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concern about the reduced availability and the increased cost of petroleum fuels prompted great efforts in recent years to reduce the fuel consumption of auto mobiles the ongoing efforts to reduce fuel consumption have addressed many relevant factors including increased engine performance reduced friction use of lightweight materials and reduced aerodynamic drag the results of the investigations assessing the various factors affecting fuel economy have been published in journals conference proceedings and in company and government reports this proliferation of technical information makes it difficult for workers to keep abreast of au developments the material presented in this book brings together in a single volume much of the relevant materials summarizes many of the state of the art theories and data and provides extensive lists of references thus it is hoped that this book will be a useful reference for specialists and practicing engineers interested in the fuel economy of automobiles j c hilliard o s springer vii contents 1 automotive fuel economy david cole i introduction and background 1 n fuel economy factors 9 a engine 11 b drive train 20 c vehicle factors 22 d operating factors 28 e test cycles 32 references 33 2 fuel economy and emissions j t kummer i introduction 35 n emission regulations this volume presents realistic estimates for the level of fuel economy that is achievable in the next decade for cars and light trucks made in the united states and canada a source of objective and comprehensive information on the topic this book takes into account real world factors such as the financial conditions in the automotive industry costs and benefits to consumers and marketability of high efficiency vehicles the committee is composed of experts from the fields of science technology finance and regulation and offers practical evaluations of technological improvements that could contribute to increased fuel efficiency the volume also examines potential barriers to improvement such as high production costs regulations on safety and emissions and consumer preferences this practical book is of considerable interest to car and light truck manufacturers policymakers federal and state agencies and the public various combinations of commercially available technologies could greatly reduce fuel consumption in passenger cars sport utility vehicles minivans and other light duty vehicles without compromising vehicle performance or safety assessment of technologies for improving light duty vehicle fuel economy estimates the potential fuel savings and costs to consumers of available technology combinations for three types of engines spark ignition gasoline compression ignition diesel and hybrid according to its estimates adopting the full combination of improved technologies in medium and large cars and pickup trucks with spark ignition engines could reduce fuel consumption by 29 percent at an additional cost of 2 200 to the consumer replacing spark ignition engines with diesel engines and components would yield fuel savings of about 37 percent at an added cost of approximately 5 900 per vehicle and replacing spark ignition engines with hybrid engines and components would reduce fuel consumption by 43 percent at an increase of 6 000 per vehicle the book focuses on fuel consumption the amount of fuel consumed in a given driving distance because energy savings are directly related to the amount of fuel used in contrast fuel economy measures how far a vehicle will travel with a gallon of fuel because fuel consumption data indicate money saved on fuel purchases and reductions in carbon dioxide emissions the book finds that vehicle stickers should provide consumers with fuel consumption data in addition to fuel economy information this book reveals the mechanisms underlying the convergence of car fuel economy regulations in europe japan and the us by drawing upon a constructivist theory of international relations and law that focuses on business competition and environmental regulations it offers new understanding of the topic of cars and an issue of climate change discussing the emerging phenomenon of convergence of fuel economy regulations addressing the role of business actors in pushing for climate change action proposing the new model of agency with and beyond states and providing insightful case studies from europe japan and the us the opening chapter reviews the automobile industry and global climate change providing a background for the discussion to follow chapter 2 business actors and global environmental governance grounds the discussion in the field of environmental governance the third chapter is a case study examining the construction and timing of the european union s climate policies for automobile co2 emissions discussing the underlying factors and the actors influencing the policies the following chapter argues that japan adopted its stringent fuel economy regulations primarily because of industry competitiveness motivated by stringent environmental regulations in export markets and encouraged by a tradition of co regulation and corporatism to enhance the regulations chapter 5 asks why the us the first country to introduce fuel economy regulations spent two decades in regulatory stagnation and discusses how recent us fuel economy regulations came to converge with japanese and european standards chapter 6 compares contrasts and analyzes fuel economy regulations among the three case studies and identifies policy implications for the future climate governance for 2015 and beyond the final chapter explores applicability of the agency with and beyond the state model to other sectors and to climate governance as a whole internal combustion engines ice still have potential for substantial improvements particularly with regard to fuel efficiency and environmental compatibility in order to fully exploit the remaining margins increasingly sophisticated control systems have to be applied this book offers an introduction to cost effective model based control system design for ice the primary emphasis is put on the ice and its auxiliary devices mathematical models for these processes are developed and solutions for selected feedforward and feedback control problems are presented the discussions concerning pollutant emissions and fuel economy of ice in automotive applications constantly intensified since the first edition of this book was published concerns about the air quality the limited resources of fossil fuels and the detrimental effects of greenhouse gases exceedingly spurred the interest of both the industry and academia in further improvements the most important changes and additions included in this second edition are

restructured and slightly extended section on superchargers short subsection on rotational oscillations and their treatment on engine test benches complete section on modeling detection and control of engine knock improved physical and chemical model for the three way catalytic converter new methodology for the design of an air to fuel ratio controller short introduction to thermodynamic engine cycle calculation and corresponding control oriented aspects technologies and approaches to reducing the fuel consumption of medium and heavy duty vehicles evaluates various technologies and methods that could improve the fuel economy of medium and heavy duty vehicles such as tractor trailers transit buses and work trucks the book also recommends approaches that federal agencies could use to regulate these vehicles fuel consumption currently there are no fuel consumption standards for such vehicles which account for about 26 percent of the transportation fuel used in the u s the miles per gallon measure used to regulate the fuel economy of passenger cars is not appropriate for medium and heavy duty vehicles which are designed above all to carry loads efficiently instead any regulation of medium and heavy duty vehicles should use a metric that reflects the efficiency with which a vehicle moves goods or passengers such as gallons per ton mile a unit that reflects the amount of fuel a vehicle would use to carry a ton of goods one mile this is called load specific fuel consumption lsfc the book estimates the improvements that various technologies could achieve over the next decade in seven vehicle types for example using advanced diesel engines in tractor trailers could lower their fuel consumption by up to 20 percent by 2020 and improved aerodynamics could yield an 11 percent reduction hybrid powertrains could lower the fuel consumption of vehicles that stop frequently such as garbage trucks and transit buses by as much 35 percent in the same time frame since cafe standards were established 25 years ago there have been significant changes in motor vehicle technology globalization of the industry the mix and characteristics of vehicle sales production capacity and other factors this volume evaluates the implications of these changes as well as changes anticipated in the next few years on the need for cafe as well as the stringency and or structure of the cafe program in future years this book presents the papers from the innovations in fuel economy and sustainable road transport conference held in pune india 8 9 november 2011 papers examine advances in powertrain alternative fuels lightweight vehicles electric vehicles and hybrid vehicles an international assembly of senior industry representatives provide insight into research and technological advances in low carbon technology sustainability for road transport helping towards achieving stringent emissions standards and continual improvements in fuel economy efficiency all in an expanding indian market these technical papers from industry and academia discuss the developments and research of leading organisations discusses maximising powertrain performance for a low carbon agenda provides readers with an understanding of the latest developments in alternative fuels examines the future landscape for the implementation and development of electric vehicles the authors of this text have written a comprehensive introduction to the modeling and optimization problems encountered when designing new propulsion systems for passenger cars it is intended for persons interested in the analysis and optimization of vehicle propulsion systems its focus is on the control oriented mathematical description of the physical processes and on the model based optimization of the system structure and of the supervisory control algorithms since cafe standards were established 25 years ago there have been significant changes in motor vehicle technology globalization of the industry the mix and characteristics of vehicle sales production capacity and other factors this volume evaluates the implications of these changes as well as changes anticipated in the next few years on the need for cafe as well as the stringency and or structure of the cafe program in future years 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 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promising technologies and makes recommendations for their inclusion on the list of technologies applicable for the 2017 2025 cafe standards introduction mean value models discrete event models control of engine systems

Fuel Economy 2013-11-11

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Fuel Economy 2014-01-15

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Automotive Fuel Economy 1992-02-01

various combinations of commercially available technologies could greatly reduce fuel consumption in passenger cars sport utility vehicles minivans and other light duty vehicles without compromising vehicle performance or safety assessment of technologies for improving light duty vehicle fuel economy estimates the potential fuel savings and costs to consumers of available technology combinations for three types of engines spark ignition gasoline compression ignition diesel and hybrid according to its estimates adopting the full combination of improved technologies in medium and large cars and pickup trucks with spark ignition engines could reduce fuel consumption by 29 percent at an additional cost of 2 200 to the consumer replacing spark ignition engines with diesel engines and components would yield fuel savings of about 37 percent at an added cost of approximately 5 900 per vehicle and replacing spark ignition engines with hybrid engines and components would reduce fuel consumption by 43 percent at an increase of 6 000 per vehicle the book focuses on fuel consumption the amount of fuel consumed in a given driving distance because energy savings are directly related to the amount of fuel used in contrast fuel economy measures how far a vehicle will travel with a gallon of fuel because fuel consumption data indicate money saved on fuel purchases and reductions in carbon dioxide emissions the book finds that vehicle stickers should provide consumers with fuel consumption data in addition to fuel economy information

Automobile Fuel Economy 1973

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regulations chapter 5 asks why the us the first country to introduce fuel economy regulations spent two decades in regulatory stagnation and discusses how recent us fuel economy regulations came to converge with japanese and european standards chapter 6 compares contrasts and analyzes fuel economy regulations among the three case studies and identifies policy implications for the future climate governance for 2015 and beyond the final chapter explores applicability of the agency with and beyond the state model to other sectors and to climate governance as a whole

Assessment of Fuel Economy Technologies for Light-Duty Vehicles 2011-06-03

internal combustion engines ice still have potential for substantial improvements particularly with regard to fuel efficiency and environmental compatibility in order to fully exploit the remaining margins increasingly sophisticated control systems have to be applied this book offers an introduction to cost effective model based control system design for ice the primary emphasis is put on the ice and its auxiliary devices mathematical models for these processes are developed and solutions for selected feedforward and feedback control problems are presented the discussions concerning pollutant emissions and fuel economy of ice in automotive applications constantly intensified since the first edition of this book was published concerns about the air quality the limited resources of fossil fuels and the detrimental effects of greenhouse gases exceedingly spurred the interest of both the industry and academia in further improvements the most important changes and additions included in this second edition are restructured and slightly extended section on superchargers short subsection on rotational oscillations and their treatment on engine test benches complete section on modeling detection and control of engine knock improved physical and chemical model for the three way catalytic converter new methodology for the design of an air to fuel ratio controller short introduction to thermodynamic engine cycle calculation and corresponding control oriented aspects

Automobile Fuel Economy Standards 1986

technologies and approaches to reducing the fuel consumption of medium and heavy duty vehicles evaluates various technologies and methods that could improve the fuel economy of medium and heavy duty vehicles such as tractor trailers transit buses and work trucks the book also recommends approaches that federal agencies could use to regulate these vehicles fuel consumption currently there are no fuel consumption standards for such vehicles which account for about 26 percent of the transportation fuel used in the u s the miles per gallon measure used to regulate the fuel economy of passenger cars is not appropriate for medium and heavy duty vehicles which are designed above all to carry loads efficiently instead any regulation of medium and heavy duty vehicles should use a metric that reflects the efficiency with which a vehicle moves goods or passengers such as gallons per ton mile a unit that reflects the amount of fuel a vehicle would use to carry a ton of goods one mile this is called load specific fuel consumption lsfc the book estimates the improvements that various technologies could achieve over the next decade in seven vehicle types for example using advanced diesel engines in tractor trailers could lower their fuel consumption by up to 20 percent by 2020 and improved aerodynamics could yield an 11 percent reduction hybrid powertrains could lower the fuel consumption of vehicles that stop frequently such as garbage trucks and transit buses by as much 35 percent in the same time frame

Divergence and Convergence of Automobile Fuel Economy Regulations 2015-04-08

since cafe standards were established 25 years ago there have been significant changes in motor vehicle technology globalization of the industry the mix and characteristics of vehicle sales production capacity and other factors this volume evaluates the implications of these changes as well as changes anticipated in the next few years on the need for cafe as well as the stringency and or structure of the cafe program in future years

Automobile Fuel Economy Standards 1985

this book presents the papers from the innovations in fuel economy and sustainable road transport conference held in pune india 8 9 november 2011 papers examine advances in powertrain alternative fuels lightweight vehicles electric vehicles and hybrid vehicles an international assembly of senior industry representatives provide insight into research and technological advances in low carbon technology sustainability for road transport helping towards achieving stringent emissions standards and continual improvements in fuel economy efficiency all in an expanding indian market these technical papers from industry and academia discuss the developments and research of leading organisations discusses maximising powertrain performance for a low carbon agenda provides readers

with an understanding of the latest developments in alternative fuels examines the future landscape for the implementation and development of electric vehicles

Passenger Vehicle Fuel Economy 2007-09

the authors of this text have written a comprehensive introduction to the modeling and optimization problems encountered when designing new propulsion systems for passenger cars it is intended for persons interested in the analysis and optimization of vehicle propulsion systems its focus is on the control oriented mathematical description of the physical processes and on the model based optimization of the system structure and of the supervisory control algorithms

International Automotive Fuel Economy Research Conference. First. Proceedings 1981

since cafe standards were established 25 years ago there have been significant changes in motor vehicle technology globalization of the industry the mix and characteristics of vehicle sales production capacity and other factors this volume evaluates the implications of these changes as well as changes anticipated in the next few years on the need for cafe as well as the stringency and or structure of the cafe program in future years

Auto Fuel Efficiency Standards 1983

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 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

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introduction mean value models discrete event models control of engine systems

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