda hybrid system is vastly different than that of Toyota HONDA Hybrid is a Simple Design IMA or integrated motor assist The Motor Generator Unit The 12 volt Starter Honda Electronic Balancing The 1.3L Engine Soft iridium spark plugs Honda Civic Complete Cylinder Deactivation Trucks 2010-2011 Penguin Please note that the content of this book primarily consists of

articles available from Wikipedia or other free sources online. Pages: 122. Chapters: Lexus LS, Toyota Camry, Honda Fit, Honda Insight, Mercedes-Benz S-Class, Chevrolet Malibu, Toyota Prius, Hyundai Sonata, Volkswagen Golf Mk5, Audi A4, Lexus GS, Ford Fusion Hybrid, Nissan Altima, Saab 9-5, Honda Civic Hybrid, Mazda Demio, Honda CR-pivotal moments such as the Z, Hyundai Santa Fe, Lexus RX, Lincoln MKZ, Saturn Aura, Kia Soul, Kia Optima, Lexus HS, Mercury Milan, Hyundai Elantra, Kia Cee'd, Range Rover Evoque, Toyota Prius v, Lexus CT, Chrysler Aspen, Porsche 918, Citroen C-Cactus, Chery A5, Microdot, Obvio! 828, Volvo ECC, Cadillac Urban Luxury

Concept, Citroen C-Metisse, UltraCommuter.

Save Money on Gas Buy a **Hybrid Car NK**

This timeline traces Honda's journey from its founding in post-war Japan to its current status as a global automotive and technology leader. Explore introduction of the iconic 'Super Cub,' expansion into international markets, and the development of innovative models like the NSX and Insight hybrid. Witness Honda's ongoing commitment to sustainability, culminating in the introduction of all-

electric vehicles. It's a story of relentless innovation, shaping the future of mobility through dreams and determination

100 Hybrid Cars You Will Love

to Own Mandy Concepcion A guide to what has been the #1 modified import car for the street during the last decade?the Honda engine. This book covers some performance theory basics, then launches into dyno-tested performance parts combinations for each B-series engine. Topics covered include: performance vs. economy; air intakes, manifolds and throttle bodies; tuning; turbocharging; supercharging; and nitrous oxide.

The Complete Idiot's Guide

to Hybrid and Alternative Fuel Vehicles Infobase **Publishing** This technical report details the end-of-life fuel efficiency and battery testing FreedomCAR and Vehicle on two model year 2001 Honda Insight hybrid electric vehicles (HEVs), two model year 2003 Honda Civic HEVs, and two model year 2002 Toyota PriusHEVs. The end-of-life testing was conducted after each vehicle has beenoperated for approximately 160,000 miles. This testing was

conducted by the U.S. Department of Energy's (DOE) Advanced Vehicle Testing Activity(AVTA). The AVTA is part of DOE's TechnologiesProgram. SAE J1634 fuel efficiency testing was performed on the six HEVs with theair conditioning (AC) on and off. The AC on and off test results are compared to new vehicle AC on and off fuel efficiencies for each HEV model. The six HEVs were all end-of-life tested using new-vehicle coast down

coefficients. In addition, one of each HEV model was also subjected to fuel efficiency testing using coast down coefficients obtained when the vehicles completed 160,000 miles of fleet testing. Traction battery pack capacity and power tests were also performed on all six HEVs during the end-oflife testing in accordance with the FreedomCAR Battery Test Manual For Power-Assist Hybrid Electric Vehicles procedures. When using the new-vehicle coast down coefficients (Phase I

testing), 11 of 12 HEV tests (each HEV was tested once with the AC on and once with the AC off) had increases in fuel efficiencies compared to the new vehicle test results. The end-of-life fuel efficiency tests using the AVTA testing partner end-of-life coast down coefficients (Phase II testing) Applications, and by show decreases in fuel economies in five of six tests. Associates. (three with the AC on and three with it off). All six HEVs experienced decreases in battery capacities, with the design and develop the two Insights having the highest remaining capacities

and the two Priuses having the lowest remaining of-life testing activities discussed in this report were conducted by the Idaho National Laboratory; the **Electric Transportation Exponent Failure Analysis**

Electric Car Guide Penguin This paper presents the technical approach used to powerplant for the Honda Insight, a new motor assist

hybrid vehicle with an overall development objective of just capacities. The AVTA's end- half the fuel consumption of the current Civic over a wide range of driving conditions. Fuel consumption of 35km/L (Japanese 10-15 mode), and 3.4L/100km (98/69/EC) was realized. To achieve this, a new Integrated Motor Assist (IMA) hybrid power plant system was developed, incorporating many new technologies for packaging and integrating the motor assist system and for improving engine thermal efficiency. This was

developed in combination with a new lightweight aluminum body with low aerodynamic resistance. Environmental performance goals also included the simultaneous achievement of dizzying array of choices low emissions (half the Japanese year 2000 standards, and half the EU2000 standards), high efficiency, and recyclability. Full consideration was also given to key consumer attributes, including crash safety performance, handling, and make a practical choice. and driving performance. **Hybrid Cars** National

Academies Press The Complete Idiot's Guide to Hybrid and Alternative Fuel Vehicles, by car expert Jack R. Nerad of Kelly's Blue Book, sorts out the faced by motorists in America. In clear, jargonfree and non-political language, Nerad explains the nature of each kind of car, their advantages and disadvantages, so that consumers can understand Hybrid Vehicles GRIN Verlag A couple of years ago, one could

probably count the number of electric and plug-in hybrid cars on one hand. Today however, there are numerous models available from almost every manufacturer in an array of shapes, styles, price points, and powers to meet the wide range of consumer needs. Electric Vehicles are here to stay. Manufacturers like Nissan and Toyota firmly believe that there is a prominent future in electric cars, and have invested heavily in development of these models. Essentially there are two kinds of electric cars, one which are purely electric and the other hybrid cars. The hybrid cars couples the standard gasoline motor to a small battery pack to increase the overall mileage of the cars. What

You'll Get Inside: 1, 2015 Chevrolet Spark EV 2. Chevrolet Volt / Holden Volt / Vauxhall McLaren P1 6. Ferrari Laferrari 7. 2014 Mahindra Reva E2o 8, 2015 Hyundai Sonata Hybrid 9. 2014 Mitsubishi i-MiEV 10, 2014 BMW ActiveHybrid 3 11. 2014 BMW ActiveHybrid 5 12. Porsche Hybrid 39. 2014 Renault Zoe 40. 918 13. 2015 Toyota Prius 14. Tesla Model S 15, 2015 BYD e6 16. Mercedes Benz B class Electric 17. 2015 Volkswagen e-Golf 18. 2015 Volkswagen e-up! 19. Smart For two Electric Drive 20. 2015 Fiat 500 e 22. 2015 Ford Toyota Avalon Hybrid 48. 2014 Focus Electric 23, 2014 Honda Accord PHEV 24. Mitsubishi Outlander PHEV 25, 2015 Kia Soul EV 26, 2014 Citroen c-zero

27. 2015 Morgan e plus 28. 2014 Fluence ZE 29, 2014 Nissan Leaf 30. 2014 Think City 31. 2014 Ampera 3. BMW i3 4. BMW i8 5. Myers NmG 32. 2014Tango T600 33. The eBox 34. 2015 Toyota Highlander 35. 2014 Volkswagen Jetta Hybrid 36. 2015 Lexus CT 200h 37. 2014 Renault Twizzy 38. the most inexpensive and the 2014 Porsche Panamera S E-2014 Toyota RAV4 EV 41. 2014 Wheego LiFE 42. Volkswagen XL1 43. 2015 Ford C-Max Hybrid with a long list of standard and 44. 2014 Honda Civic Hybrid 45. 2014 Ford Fusion Hybrid 46. 2014 Lexus ES 300h 47, 2014 Lexus RX 450h 49, 2014 Cadillac ELR 50. 2014 Toyota Camry Hybrid With Technical Data. Take combined Electric / IC a Sneak Peak Inside (page

36):"36, 2015 Lexus CT 200hThe 2015 Lexus CT 200h happens to be the only small luxury hatchback in the market that's also a hybrid, and it's significantly more fun than you would expect. The 2015 Lexus CT 200h is both smallest model in the line-up of Lexus brand. This puts it in a group of one. Unlike most Lexus though, the CT does not comes available features--and the pampering of a much more bespoke and observant dealership experience.Powertrain Front Wheel DrivePropulsion Electric / IC EngineHorsepower 136hp EngineTorque 105 l lb-ftPrice

Starting from US \$32,0500-60 MPH 10.3 SecMileage 43 mpg City/40 mpg HwyRange 500 milesCo2 emission 136 g/km"Buy evaluations of different battery Now & See What Model Fits You. types under real-world HEV **Bartlett Publishers** The UltraBattery Retrofit Project DP1.8 and Carbon Enriched Project C3, performed by **ECOtality North America** (ECOtality) and funded by the U.S. Department of Energy and the Advanced Lead Acid Battery Consortium (ALABC), are established to demonstrate the suitability of advanced lead battery technology in hybrid electrical vehicles (HEVs). A profile, termed the "Simulated Honda Civic HEV Profile"

(SHCHEVP) has been developed in Project DP1.8 in order to provide reproducible laboratory **Environmental Science** Jones & conditions. The cycle is based on the Urban Dynamometer Driving Schedule and Highway Fuel Economy Test cycles and simulates operation of a battery pack in a Honda Civic HEV. One pass through the SHCHEVP takes by both Furukawa Battery Co., 2.140 seconds and simulates 17.7 miles of driving. A complete nickel metal hydride (NiMH) battery pack was removed from a Honda Civic HEV and operated under SHCHEVP to validate the profile. The voltage behavior and energy balance of the battery during this operation was virtually at various rates show that both

the same as that displayed by the battery when in the Honda Civic operating on the dynamometer under the Urban Dynamometer Driving Schedule and Highway Fuel Economy Test cycles, thus confirming the efficacy of the simulated profile. An important objective of the project has been to benchmark the performance of the UltraBatteries manufactured Ltd., Japan (Furakawa) and East Penn Manufacturing Co., Inc. (East Penn). Accordingly, UltraBattery packs from both Furakawa and East Penn have been characterized under a range of conditions. Resistance measurements and capacity tests

battery types are very similar in performance. Both technologies, as well as a standard lead-acid module (included for baseline data), were evaluated under a simple HEV screening test. Both Furakawa and East Penn UltraBattery packs operated for over 32,000 HEV cycles, with minimal loss in performance; whereas the standard lead-acid unit experienced significant degradation after only 6,273 cycles. The high-carbon, ALABC battery manufactured in Project C3 also was tested under the advanced HEV schedule. Its performance was significantly better than the standard lead-acid unit, but was still inferior compared with the UltraBattery.

part of the C3 Project performed well under the HEV screening test, especially at high temperatures. The results suggest that higher operating temperatures may improve the performance of lead-acid-based technologies operated under HEV conditions--it uniqueness and the is recommended that life studies be conducted on these technologies under such conditions.

Civic Duty A&V

The globalizing world is increasingly confronting a new category of security issues related to resource availability. The resource environment contains both

The batteries supplied by Exide as traditional categories, such as energy, foodstuffs, and water, as well as new technologically related resources, such as rare earth minerals. The essays in this volume emphasize both the magnitude of these new challenges, while simultaneously acknowledging that cooperation and competition in response to these security concerns occur within the context of both the historical and contemporary international power

configurations. Moreover, these challenges are of a global nature and will require Development of Integrated global perspectives, global thinking, and innovative global solutions. Krishna-Hensel brings together a wide Discusses how these range of topics focusing on critical resource availability impacting upon global security and the geopolitical ramifications of resource competition. The volume addresses the development of illustrations. strategic thinking on these issues and underscores the increasing awareness that this is a critical area of concern in

the twenty-first century globalcell and plug-in automobiles. It landscape.

Motor Assist Hybrid System Createspace Independent Pub

machines work, the science behind the energy they make, and what the use of hybrid cars means for the planet. Features full-color photographs and

Xtreme Honda B-Series Engines HP1552 Dundurn This illustrated history chronicles electric and hybrid cars from the late 19th century to today's fuel

describes the politics, technology, marketing strategies, and environmental issues that have impacted electric and hybrid cars' research and development. The important marketing shift from a "woman's car" to "going green" is discussed. Milestone projects and technologies such as early batteries, hydrogen and bio-mass fuel cells, the upsurge of hybrid vehicles, and the various regulations and market forces that have shaped the industry are also covered.