12th EAEC European Automotive Congress Bratislava

EAEC 2009

June 29 to July 1, 2009

Bratislava, Slovakia

Europe In The Second Century Of Auto-Mobility

FINAL PROGRAMME

JUNE 2009

ORGANIZED BY

www.fisita.com www.eaec.net www.saits.bts.sk www.intenziva.sk

	Monday, June 29				Tuesday, June 30			Wednesday, July 01			
8:00	REGISTRATION				ROOM 1	ROOM 2	ROOM 3	ROOM 1	ROOM 2	ROOM 3	8:00
8:30					P05	V03	T01	P11	V07	T03	8:30
9:00	OPENING SESSION										9:00
9:30											9:30
10:00					POSTER VISIT			Coffee Break			10:00
10:30	Coffee Break							P12	V08	T04	10:30
11:00	PLENARY SESSION				P06	P09	V04				11:00
11:30											11:30
12:00								Coffee Break			12:00
12:30					LUNCH			CLOSING CEREMONY			12:30
13:00	LUNCH										13:00
13:30								FAREWELL LUNCH			13:30
14:00											14:00
14:30	POSTER VISIT										14:30
15:00	P01	P03	V01	FISITA EDUCATION CONFERENCE	P07	V05	T02	POST CONGRESS VISITS			15:00
15:30											15:30
16:00					Coffee Break / POSTER VISIT						16:00
16:30	Coffee Break										16:30
17:00	P02	P04	V02		P08	P10	V06				17:00
17:30											17:30
18:00											18:00
18:30	ROOM 1	ROOM 2	ROOM 3	ROOM 4	ROOM 1	ROOM 2	ROOM 3				18:30
19:00											19:00
19:30	CONGRESS RECEPTION				EAEC GALA DINNER			Legend:			19:30
20:00								P01-P12 POWERTRAINS			20:00
20:30								V01-V08 VEHICLES			20:30
21:00								T01_T04 SYSTEMS			21:00
21:30											21:30

	Wednesday, July 01		Thursday, July 02				Friday, July 03	
8:00	AUTODAY REGISTRATION		EAEC_COUNCIL MEETING				POST CONGRESS VISITS	POST COUNCIL VISITS
8:30								
9:00	TATRA HOTEL							
9:30	AUTODAY2009 / TATRA							
10:00			Coffee Break					
10:30			COMMITTEE_01	COMMITTEE_02	COMMITTEE_03	COMMITTEE_04		
11:00								
11:30								
12:00								
12:30								
13:00	COUNCIL DELEGATES REGISTRATION	ExBo REG.	LUNCH					
13:30								
14:00		FISITA ExBo	FISITA COUNCIL MEETING					
14:30								
15:00	AUTODAY2009 / TATRA / FISITA COUNCIL MEMBERS							
15:30								
16:00								
16:30								
17:00								
17:30								
18:00	TATRA HOTEL	ROOM 4						
18:30								
19:00	COCKTAIL_BIC BRATISLAVA (Zochova str.) (AUTODAY_2009, FISITA COUNCIL)		COUNCIL DINNER					
19:30								
20:00								
20:30								
21:00								
21:30								

WELCOME SPEECH

It is a great honour for the Slovak Republic and Central Europe that on 29th June-1st July 2009, the capital of the Slovak Republic, Bratislava, will host the important European Automotive Congress second time (before 2001), organised under auspices of FISITA for twenty four national societies of automotive engineers, members of the European Automobile Engineers Cooperation (EAEC).

In recent years, the countries of Central Europe have become an important area for the concentration and evolution of transportation techniques, manufacture of components, parts, aggregates, and modules. The automotive industry (AI) and specifically suppliers market is one of the fastest developing sectors in Central Europe (CE). Due to the world – class supply base, excellent production plants and lines, high intellectual capital and ability to readily achieve European levels of productivity, the continent can more competitively satisfy the needs of customer than any ever before in Europe.

In Central Europe, we observe remarkable effects for societies from the aspect of production and usage, an increase in production volume of over 100% in the last decade and from 30% to 80% increase in the fleet of cars.

During this decade which wil l take two more years, we expect great changes in the automotive world in utilising of information technology and almost revolutionary changes in materials and minimisation of materials and energy consumption. The automobile is a part of the living and working environment of a person, and the greatest changes will be linked with production systems and the roles of people.

The Congress with the theme "Europe in The Second Century of Auto-Mobility" will consist of 120 presentations in three groups:

Topic P: Powertrain Efficiency

Topic V: Vehicles for the Next Decade

Topic T: Production and Transportation Systems

The biennial EAEC Congresses provide excellent opportunities for automotive experts to present the latest results and to exchange information in the field of the automotive and related industries. In the Congress Area, the participants will also be able to see some of the products as results of efforts by final developers, producers, and suppliers. We organise also FISITA EDUCATION CONFERENCE and workshop AUTODAY2009 for top managers, who will meet the members of FISITA Council there.

Bratislava is a beautiful place and renowned for hosting foreign guests. It lies among the Carpathian Mountains, on the river Danube, has good transport connections (Bratislava and Vienna airports), and also has various hotels, museums, music concerts, and modern and Gothic monuments.

On behalf of the organisation committee, as President of the Slovak Society of Automotive Engineers (SAITS) and Chairman of the EAEC Automotive Congress 2009, I would like to invite you to the events taking place in Bratislava this June.

Ján Lešinský
SAITS President
EAEC Automotive Congress Bratislava 2009 Chairman

PRESIDENTIAL ADDRESS

DEAR PARTICIPANTS OF THE EAEC 2009 EUROPEAN CONGRESS,

EAEC was founded in 1985 as a cooperation of five European FISITA Member Societies, which has increased in the meantime to a family of 24 societies in the core of FISITA.

Since 1987, the national EAEC societies have organized regional automotive congresses in the "uneven" years between the International FISITA World Congresses. Leading experts from industry, research and academia present the latest technical results. Persons from political institutions give strategic directions of the European and global industry in order to meet the growing demands of mobility, safety, environmental protection and saving of energy.

We cannot ignore and we have to face the fact that the world economy and thus the auto world is now in a crisis. But that crisis does not have its origin in the automotive industry.

In Europe, we have numerous automotive events like congresses, conferences, symposia and workshops. The main event of this year is the EAEC 2009 Congress. The great number of automotive events in Europe and this Congress are, despite of the crisis, positive signals for the future of the European automotive community, which is well-prepared for the time after "tomorrow".

Europe is not only a continent. The 46 states are in a process of unification based on a unique culture and history. EAEC supports the European automotive industry via the national Societies to continue to be an important factor in the global market. We have to be aware that the most important impacts in automotive technology were initiated in Europe, for example, the main propulsion systems, the Otto and Diesel engines are European developments. The first passenger cars and trucks were produced in Europe.

Well-functioning passenger and freight links are vital for European undertakings and citizens. Automobiles are not only passenger cars, but also trucks, buses and tractors or other self-propelled vehicles on and off the road. There is and will be a need for all kinds of automobiles.

I wish the organizers and all the participants a successful meeting, many interesting presentations and fruitful discussions.

The motto for this congress and the automotive future should be:
Keeping Europe Moving!

Brigadier ret. Prof. Günter Hohl
EAEC President
FISITA Vice President Europe

INTRODUCING FISITA

FISITA is an independent world body representing over 153,000 automotive engineers belonging to national automotive societies in 38 countries. FISITA was founded in 1948 to provide a global forum for the exchange of technical knowledge on every aspect of vehicle design and manufacture. FISITA brings together engineers and decision-makers from industry, academia and government to work towards the improvement of transportation systems, the conservation of energy and the protection of the environment.

FISITA is a powerful force for the exchange of leading-edge technologies between nations, helping to create efficient, affordable safe and sustainable automotive transportation for the benefit of all.

FISITA provides a range of innovative programmes and services which help engineers to be more effective in their work.

FISITA supports the formation and development of students and young engineers.

FISITA delivers its strategy through a partnership between its member societies, the officers and staff of FISITA, the vehicle manufacturers and suppliers represented in the Honorary Committee and through co-operation with other organisations concerned with improving automotive transportation.

FISITA's Goals

To provide every FISITA member society with a global platform from which to promote its activities, advance its objectives and deliver added value to its individual members.

To support the professional development of automotive engineers by providing high quality, relevant technical and non-technical information and networking services.

To encourage young people to pursue a career in automotive engineering by providing advice, information and support to students and young engineers.

To create a better understanding of automotive engineering and its positive contribution to society among decision-makers, other organisations in the mobility sector and the general public.

To raise awareness of FISITA, its members and its mission.

INTRODUCING EAEC

European Automobile Engineers Cooperation is a cooperation of the European automotive engineering societies, which was founded in 1986 within the core of FISITA, responding the need of more specific cooperation among the European societies to forge closer links between the European automobile engineers societies, with the specific objective of interchanging information through programmes of events and joint technical meetings.

INTRODUCING SAITS

Slovak Society of Automotive Engineers is an organization grouping engineers and technicians from the field of automotive and related industries, research and universities. It has more than 150 members.

It plays the role of active backing for the research, development, production and application of road and off-road motorcars, their parts and systems, including fuels.

The SAITS was founded on 1st October 1993 in Bratislava. As the 27th national organisation of automotive engineers and technicians, it was accepted to the World Federation of FISITA at the

FISITA Council in Munich on the 19th May 1994. Simultaneously it became a member of the European Association of FISITA Members – EAEC.

INTRODUCING E&CC INTENZÍVA, LTD.

Educational & Conference Centre INTENZÍVA, Ltd. is an independent private company founded 9 years ago. Professional team of experts is able to provide, to proceed and to evaluate all programmes within our portfolio as well as to prepare brand new project according to the needs and requirements of its customers. Its mission is to focus on longterm certified educational programms – various issues for experts within the areas of management, marketing and human resources.

It is a unique provider of conference services based on own know-how with a series of repeated events.

It has implemented a Quality Management System according to standard ISO 9001:2000 since 2003.

FOR MORE INFORMATION PLEASE CONTACT

Patronage

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Co-Organizer

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Main organizer

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Official Congress website: www.eaec2009.com

EAEC MEMBERS

Austria	ÖVK	Austrian Society of Automotive Engineers (Österreichischer Verein für raftfahrzeugtechnik)
Belarus	AAA	Academic Automotive Association (Академическая Автомобильная Ассоциация)
Belgium	UBIA	Union Belge des Ingénieurs de l'Automobile
Bulgaria	SAEB	Society of Automotive Engineers in Bulgaria
Croatia	CroSev	Croatian Society for Engines and Vehicles
Czech Republik	CAS	Česká Automobilová Společnost
Finland	SATL	Suomen Autoteknillinen Liitto r.y.
France	SIA	Société des Ingénieurs de l'Automobile
Germany	VDI	VDI-Gesellschaft Fahrzeug-und Verkehrstechnik
Hungary	GTE	Scientific Society of Mechanical Engineering (Vehicle Devision) Gepipari Tudomanyos Egyesulet
Italy	ATA	Associazone Tecnica dell' Automobile
Latvia	LAIA	Latvian Society of Automobile Engineers
Lithuania	LSAE	Lithuanian Society of Automotive Engineers

The Netherlands	KIVI-NIRIA	Koninklijk Instituut Van Ingenieurs
Poland	SIMP	Polish Society of Mechanical Engineers and Technicians
Romania	SIAR	Societatea Inginerilor de Automobile din Romania
Russia	AEE	Association of Automotive Engineers
Serbia	JUMV	Yugoslav Society of Automotive Engineers
Slovak Republik	SAITS	Spolok Automobilových Inžinierov a Technikov Slovenska
Slovenia	AMETS-AG	Association of Mechanical Engineers and Technicians of Slovenia – Automotive Group
Spain	STA	Sociedad de Técnicos de Automoción
Sweden	SVEA	Swedish Vehicular Engineering Assocociation
Switzerland Switzerland	SAE	Society of Automotive Engineers Switzerland
United Kingdom	IMechE	Institution of Mechanical Engineers Automotive Division

ORGANISING COMMITTEE MEMBERS

JÁN LEŠINSKÝ, CHAIRMAN	SLOVAK REPUBLIC
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DUBOKA, Cedomir	SERBIA
LEŠINSKÝ, Ján	Chairman, SLOVAK REPUBLIC

JUN 29, 2009

DELEGATE REGISTRATIONS (7:30 – 09:00)

DETAILED SCIENTIFIC PROGRAMME

OPENING SESSION (9:00 – 10:30)
Ján Lešinský, EAEC Congress 2009 chairman
Günter Hohl, president of EAEC
Welcome of the Slovak Republic representatives

Coffee Break ***(10:30 – 11:00)***

PLENARY SESSION (11:00 – 12:30)

1 Takao KUBOZUKA, JSAE, Japan
Forecast of Vehicle Technologies in Year 2030

2 N.J.SCHUBERT , Center of Excellence Fuels/Innovations&Development, OMV
Future CO2 Challenge for the Car and Fuel Industry – OMV´s Perspective

3 Emilia BRATSCHITSCH, FH Joanneum, Austria
Research and Development in Engineering Education

4 Jozef BILLY, R&D Institute, US STEEL Košice, Slovak Republic
A Galvanizing Time for Central Europe

5 Franz X. MOSER, Executive Vice President, AVL LIST, Graz
Future Heavy Truck Powertrain Concepts – the CO2 Challenge

6 Christian BEIDL, TU Darmstadt, Germany
Powertains & Europe – history and future

Lunch ***(13:00 – 15:00)***

MONDAY, JUNE 29	ROOM 1	SESSION **P01** 15:00 – 16:30	POWERTRAIN PERFORMANCE 1
			Chairman: Hans Peter LENZ
			Mahamalage S. M. PERERA, S. THEODOSSIADES, H. RAHNEJAT Loughborough University, UK *Effect of offsetting crankshaft on engine efficiency*
			Michael DELIGANT, P. PODEVIN, F. VIDAL, W. TYMINSKI, S. GUILAIN, H. LAHJAILY Conservatoire national des arts et métiers, Paris, France *3D thermal steady-state CFD analysis of power friction losses in turbocharger´s journal bearing and comparison with finite difference method and experimentation*
			Emil TOPORCER, V. HLAVNA, E. KOVALČÍK University of Zilina, Zilina, Slovak republic *Cylinder liner thermal and structural stress analysis*
		16:30 – 17:00	Coffee break
		SESSION **P02** 17:00 – 18:30	ENGINE DEVELOPMENT (INNOVATION)
			Chairman: Ján LEŠINSKÝ
			Timo JANHUNEN Aumet Oy, Finland *The Z engine, a new type of car diesel engine having low emissions, high part load efficiency and power density and low manufacturing costs*
			Angelo ALGIERI, P. MORRONE University od Calabria, Italy *The influence of the operating conditions on the performances of innovative after treatment systems*
			Harald RIENER MAGNA Powertrain Engineering Center, Steyr, St. Valentin, Austria *Simulation of engine dynamics by using MBS/FEM-coupled structures*
	ROOM 2	SESSION **P03** 15:00 – 16:30	NOISE & VIBRATION – ENGINES
			Chairman: Raphael HALLEZ
			Peter FISCHER, S. HOLZER, C. SCHÖRGHUBER dTech Steyr DTS GmBH., Austria *The virtual acoustic test track: Real time simulation of computed engine borne sound for transient driving conditions*
			Stefan KAINDL, P. FISCHER dTech Steyr DTS GmBH., Austria *Simulation of vibration fatigue for transient loaded engine components*
			Marek FLEKIEWICZ, P. FABIS, B. FLEKIEWICZ GIGATRONIC Stuttgart GmBH, Germany *Misfire detection in spark ignition engine – part 1*
			Adrian CLENCI, A. BIZIIAC, J. BERQUEZ, L. BOGDAN, P. PODEVIN, G. DESCOMBES, V. HARA University of Pitesti, Romania *Variable intake valve lift on spark ignition engine and the effects on fuel economy*

MONDAY, JUNE 29	ROOM 2	16:30 – 17:00	Coffee break
		SESSION **P04** 17:00 – 18:30	POWERTRAINS AND GEARS
			Chairman: Thomas DRÄXL
			Bernd-Robert HÖHN, T. DRÄXL FZG, TU Munich, Germany *The optimized CVT hybrid driveline – combining fuel economy and drivability through a novel engine starting method*
			Karol GRAB-ROGALINSKI TU Czestochowa *Analysis of turbocharged gas engine with MILLER CYCLE*
			Bogdan Ovidiu VARGA, N. BURNETE, I. RUS, A. COSTEA TU of Cluj-Napoca, Romania *Automatic gearbox optimizing process developed in Simulink and CANoe*
	ROOM 3	SESSION **V01** 15:00 – 16:30	BUSSES & TRUCKS 1
			Chairman: Günter HOHL
			Valentin IVANOV, B. SHYROKAU, K. AUGSBURG TU of Ilmenau, Germany *Model- and hardware-in-the-loop-simulation for problems of bus dynamics control*
			Mihaela-Liana BOGDAN University of Craiova, Romania *Aspects about dynamic simulation of a car suspension assembly*
			Juraj MATEJ *Slovak University of Technology, Bratislava, Slovak republic* Optimization of hybrid electric truck
			Jerzy JASKOLSKI, R. KRZYZAK Cracow University of technology, Poland *The molecular and thermo-mechanical aspects of joining materials – ideas against ceramic elements of the engine*
		16:30 – 17:00	Coffee break
	ROOM 3	SESSION **V02** 17:00 – 18:30	BUSSES & TRUCKS 2
			Chairman: András VOITH
			Beatriz L. BOADA, A. GAUCHIA, M.J.L. BOADA, V. DIAZ Carlos III University, Madrid, Spain *The effect of an active roll system in the behavior of a bus structure*
			Ester OLMEDA, J. L. SAN ROMAN, A. GAUCHIA Iesvea, Carlos III University, Madrid, Spain *A model of coordinate system for bus dynamic analysis*
			Agnieszka RUTECKA, L. DIETRICH, Z. L. KOWALEWSKI Institute of fundamental Technological research PAN, Warsaw, Poland *Creep and low cycle fatigue investigations of light aluminium alloys for engine cylinder heads*
			Waleed FARIS, S. IHSAN Int. Islamic University, Malaysia *Semi-active suspensions for two and three-axles off-road vehicles*

TUESDAY, JUNE 30	ROOM 1	SESSION **P05** 08:30 – 10:00	HYBRID 1
			Chairman: Aditya DHAND
			Jihun KIM, H. KIM, T. PARK, K. HAN, H. LEE Hanyang University, Seoul, Korea *A study of the control strategy of the ISG system using DOB for the parallel hybrid vehicle*
			Kyuhong HAN, J. KIM, H. KIM, T. PARK, J. KIM, H. LEE Hanyang University, Seoul, Korea *Fault detection and isolation strategy in parallel hybrid electric vehicles*
			Eberhard SCHUTTING, T. SCHATYBERGER, T. KAMMERDIENER, M. NOST Graz Univesity of Technology, Austria *In-cylinder strategies and alternative fuels for lowest diesel emissions*
			Danut Gabriel MARINESCU, I. TABACU Univesity of Pitesti, Romania *Ecomatic hybrid system for an hybrid utility vehicle*
		10:00 – 11:00	Poster visit
		SESSION **P06** 11:00 – 12:30	HYBRID 2
			Chairman: Eberhard SCHUTTING
			Juraj MATEJ Slovak University of Technology, Bratislava, Slovak republic *Hybrid vehicle power-flow control*
			Aditya DHAND, A. WALKER, B. CHO, D. KOK, R. H. LORENTZEN, T. PETRIDIS AVL Powertrain UK Ltd., Basildon, Esex, UK *Evaluation of impaired vehicle launch for stop-start micro hybrid vehicles*
			Tomaz KATRASNIK Univesity of Ljubljana, Slovenia *Energy conversion efficiency of parallel and series hybrid electric heavy-duty vehicles*
			Qinglian REN, D. Crolla, A. Morris Univesity of Sunderland, UK *Performance comparisons of single and dual epicyclic power split transmissions for hybrid electric vehicles*
		12:30 – 14:30	Lunch

TUESDAY, JUNE 30	ROOM 1	SESSION **P07** 14:30 – 16:00	**GAS FUELS 1**
			Chairman: Antoni JANKOWSKI
			Sebastian VERHELST, R. SIERENS Ghent University, Belgium *Potential of a supercharged port fuel injected hydrogen engine*
			Peter MESMAN, B. VEENHUIZEN HAN Unviersity, Arnhem, Netherlands *Influence of backpressure on the spray formation of liquid LPG in a constant volume chamber*
			Piotr BIELACZYC, A. SZCZOTKA, P. GIZYNSKI, I. BEDYK BOSMAL Automotive RND Centre, Bielsko Biala, Poland *The impact of different biodiesel blends with high contents of RME on the exhaust emissions from modern light-duty diesel engine*
			Mustafa ELKADY, A. ELMARAKBI, M. SALEH, M. ABDELHAMEED, A. BAWADY Sunderland University, UK *Continuous variable valve timing control system for model spark ignition engine*
		16:00 – 17:00	Coffee break/Poster visit
		SESSION **P08** 17:00 – 18:30	**POWERTRAIN & COMBUSTION**
			Chairman: Guido LENAERS
			Kjell ac BENGSTRÖM GM Powertrain Sweeden AB *The new Ecotec turbo Biopower – power of nature*
			Antoni JANKOWSKI, J. JAROSINSKI, M. SLEZAK Institute of Aeronautics, Warsaw, Poland *Evaluation of heat transfer from combustion gases to combustion chamber walls of piston engines*
			Antoni JANKOWSKI, P. LAGOWSKI, M. SLEZAK Institute of Aeronautics, Warsaw, Poland *Theoretical and experimental studies of heat release characteristics in the combustion chamber of CI engine*
			Michael URBANEK, P. HOFMANN, B. GERINGER TU Vienna, Austria *Vehicle use with ethanol blends – emission performance and potential for CO2 reduction*

TUESDAY, JUNE 30	ROOM 2	SESSION **V03** 08:30 – 10:00	BUSSES & TRUCKS
			Chairman: Antonio GAUCHIA
			Peter GAJDATSY, K. JANSSENS, P. MAS, L. GIELEN, H. van der AUWERAER, W. DESMET LMS International n. v. Leuwen, Belgium *Introduction and validation of a novel TPA method on experimental and industrial cases*
			Siegfried HOLZER, P. FISCHER, G. WAGNER, A. WALSER, Ch. STOCKINGER Kässbohrer Transport technik GmBH., Eugendorf, Austria *Durable design of transport vehicles – Calculation of welding seam fatigue properties*
			Ralf STETTER, Carsten LAUBER Hochschule Ravensburg – Weingarten, Germany *Advanced simulation techniques for customer oriented seating systems development*
		10:00 – 11:00	Poster visit
		SESSION **P09** 11:00-12:30	ENGINE & EMISSIONS
			Chairman: Kjell ac BERGSTRÖM
			Marek FLEKIEWICZ,G. KUBICA , K. WILK Silesian University of Technology, Katowice, Poland *Heat Release Process Analysis of an SI Engine Powered by Natural Gas and Methane-Hydrogen Blends*
			Guido LENAERS VITO, Mol, Belgium *On-board measurement of the influence of driving behavior and road type on CO2 emission and consumption for 4 powertrain technologies*
			Jerzy MERKISZ, J. PIELECHA Poznan University of Technology, Poland *On-board emissions measurement from light duty diesel vehicles*
			Toni KINNUNEN, S. DEL RE ECO CAT *Catalytic solution for CNG and bi-fuel engine-out emissions*
		12:30 – 14:30	Lunch

TUESDAY, JUNE 30	ROOM 2	SESSION **V05** 14:30 – 16:00	VEHICLE SYSTEMS 1
			Chairman: Alexander BERG
			Marcus KALTENBÖCK, H. Dannbauer, D. Eberhard, W. Robert, Ch. Gaier Magna Powertrain, St. Valentin, Austria *Stiffness and fatigue life investigations of different spot weld modeling techniques*
			Gergely BARI Budapest University of technology and economics, Hungary *Application of Active anti Roll bar Systems for Enhancing Yaw Stability*
			Jinkuk CHO, J. KIM, H. LEE Hanyang University, Seoul, Korea *Integrated control for ESC and TVD using sideslip angle – sideslip angular speed, sideslip angle – yaw rate phase plane*
		16:00 – 17:00	Coffee break/Poster visit
		SESSION **P10** 17:00 – 18:30	GAS FUELS 2
			Chairman: Roger SIERENS
			Rizalman MAMAT Universitz of Birmingham, UK *Effect of exhaust gas recirculation (EGR) with multiple injectionon combustion pattern in a common rail diesel engine*
			Pasquale CORBO, F. MIGLIARDINI, O. VENERI Italian national research council – Instituto Motori, Napoli, Italy *Light metal hydrides as hydrogen storage system for fuel cell power trains*
			Markus KIEBERGER, P. HOFFMANN, B. GERINGER TU Vienna, Austria *Preignition Phenomena – Limit of supercharging of SI engines*
	ROOM 3	SESSION **T01** 08:30 – 10:00	PRODUCTION TECHNOLOGY
			Chairman: Herman VAN DER AUWERAER
			Attila GUBOVITS Budapest University of Technology and Economics, Hungary *Validation process for vehicles equipped with ESP*
			Tom GORDON, A. BODEN, J. BROWN, C. WELUNGODA MIGfast Pty Ltd., Melbourne, Australia *Paradigm shift in productivity for robotic MIG welding*
			George GHERGHINA, M. BRABETE University of Craiova, Romania *Implementing a component from a new supplier*
			Daniel IOZSA Politechnica University of Bucharest, Romania *FE analysis of a truck structure in order to predict its crash behavior*

TUESDAY, JUNE 30	ROOM 3	10:00 – 11:00	Poster visit
		SESSION **V04** 11:00 – 12:30	MODELS & VEHICLE SIMULATION
			Chairman: Peter FISCHER
			Belachew TESFA, R. MISHRA, F. GU, A. BALL University of Hudesfield, UK *Transient process modeling for condition monitoring of compression ignition (CI) engine*
			Wolfgang HIRSCHBERG, F. PALČÁK, G. RILL, J. ŠOTNÍK TU Graz, Austria *Reliable vehicle dynamics simulation in spite of uncertain input data*
			Balint SZABO Budapest University of Technology and Economics, Hungary *Multi-body wheel model development for simulating the tire deformations during planar motion*
			Francisco J. MARTÍNEZ, J. M. ROYO, I. NADAL, J. J. SÁNCHEZ, J. NOACK, B. KUNHERT Aragón Institute of Technology, Spain *Multibody simulations of a brake booster system by means of finite element analysis*
		12:30 – 14:30	Lunch
		SESSION **T02** 14:30 – 16:00	PRODUCT & PRODUCTION PROCESS
			Chairman: Ralf STETTER
			Gabriel NOWACKI Motor Transport Institute, Warsaw, Poland *The national automatic toll collection system (NATCS) – proposition for Poland*
			Antonio GAUCHIA, M.J.L. BOADA, V. DIAZ Carlos III University, Madrid, Spain *Investigation of the dynamic performance of a light van body-in-white structure*
			Giovanni BELINGARDI, E. GOBETTO, A. SCATTINA Politecnico di Torino, Italy *A new design for a van bonnet to meet lightweight and pedestrian safety targets*
		16:00 – 17:00	Coffee break/Poster visit

TUESDAY, JUNE 30	ROOM 3	SESSION **V06** 17:00 – 18:30	**VEHICLE SYSTEMS 2**
			Chairman: Wolfgang HIRSCHBERG
			Alexander BERG, P. RÜCKER, F. LEIMBACH, E. C. CHIRWA, G. K. SHINNASWAMY DEKRA Automobil GmBH., Stuttgart, Germany *Contribution to highlight possible impacts of nonprofessional repair on the quality and safety of vehicles*
			Tommas INGRASSIA, G. MARANNANO. G. V. MARIOTTI University of Palermo, Italy *Design and optimization of a chassis for a formula SAE race car*
			Herman VAN DER AUWERAER, J. ANTHONIS, M. GUBITOSA, N. ALBARELLO, P. MAS LMS International, Leuven, Belgium *Mechatronic optimization in intelligent vehicles: application to an active damper*

WEDNESDAY, JULY 01	ROOM 1	SESSION **P11** 08:30 – 10:00	**POWERTRAIN PERFORMANCE 2**
			Chairman: Michael DELIGANT
			Wladyslaw MITIANIEC, K. BUCZEK Cracow University of Technology, Poland *A new design of ecologic two-stroke engines*
			István BARABÁS, A. TODORUT, D. BALDEAN, F. SUCIU Technical University of Cluj-Napoca, Romania *Experimental study on the spray characteristics for diesel fuel and biodiesel-diesel fuel-bioethanol blends*
			Wladyslaw MITIANIEC, M. FORMA Cracow University of Technology, Poland *Influence of charge motion on spray guided direct fuel injection in small power two-stroke engines*
		10:00 – 10:30	Coffee break
		SESSION **P12** 10:30 – 12:00	**FUELS & LUBRICANTS**
			Chairman: Belachew TESFA
			Sabato IANNACCONE, M. GAMBINO, L. DE SIMIO Instituto Motori – CNR, Napoli, Italy *Environmental advantages from biofuels employment*
			Karel VLASAK DEP Europe Stuttgart, Germany *CAE driven vehicle development using mesh morphing for weight reduction & fuel economy*
			Dzmitry HERSHAN Belarusian National Technical University, Belarus *Coordination of fuel sprays characteristics with combustion chamber parameters*
			Harry C. WATSON, Pou.a MEHRANI University of Melbourne, Australia *An ultra-lean burn SI engine with extreme efficiency and flexibility*

WEDNESDAY, JULY 01	ROOM 2	SESSION **V07** 08:30 – 10:00	BRAKES & SUSPENSION 1
			Chairman: Jose VALDES
			John D FIELDHOUSE, D. BRYANT, A. CRAMPTON, C. TALBOT The University of Huddersfield, UK *Thermo-elastic and elastic investigations of a brake disc during a heavy braking event.*
			Siarhei KLIAUZOVICH, K. AUGSBURG, J. SENDLER Minsk-Lada, Belarus *Development of brake-by-wire systems for alternative vehicle concepts*
			John D. FIELDHOUSE, N. ASHRAF, C. J. TALBOT The University of Huddersfield, UK *An investigation of the movement of the disc/pad centre of pressure during a braking event.*
		10:00 – 10:30	Coffee break
		SESSION **V08** 10:30 – 12:00	BRAKES & SUSPENSION 2
			Chairman: Stefan KAINDL
			Javier ORUS, J. M. RODRIGUEZ-FORTUN, T. PÜTZ, W. SCHWANKE, Instituto Technológico de Aragón (ITA), Zaragoza, Spain *Real-time simulation of hydraulic control unit for brake systems*
			Hyunsup KIM, H. LEE Hanyang University, Seoul, Korea *Synchronous height control algorithms based on optimal control for the air suspension system*
			Vladimir ALGIN, D. TRETSIAK, O. DROBYSHEVSKAYA *National Academy of Sciences of Belarus, Minsk* Investigations in advanced brake assistant systems
			Zsofia UJSAGHY Budapest University of Technology and Economics, Hungary *Modern recycling methods of car wrecks, considering recovery possibilities of shredded light fraction*
	ROOM 3	SESSION **T03** 08:30 – 10:00	STANDARD & REGULATIONS
			Chairman: Peter GAJDATSY
			Nicolae FILIP, F. CRISTEA, C. AIRINEI Technical University of Cluj-Napoca, Romania *Research concerning the vehicles classification and identification with laser sensor*
			Raphael HALLEZ, K. DE LANGHE, P.GAJDACSY LMS International, Leuven, Belgium *Application of the fast multipole method to compute the acoustic radiation of a complete vehicle*
			Tímea FÜLEP, L. NÁDAI Budapest University of Technology and Econimics, Hungary *Dependability in design of automotive systems regarding legislative requirements*

WEDNESDAY, JULY 01	ROOM 3	SESSION **T03** 08:30 – 10:00	Nikolett PEZSA, A. TOROK, M. ZOLDY Budapest University of Technology and Economics, Hungary *Greenhouse gas emission of the Hungarian transport sector*
		10:00 – 10:30	Coffee break
		SESSION **T04** 10:30 – 12:00	INFORMATION & COMMUNICATION SYSTEMS
			Chairman: Alessandro SCATTINA
			Oliver SANDER, B. GLAS, Ch. ROTH, J. BECKER, K. D. MUELLER-GLASER University of Karlsruhe KIT, Germany *Real time information processing for car to car communication applications*
			Richard MUTSCHLER GIGATRONIC Stuttgart GmBH, Germany *Improvement of the HMI development process through model based specification.*
			David GALLEGOS, F. LIESA, M. MATEO, F. CANSECO Technical University of Catalonia, Barcelona, Spain *Assignment process of the emergency services in the e-call project*

POSTER SESSION	György BUDIK Budapest University of Technology and Economics, Hungary *Hydrogen based operation of internal combustion engines*
	István BARABÁS, A. TODORUT, D. BALDEAN, F. SUCIU Technical University of Cluj-Napoca, Romania *Key fuel properties of biodiesel-diesel-bioethanol blends which influence the spray process*
	Chien-tai HUANG, Ch. CHEN, S. CHENG, B. CHEN, Y. LIAO Automotive Research and Testing Center (ARTC), Lugang, Taiwan *Product design and vehicle testing of an electric parking brake actuator*
	Catalin ALEXANDRU, P. ALEXANDRU University Transilvania of Brasov, Romania *The dynamic analysis & simulation of the guiding – suspension system of the motor vehicles using the virtual prototyping technique*
	Miguel Ángel PÉREZ SALAVERRÍA Jaguar-Land Rover Spain Portugal, Madrid, Spain *Service needs forecasting: an approach for the automotive industry using analogies with medical ER management models*
	Miguel Ángel PÉREZ SALAVERRÍA Jaguar-Land Rover Spain Portugal, Madrid, Spain *Intensive use of aluminium in car body construction*
	Petre ALEXANDRU, C. ALEXANDRU University Transilvania of Brasov, Romania *Mechanisms for the integral steering*
	Jacek NOWAKOWSKI, K. BRZOZOWSKI University of Bielsko-Biala, Poland *Numerical model and programme for simulating working process i n the compression-ignition engine with EGR*

POSTER SESSION	
	Vihar MALVIYA, R. MISHRA, J. FIELDHOUSE University of Huddersfield, UK *Enhanced analytical vehicle stability model*
	Zdzislaw STELMASIAK, J. LARISCH, J. SEMIKOW Technical University of Bielsko-Biala, Poland *Some aspects of bifuel SI engine run on alcohol and gasoline*
	Gyubaek CHO, H. KIM, H. CHO, Y. JEONG Korea Institute of Machinery and Materials, Daejeon, Korea *Development of the active regeneration system for the DPF of middle duty vehicles with plasma assisted burner*
	George-Radu TOGANEL, A. SOICA, D. DIMA University Transilvania of Brasov, Romania *Aspects regarding the analysis of the car geometry influence over the pedestrian injury severity and distribution*
	Andrzej AMBROZIK, T. AMBROZIK, P. LAGOWSKI Technical University of Kielce, Poland *Glued functions – based assessment of approximation accuracy of self-ignition engine real indicator diagram*
	Jacek NOWAKOWSKI, K. BRZOZOWSKI University of Bielsko-Biala, Poland *Numerical model and programme simulating working process in the compression-ignition engine with EGR.*

JULY 1, 2009

PLENARY CLOSING CEREMONY

PLENARY CLOSING CEREMONY (12:30 – 13:30)

Ed ROBERTSON, FISITA President Elect (2010 – 2012), USA
Strategy for the Future
Ľudovít UJHELYI, AIA Vice President, Slovak Republic
Address of the Automotive Industry of SR
Ján LEŠINSKÝ, SAITS, Chairman of the EAEC Congress 2009
Günter HOHL, president of EAEC
STA Representative, Chairman of the EAEC 2011, Invitation

Farewell Lunch ***(13:30 – 15:00)***

FISITA Educators Seminar:
'Developing the links between Industry and Higher Education Institutions (HEIs) in Automotive Engineering'
Monday 29 June 2009 (15.00 – 18.30)

This new seminar, organised by FISITA, will provide an opportunity for engineering educators to gain insight into the current and future needs of the industry, in terms of technology and wider competencies, helping them to ensure the relevance of their courses and the employability of their graduates. This unique meeting will also be a chance for educators and industry employers to make connections and discuss common problems and challenges around the need for innovation in automotive engineering education.

The rapid pace of development in automotive technology necessitates a greater shared understanding between engineering educators and their 'consumers' in the automotive industry. With industry leaders predicting a virtual 'reinvention of the automobile' over the coming decades, universities need to prepare their students for careers in tomorrow's automotive business, where diverse factors such as alternative energy; electrification; downsizing; mobility technology; increasing use of advanced electronics & lightweight materials and global demographic shifts, are changing forever the way the industry uses engineering talent.

Seminar Moderator: Matti Juhala, FISITA VP Education

The seminar will be moderated by the FISITA Vice President Education, Matti Juhala.

Speakers will include:

- Representative from the European Commission;
- Business Development Manager responsible for Industry-Partnerships for University of London;
- Human Resources Manager of a major automaker;
- Education Manager of a FISITA member society.

EAEC delegates can attend this seminar free of charge.

A detailed programme for the Educators Seminar, with confirmed speakers, will be available on both the FISITA website (www.fisita.com) and the 2009 EAEC Congress (http://www.eaec2009.com) from early May. You can obtain further information from Emer Padden, Education Officer (e.padden@fisita.com).

AUTODAY 2009

A Brokerage event AutoDay 2009 is organised within the Enterprise Europe Network on the 1st of July 2009 in Bratislava as an official accompanying event to the 12th EAEC European Automotive Congress 2009.

The event is targeted to organisations offering or looking for technologies, tools and solutions in their products, services, development and manufacturing processes or commercial activities in the field of automotive industry. It will be a unique opportunity to establish new business contacts with potential partners from Slovakia and other European countries and a perfect starting point for developing of further co-operation with European automotive suppliers.

There are some more information on the AutoDay website: www.autoday2009.sk.

GENERAL INFORMATION

Venue

The 12th EAEC European Automotive Congress Bratislava will take place at Crowne Plaza Bratislava, a first class deluxe hotel, combining the best central location with comfortable accommodation, modern conference facilities and superb cuisine. Hotel is situated in the heart of the city – opposite the Presidential Residence, within the pedestrian zone and only a few minutes walking distance to the famous Bratislava Castle. Easy to reach, within 10 km distance from Airport in Bratislava, or 50 km distance from Airport in Vienna, it is the best location for the congress.

For more information visit Crowne Plaza's website: www.crowne-plaza.sk/en/

Language

Official language of the 17th EAEC European Automotive Congress is English. Simultaneous translation (English/Slovak) will be at disposal only during Opening and Plenary session.

Currency

From 1st January 2009 Slovakia became a new member of Eurozone, therefore valid currency in Slovakia since January 1st 2009 is EURO. Travellers cheques are accepted at all major banks and exchange offices. If you need to change the money you can easily do that in the exchange offices that are available at the airport, railway station, in the hotel etc. Most shops are accepting credit cards, but it is best to check beforehand. In case you might need cash you can withdraw the money from the ATM cash machine available at the bank office, on the street , in the hotel or in the big shopping centers.

Tipping

Tip is mostly not included; the average is 5-10% of the bill.

Tax

The VAT in Slovakia is 19% and is included in the prices.

Communication

All Slovak nets are UMTS supported, GSM phones are supported too. In the hotel and in some cafes W-LAN connection is available, free of charge.

Electricity
Electric voltage in Slovakia is 230 Volts, alternating at 50 cycles per second. Outlets in Slovakia accept only 1 type of plug, with two round pins; you might need a plug adapter.

Time Zone
Central European Standard Time in summer is 2 hours ahead of Greenwich Mean Time (GMT+2).

Insurance
Participants are recommended to obtain insurance (travel, medical, personal accident, luggage) in their homeland. The organizers can not take any kind of responsibility for potential loss, damage or personal injuries of participants to the Congress or to their relatives or accompanying persons.

Lunches
Lunch in Crowne Plaza is available for all participants that marked this option in Booking Form or will order them during registration. Lunch will be served in restaurant ROME and unit price is 17 EUR per person and day.

REGISTRATION AND PAYMENT

Main registration fees are following:

I register as	Basic fee
Delegate (OECD countries)	750
Delegate (non-OECD countries)	550
Speaker/chair (OECD)	600
Speaker/chair (non-OECD)	450
One's day ticket (FISITA Education Conference)	250
Exhibitors (1 badge)	500
Post graduate student (OECD)	300
Post graduate student (non-OECD)	225
Graduate student	80
Accompanying person(s)	200

Please note: Slovakia has been a member of the EUROZONE from the 1st January 2009.

DELEGATE (SPEAKER/CHAIR) REGISTRATION INCLUDES:

- Opening and Closing Ceremonies
- Plenary and Technical Sessions (oral and poster presentations)
- Congress materials
- Coffee & Refreshments
- EAEC 2009 Congress Welcome Drink

STUDENT REGISTRATION INCLUDES:

- Opening and Closing Ceremonies
- Plenary and Technical Sessions (oral and poster presentations)
- CD Full Papers
- Coffee & Refreshments

ACCOMPANYING PERSON REGISTRATION INCLUDES:

- Opening and Closing Ceremonies
- Coffee & Refreshments
- EAEC 2009 Congress Welcome Drink

Lunch is NOT included in the registration fee

HOW TO REGISTER:

Fill in a Booking Form which you may find at Registration Desk and pay the charged fee by cash. You will obtain the tax proof. Our hostesses will arrange all the necessary.

ACCOMMODATION & BOARD

Discounted prices for Congress Participants in hotel Crowne Plaza are following:

Accommodation at Hotel Crowne Plaza****	
Room type	1 night
single	120 EUR
double	145 EUR

Please note that the price for room includes breakfast, local tax, fitness centre & pool entry and internet connection.

Lunch at Hotel Crowne Plaza****	
Price with Congress discount	17 EUR/person

If from any reason you prefer to stay in other hotel we can recommend you following ones:

Hotels (close the venue)

Name	Address	Contact
Park Inn Danube****	Rybné námestie 1 813 38 Bratislava	Phone: +421 2 5934 0000 Fax: +421 2 5441 4311 reservation@hoteldanube.com www.hoteldanube.com
TATRA***	Nám.1.mája 5 811 06 Bratislava	Phone: 00421 2 59272123 Fax: 00421 2 59272135 recepcia@hoteltatra.sk www.hoteltatra.sk
Devín****	Riečna 4 811 02 Bratislava	Phone: + 421 2 599 858 56 Fax: +421 2 599 858 57 reservations@hoteldevin.sk www.hoteldevin.sk
Družba** (college)	Botanická 25 842 14 Bratislava	Phone: + 421 2 599 858 56 Fax: +421 2 599 858 57 reservations@hoteldevin.sk www.hoteldevin.sk

ACCOMPANYING PROGRAMMES

Technical Tours		
Terms	**Plants**	**Price/person**
1 July,13:30 -17:30	Brose, Lear, Johnson Controls (production) – Lozorno	15 EUR
3 July, 9:00 -17:00	KIA – Žilina, Johnson Controls (R&D Centre) – Trenčín	25 EUR
3 July, 9:00 -13:00	PSA Peugeot – Citroen Trnava	20 EUR

Social Events		
Terms	**Events**	**Place**
29 June 2009	EAEC Congress Welcome	Hotel Crowne Plaza
30 June 2009	Gala Dinner (100 EUR/pers)	Hotel Bonbon
1 July 2009	AUTODAY Dinner	Hotel Tatra

Cultural Programmes		
Terms	**Events**	**Price/person**
29 June,13:3 – 17:00	Walking tour of the historical city centre of Bratislava – (including guide and incoming charges)	15 EUR
A three-hour-long tour of the most important and most famous sightseeing places in the old historical centre of Bratislava		
30 June, 08:00 – 12:30	Sight seeing cruise on the Danube at Devín Castle (including the guide and time charter of the boat)	60 EUR
A comfortable cruise on the river Danube, with a perfect view of both banks and the historical buildings in the city centre. After that a visit of the Slavic fortress Devín, built in the 8th century, which remembers all of its Celtic, Romanian, Slavic and Hungarian inhabitants		
30 June,10:30 – 16:00	Walking tour of the Spa Piešťany (including lunch, guide and transport)	50 EUR
Due to its thermal water sources and now well-known healing hot springs, the area of today's Piešťany was inhabited by our ancestors already in the post tertiary era – 20 000 years BC. Later it was a favourite and precious imperial property. People travel here to relax and enjoy the healing water as well as Piešťany' s beautiful architecture, to be seen at Napoleons Spa or the Colonnade Bridge, which only improves the calm and "curing" atmosphere of this picturesque town.		
1 July, 10:30 – 16:00	Walking tour of the historical city centre of Bratislava – (including guide and incoming charges)	15 EUR
A three-hour-long tour of the most important and most famous sightseeing places in the old historical centre of Bratislava		
2 July, 9:00 – 13:00	Sight seeing cruise on the Danube at Devín Castle (including the guide and time charter of the boat)	60 EUR
A comfortable cruise on the river Danube, with a perfect view of both banks and the historical buildings in the city centre. After that a visit of the Slavic fortress Devín, built in the 8th century, which remembers all of its Celtic, Romanian, Slavic and Hungarian inhabitants		
2 July, 9:00 – 13:00	Walking tour of the Spa Piešťany (including lunch, guide and transport)	50 EUR
Due to its thermal water sources and now well-known healing hot springs, the area of today's Piešťany was inhabited by our ancestors already in the post tertiary era – 20 000 years BC. Later it was a favourite and precious imperial property. People travel here to relax and enjoy the healing water as well as Piešťany' s beautiful architecture, to be seen at Napoleons Spa or the Colonnade Bridge, which only improves the calm and "curing" atmosphere of this picturesque town.		

Cultural Programmes		
Terms	**Events**	**Price/person**
3 July, 9:00 – 17:00	Along the Small Carpathians (Modra, Pezinok, Červený Kameň-Castle)	80 EUR
On this all-day trip you will visit the best known wine-making towns in this region – Pezinok and Modra. Both Small Carpathian towns have a long history and used to be one of the richest and most favourite imperial towns of the 17th and 18th century. After a visit of a hand-made majolica manufactory, you will enjoy the wine tasting of the best wine sorts in one of Pezinok's wine cellars. A visit of the Červený Kameň castle follows, where you will admire the magnificent rooms full of antique furniture, elegant paintings and hunting trophies or watch the hawker's show.		

CANCELLATION POLICY

The organizer reserves the right to cancel the event. Should the event be cancelled we will arrange a full refund. All cancellations by the client must be made in writing, at least 30 days before the event. A 20% registration cancellation fee for processing will be deducted from the full registration refund. Please note that should you cancel your registration less than 30 days prior to the actual starting date of the event, your registration fee shall not be refunded. Should this occur a substitute delegate (exhibitor) may attend at no extra charge.

12th EAEC European Automotive Congress Bratislava

EAEC 2009

June 29 to July 1, 2009

Bratislava, Slovakia

Europe In The Second Century Of Auto-Mobility

BOOK OF ABSTRACTS

JUNE 2009

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ORAL PRESENTATIONS

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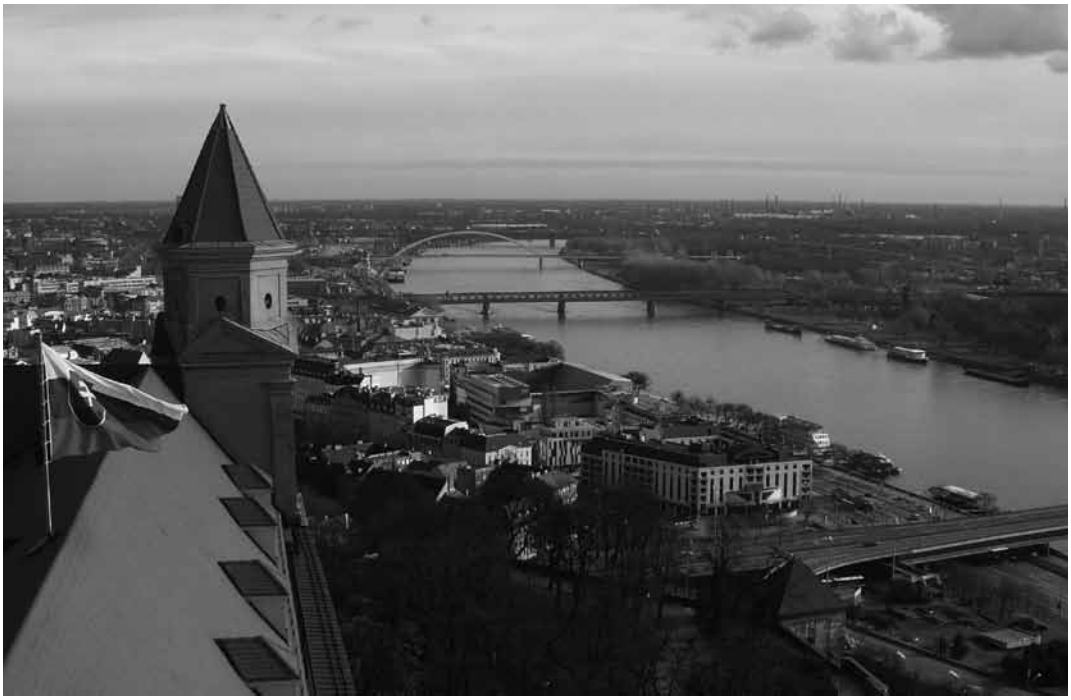

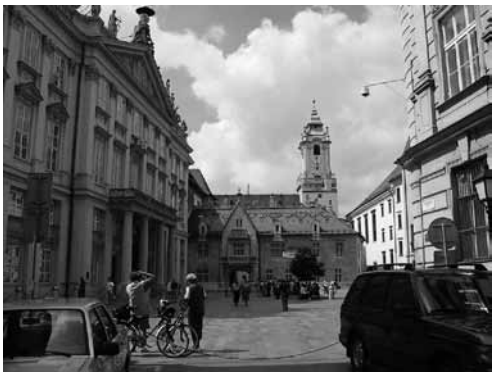

AUTOMATIC GEARBOX OPTIMIZING PROCESS DEVELOPED IN SIMULINK AND CANOE

Lecturer eng. PhD VARGA BOGDAN OVIDIU, Professor eng. PhD BURNETE NICOLAE,
Professor eng. PhD RUS IOAN, Assistant eng. PhD COSTEA ADRIAN
Technical University of Cluj-Napoca, Romania

ABSTRACT
The optimization of the automatic gearbox from the software point of view is considered to be as important as the optimization of the functioning process itself. The software has to take into account all the necessary and unnecessary information that is provided by the ECU for the TCU. If the software of the TCU is not updated to be able to make decisions that are correct for the driver, for the safety of the vehicle and for the transmission itself the entire power train unit has to suffer by poor data management. If the information provided by the ABS and by the ESP, information that are in strict connection with the safety of the vehicle are not correctly treated by the TCU there is a possibility of miss-function of the entire power train unit.

Optimizing the data management is vital in the virtual environment of the TCU control software.

KEYWORDS:
TCU, Optimization, Canoe, Test stand

AN ULTRA-LEAN BURN SI ENGINE WITH EXTREME EFFICIENCY AND FLEXIBILITY

Prof Harry C Watson and Dr Pouria Mehrani
Mechanical Engineering Dept., University of Melbourne

ABSTRACT
The capability of an ultra lean burn spark ignition engine is described. The concept is operation at air-fuel ratios similar to the diesel engine but with essentially homogenous charge. To achieve high thermal efficiency this engine has high compression ratio but with variable valve timing. High specific power output is achieved by supercharging the engine. To meet emission standards no NOx reduction is proposed with only an oxidation catalyst needed to meet Euro 6 standards. This paper is founded on extensive experimental research with lean burn, high compression ratio engines using LPG, CNG and gasoline fuels. It also builds on recent experience with highly boosted spark ignition gasoline and LPG engines and single cylinder engine research used for model calibration. The final experimental foundation is an evaluation of jet assisted ignition that generally allows a lean mixture shift of more than one unit in lambda with consequential benefits of improved thermal efficiency and close to zero NOx. A 2.6 L four-cylinder engine is simulated using the group's PSO (particle swarm optimizer) engine simulation model that at a particular torque-speed, can rapidly find the local optimum engine configuration. Mechanical constraints limit the compression ratio to 15 and variable cam phasing is essential for Atkinson cycle operation under low speed moderate load conditions and reduction in the effective compression ratio under when desirable. In addition to power, thermal efficiency, and NOx emissions, operational characteristics of the engine are reported: optimum ignition timing, lambda, cam-phasing, boost/throttle and more. The engine's predicted maximum performance is a torque of 275 Nm and power of 120 kW with a fuel

consumption reduction of around 40% over conventional SI. This prediction is based on hot-start steady state data so real engine performance will likely be less. It has been shown that the model accurately predicts the lean limit performance of both normal spark ignition and jet assisted ignition with LPG and other fuels.

KEYWORDS:
Efficiency, NOx, ultra-lean burn, jet assisted ignition

CYLINDER LINER THERMAL AND STRUCTURAL STRESS ANALYSIS

Ing. Emil Toporcer, PhD., prof. Ing. Vladimír Hlavňa, PhD., Ing Andrej Kovalčík
University of Zilina / Faculty of Mechanical Engineering

ABSTRACT
The paper follows the paper Simulation of a more effective use of fuel energy in a motor vehicle which has been presented at the EAEC European Automotive Congress 2007. The paper deals with thermal and simultaneously pressure loading of the cylinder liner of a nonconventional cooling-combustion engine. From results of the simulation the following conclusions can be obtained: – the liner was loaded mainly in the upper part some 22 mm from the cylinder head by a relatively high value of equivalent stress. Displacement can be assumed insignificant due to their position (in the direction of y-axis in the liner top and in the direction of x-axis in the upper quarter of the liner).

KEYWORDS:
cylinder liner, stress analysis, nonconventional engine

APPLICATION OF THE FAST MULTIPOLE METHOD FOR SOLVING VERY LARGE ACOUSTIC RADIATION PROBLEMS

Dipl.-Ing. R. Hallez, Dr.-Ing. K. De Langhe, Dipl.-Ing. P. Gajdatsy LMS International,
Leuven, Belgium

ABSTRACT
The Boundary Element Method (BEM) is well known and extensively used to solve acoustic radiation problems. It is especially appropriate for exterior radiation since the fluid domain does not need to be meshed, as opposed to the finite element method. However, the size of the model increases drastically as the frequency of analysis increases, therefore its application is typically limited to component levels and to the lower frequency range. The fast multipole method can be used to extend the boundary element solver and to be able to solve ultra-large scale problems at higher frequencies. This new methodology has been applied here to study the acoustic scattering of a full vehicle in the mid-frequency range. The accuracy of the results as well as the computation time demonstrates the great potential of this new method to solve very large boundary element models.

KEYWORDS:
Acoustics, Fast Multipole, Boundary Element method

PERFORMANCE COMPARISONS OF SINGLE AND DUAL EPICYCLIC POWER SPLIT TRANSMISSIONS FOR HYBRID ELECTRIC VEHICLES

Q. Ren; D. A. Crolla; A. Morris
Institute for Automotive and Manufacturing Advanced Practice (AMAP)
University of Sunderland, UK

ABSTRACT
The development of power splitting transmissions (PST) has been a crucial feature in the technological success of hybrid driveline vehicles and PSTs have played a key role in facilitating the management of the mechanical and electrical power flows, ensuring good driveability, providing improved economy and reducing emissions compared to conventional internal combustion engine vehicles. A new PST is described based on a set of dual epicyclic gears and it is shown to offer economy improvements of around 10% over the more conventional single epicyclic arrangement during the main European and USA driving cycles.

KEYWORDS:
hybrid vehicles, power split, transmission, performance

SIMULATION OF ENGINE DYNAMICS BY USING MBS/FEM COMPOSITE STRUCTURES

Dipl. Ing. Harald Riener, Dipl. Ing. Michael Fischer, Dr.techn. Wolfgang Witteveen
MAGNA POWERTRAIN
Engineering Center Steyr GmbH & Co KG (ECS), Structural Analysis Department
Steyrer Strasse 32, 4300 St. Valentin, Austria

ABSTRACT
The main aim in engine development is to implement new, optimized engine concepts regarding function, design space, weight and costs in very short development times. The trend towards increasing power density by means of supercharging, high speeds and downsizing leads to higher load on crank train components with a reduction of load reserves. Fail-safe design and optimization of these high-load components can be significantly promoted by the efficient use of transient simulation technologies based on MBS algorithms using elastic structures. This paper demonstrates as a primary application the dynamic analysis of an AUDI AG V8 crank train based on a run-up simulation. The aim is to demonstrate the great potential of this method by showing interesting possibilities using optimization tools (e.g. FE-Design's TOSCA) to the acoustics simulation of the complete engine-gearbox assemblies.

KEYWORDS:
Engine Dynamics; MBS- Simulation; Crank train; Durability

A NEW DESIGN OF ECOLOGIC TWO-STROKE ENGINE

DSc. PhD. Eng. Władysław Mitianiec, MSc. Eng. Konrad Buczek
Cracow University of Technology

ABSTRACT
The paper describes the increased downsizing effect during substitution of typical four-stroke engine with new design of two-stroke power unit. A new approach in two-stroke engine conception lies in adaptation of typical four-stroke engine to work in two-stroke mode. To enable proper scavenging, since crankcase has been left for lubricating purposes, abovementioned engine has to be equipped with turbocharger and additional mechanical or electrical charger for transient states operation. The direct injection has to be applied as well, in order to obtain lower emission of pollutants. The work is based on theoretical considerations, which were performed by use of GT-Power software. Results show that work of such engine depends on proper choice of valve timings, geometrical parameters of inlet and outlet ducts and charge pressure. In comparison with reference to four-stroke engine (the same engine with original timing drive), the two-stroke engine obtained 27 g/kWh reduction of brake specific fuel consumption. The benefits of application of this kind of two-stroke engine may be even better, taking into consideration that it produced twice as much power as reference engine, so it can substitute bigger power units which produce more friction losses. Authors plan to adapt existing four-stroke engine to perform two-stroke cycle after additional CFD analysis in the near future.

KEYWORDS:
engine development, two-stroke engine

INFLUENCE OF CHARGE MOTION ON SPRAY GUIDED DIRECT FUEL INJECTION IN SMALL POWER TWO-STROKE ENGINES

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ABSTRACT
The paper considers to mixture formation at direct fuel injection in a small power two-stroke engine. Modelling of physics process during injection was carried out with assumption of the exact experimental set-up. Modelling of the processes taken place in the cylinder requires applying of the physical model based on a turbulent flow, calculation of finite differences in base of the equations of conservation of mass, momentum, energy and chemical species being carried out as a Reynolds average value of the correspondent laminar flow equations. In the paper the following variation for different piston position were shown: distribution of gaseous phase of fuel, temperature, chemical species in the cylinder and vapour mass ratio for the piston and downstream fuel injection systems. The simulation analysis indicates the possible optimal location of injector in the cylinder head in relation to the spark plug. The preliminary results of the modelling and simulation carried out in GT-Power program and KIVA on the real two-stroke engine Robin EC12 show a considerable increase of engine power and reduction of fuel consumption and decreasing of hydrocarbons in exhaust gases in comparison to conventional engine. The paper shows that the scavenge process highly influences on the vaporization and

stratification of the mixture in the cylinder. The engine with direct fuel injection indicates however higher concentration of nitrogen oxide than the carburetted two-stroke engine.

KEYWORDS:
Transport, two-stroke engine, direct fuel injection, pollutants

ENERGY CONVERSION EFFICIENCY OF PARALLEL AND SERIES HYBRID ELECTRIC HEAVY-DUTY VEHICLES

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ABSTRACT
Fuel economy of hybrid electric vehicles (HEVs) strongly depends on the HEV topology, power ratios of the components, applied control strategies and applied drive cycle. Combined analytical and simulation approach was applied to analyze energy conversion efficiency of different HEV topologies. Analytical approach is based on the energy balance equations and considers all energy paths in the HEVs from the energy sources to the wheels and to other energy sinks. Simulation approach is based on a fast forward-facing simulation model for simulating parallel and series HEVs as well as conventional internal combustion vehicles, and considers all components relevant for modeling energy conversion phenomena. Combined approach enables evaluation of energy losses on different energy paths and provides their impact on the fuel economy. It therefore enables identification of most suitable HEV topology and of most suitable power ratios of the components, since it reveals and quantifies the instruments that could lead to improved fuel economy of particular HEV. It is discernible from the analysis that fuel economy improvement of HEVs over internal combustion engine vehicles (ICEVs) is significantly influenced by the drive cycles and to a lesser extent by the vehicle load. HEVs thus enable significant fuel economy improvement for test cycles where ICEVs feature low effective efficiency of the ICE, and for test cycles enabling significant recuperation of the energy by regenerative braking. It is also evident from the results that drive cycle significantly determines most energy efficient HEV topology and configuration.

KEYWORDS:
Hybrid electric vehicles, Energy conversion efficiency, Simulation, Transient cycles

ANALYSIS OF TURBOCHARGED GAS ENGINE WITH MILLER CYCLE

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ABSTRACT
Theoretical analysis of an overexpanded turbocharged gas engine was made using several computer codes. Particularly the Miller cycle was under investigation. Miller cycle can be realized by: advanced or later closure of the intake valve with respect to bottom dead center of the piston. Modeling was realized at various locations of the intake valve closure, various overlap angle, compression ratio and ignition timing. The limits of valve closure was 90 degree of crank angle before bottom dead center and 75 degree after bottom dead center. Several benefits can be achieved when apply Miller cycle to the engine. They are as follows: reducing NO_x emission, increasing indicated efficiency, and decreasing pumping losses. Results of modeling was present on a diagrams which presents changes of the engine parameters such as indicated efficiency, maximum in-cylinder pressure, charged pressure, maximum temperature of unburned charge, maximum temperature of exhaust gases, fresh charge loss on overlap, gas fuel consumption, volumetric efficiency functions of intake valve closure.

KEYWORDS:
Miller cycle, cycle analysis, modeling, turbocharged gas engine

THE OPTIMISED CVT HYBRID DRIVELINE – COMBINING FUEL ECONOMY AND DRIVABILITY THROUGH A NOVEL ENGINE STARTING METHOD

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ABSTRACT
Hybrid powertrains are an answer to the challenge of improving fuel economy of road vehicles. Combining an internal combustion engine with an electric power source allows for various fuel saving measures, such as engine start-stop, regenerative braking and electric power-assist of a downsized engine. Analysis of typical urban driving cycles shows that relatively small installed electric power and energy storage capacity are sufficient to access a large savings potential. This requires frequent starting and shutdown of the IC engine, however. These engine starts can be perceived as uncomfortable. The optimised CVT hybrid driveline developed at Technische Universität München avoids this problem through a novel engine starting method. The core element of the driveline is a two-range CVT ($i\sqrt{i}$ transmission). Dynamic torque gained from a fast transmission ratio change, causing deceleration of the electric motor, is used to crank the IC engine by coordinated engagement of a multi-disc clutch. This permits jerk-free starting and quick response. Shifting between the low and high speed driving range of the transmission is also accomplished without interruption of traction, using two synchroniser clutches only. Two prototypes of the driveline were built and were put into operation on a component test rig and in a large family car. The operation principle of the driveline and the engine start in particular are presented and are complemented by experimental results. An outlook is given on further enhancement of the engine start by closed-loop output torque control.

KEYWORDS:
hybrid, CVT, engine start, multi-disc clutch

A STUDY ON THE CONTROL STRATEGY FOR A PARALLEL HYBRID ELECTRIC VEHICLE WITH AN ENGINE CLUTCH

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ABSTRACT
This paper presents a control method to decrease the torque fluctuation in the powertrain and to improve the comfort, drivability and the response time during the mode transition from the EV mode to the HEV mode by appropriately control of the belt driven ISG system.

The control torques to the ISG are determined for four different phase of the EV-to-HEV mode transition and the slip control of the engine clutch is developed for smooth engagement of the engine clutch.

A estimation algorithm of the crankshaft torque is also developed to determine the compensation torque of the ISG during the torque replacement phase of the EV-to-HEV mode transition.

An optimal control method is applied to conduct fast and stable synchronization of the traction motor speed and the engine speed during the synchronization phase.

The vehicle model programmed with AMESim and Simulink representing the characteristics of the transient response of the target system is used to simulate and verify the proposed control algorithms.

The simulation results show the validity of the proposed control algorithms.

KEYWORDS:
Parallel HEV (Hybrid Electric Vehicle), HCU (Hybrid Control Unit), Torque Fluctuation, ISG (Integrated Starter Generator)
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3D THERMAL STEADY-STATE CFD ANALYSIS OF POWER FRICTION LOSSES IN A TURBOCHARGER'S JOURNAL BEARING AND COMPARISON WITH FINITE DIFFERENCE METHOD AND EXPERIMENTATION

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ABSTRACT
Whether it is due to the CAFÉ commitment or the regulation to come in 2015, but also to the customer requirements, the fuel consumption, and hence the CO2 emissions, become one of the major issue for car manufacturers. One of the most efficient ways to reduce the fuel consumption is to downsize the engines, namely by increasing the engine-specific power and torque, as well as reducing the engine capacity and using turbochargers. In order to keep engine power functioning on a wide area, the turbocharger must have a high performances level. The

turbocharger's performances need to be known for the whole range of engine use. Unfortunately, this is not the case for the turbocharger's operation at low speeds (less than 100000 rpm): these speeds are often encountered in automotive applications particularly in urban conditions where fuel consumption optimisation is an important issue.

In the CNAM laboratory a series of experiments have been performed on a turbocharger test bench equipped with a torquemeter in the low speed range. Results allow a rough evaluation of friction losses based on the difference between the power delivered to the airflow and the power measured by the torquemeter. It seems that these losses can be accurately obtained through direct calculation.

Solutions for the generalised Reynolds equation with an axial groove device were computed in tables for classical journal bearings used in large machines. These tables compile dimensionless solutions for the Reynolds equation for relative eccentricity between 0.1 and 0.95 and different L/D ratios. Unfortunately, turbocharger journal bearings are weakly loaded and oil viscosity is significant so eccentricity is less than 0.05.

A finite difference method was implemented to solve the isothermal Reynolds equation in order to extend tables for turbocharger applications. This method was validated by recomputing the values in tables and it was applied to the parameters of the turbocharger's journal bearing. As with the classical method, the program authorises computed solutions for specified L/D ratios and eccentricity. Since the load force is a result of integration of the pressure field, and turbochargers operate with a constant load, relative eccentricity values are to be determined. For that purpose, a simple dichotomy procedure for eccentricity was developed.

This method was then enhanced considering a real inlet layout device with four holes, and applied to the turbocharger's journal bearing for different parameters (inlet oil temperature, inlet oil pressure, rotational speed). The calculated friction power losses seem to be over-estimated by this method due to the high rotational speed and the isothermal hypothesis.

A 3D CFD model using Navier-Stokes mass and energy equations was therefore developed. Calculations were split into two steps. The first step computes pressure and velocity maps with constant temperature. Then the activation of the energy equation and viscous heating allows a temperature map to be computed over all the oil volume. Friction effects result in an increasing oil temperature and decreasing oil viscosity. Thus estimated friction power losses are smaller than with an isothermal method and a comparison with experiments shows more realistic results.

KEYWORDS:
turbocharger, friction losses, journal bearings, CFD, THD, hydrodynamic, lubrication

EVALUATION OF IMPAIRED VEHICLE LAUNCH FOR START-STOP MICRO HYBRID VEHICLES

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ABSTRACT
One of the primary features of a micro hybrid vehicle is the automatic shutdown and restart of the engine to avoid engine idling when the vehicle is at rest. For the vehicles with manual

transmission, depending upon the strategy adopted, an engine stop can be initiated with the transmission in gear and the clutch disengaged or the transmission in neutral. This strategy and its calibration such as pedal position threshold, has an important significance on the drivability of the vehicle in terms of vehicle launch behaviour.

An impaired vehicle launch is defined as an inferior launch performance of the vehicle resulting in a stalled engine; a kangaroo launch and an aborted engine restart due to the inability of the vehicle to provide torque as demanded by the user. In this research, a methodology to analyse the occurrence of impaired vehicle launch using an engine start-stop simulation model (1) and clutch usage data measured in real driving conditions from a conventional vehicle, has been developed. The stopping and starting of various engines in combination with different starting devices have been simulated. The starting devices include both permanently and non-permanently engaged devices. The clutch pedal release data has been analysed to compute the characteristics of the launch events.

The proportion of impaired vehicle launch in real world for different combinations of powertrains and starting devices has been calculated. Also using the simulation tools, the opportunities and risks in terms of engine stopping and starting can be analysed and there influence on the occurrence of impaired vehicle launch can be evaluated. Additionally the methodology supports the sensitivity analysis of the control strategy and its calibration parameters.

The methodology developed in this study provides a useful tool which supports the calculation of impaired vehicle launch occurrence depending on the micro hybrid system design as well as the evaluation of the initial calibration of the strategy.

KEYWORDS:
Start-stop, Launch, clutch usage, change of mind, stop-in-gear, stop-in-neutral

THE Z ENGINE, A NEW TYPE OF CAR DIESEL ENGINE HAVING LOW EMISSIONS, HIGH PART LOAD EFFICIENCY AND POWER DENSITY AND LOW MANUFACTORING COSTS

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ABSTRACT
In 1999, Aumet Oy began to research a 2-stroke car diesel engine called the Z engine, in co-operation with the Internal Combustion Engine Laboratory at the Helsinki University of Technology (HUT) and the Energy Technology Department at the Lappeenranta University of Technology (LUT). So far, three master's theses, two SAE Papers and two Fisita Papers have been completed on the subject. Modern simulation tools, such as Star CD, GT-Power and Diesel RK have been used. Aumet's research project was a part of the Finnish Engine Technology Programme, ProMotor, and it was supported by the National Technology Agency Finland, TEKES. A prototype engine made its first start in December 2003 and testing of the engine has been two years in a test bench at VTT (Technical Research Centre of Finland).The Z engine has until now got six international patents, several are pending and Aumet Oy has got recently the Euro patent in February 2009.

The Z engine introduces a completely new work cycle. It combines the best parts of 2- and 4- stroke engines. In the Z engine, work is produced at every crankshaft revolution as in 2-stroke engines. The Z engine does not have a 2-stroke type scavenging or its disadvantages: poor scav-

enging efficiency or a loss of the scavenging gas to the exhaust channel. The Z engine uses poppet valves, so there are no problems with the wear of the piston rings and the emissions caused by lubricants. Thus, it is possible to halve the number of the working cylinders of the engine by having one integrated compressor cylinder in the engine. In engines, size of car engines, the piston compressor has a better efficiency than flow machines, for example Roots blower and it is also more economical to produce. The pre turbocharger lowers the size of the compressor by 50-70%. The turbocharger in the Z engine can use all the available exhaust gas energy at all load conditions and thus no waist gate is needed. This improves the efficiency of the engine. The transient behaviour is excellent. To understand the lower manufacturing costs of the Z-engine, one can think to remove two working cylinders from a 4-cylinder, 4-stroke engine having a turbo charger and a Root-blower and to replace the Root-blower with a piston compressor, integrated into the engine. A 2-cylinder Z engine is equal to a 4-cylinder 4-stroke engine in its power output and balancing.

In the Z engine, it is possible to utilize a late HCCI-combustion, trigged after TDC with an ignition fuel injection. This triggers the cool flame and it ignites the hot flame. This is possible as in the Z engine the temperature at TDC can be kept low, under 800 K because of the very high degree of inter cooling. There is an internal EGR in the Z-engine and it is possible to use the advantages of the ATAC system, as the exhaust gases, remaining in the cylinder, are hot and they contain active radicals. Thus it is possible to stabilize the combustion at low loads and high revs. A rapid evaporating occurs, when the fuel is injected in to cylinder at the time, when the exhaust valves close. Thus the heat of the exhaust gases is used to evaporate the fuel, this improves the efficiency. The Z engine has the potential to comply with the future environmental legislations without exhaust gas after-treatment.

By using the Z engine, it is possible to reduce the manufacturing costs of the vehicles. All the components used in the Z engine are like those used in normal engines and compressors. For this reason, there is no need for any changes in the component supply chain. It is possible to have a diesel car without a NOx catalyst, when using the Z engine.

KEYWORDS:
efficiency, emissions, diesel engine, combustion

ON-BOARD MEASUREMENT OF THE INFLUENCE OF DRIVING BEHAVIOUR AND ROAD TYPE ON CO2 EMISSION AND CONSUMPTION FOR 4 POWERTRAIN TECHNOLOGIES

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ABSTRACT
Four recent family cars are evaluated in real traffic for their fuel consumption and CO_2 emission: a petrol, diesel, hybrid and LPG car. Each one is subjected to four driving styles: new (environment friendly), relaxed, normal and aggressive. Each driving style is tested on three road types: urban, rural and motorway. The petrol and diesel fuelled car are both Peugeot 1.6l 307. The hybrid vehicle is a Toyota Prius II. The LPG car is a Seat Leon 1.6l.

Consumption+CO_2 is highest on urban roads for all driving styles except for the Toyota Prius where this is only valid for the aggressive style; it is lowest on rural roads except for aggressive driving that is lowest on motorway for the Peugeot 307 petrol and diesel.

Aggressive driving results in a significant increase of consumption+CO_2 on urban (max. of 68% from the Peugeot petrol car) and rural roads (max. of 47% from the Peugeot diesel car). The lowest increase is for the Seat Leon LPG (9% urban and 19% rural) together with the Prius (18% rural). Aggressive driving on urban roads results in high absolute consumption and CO2 figures of 10 to 18 l/100km and 240 to 430 g/km (Toyota Prius and Peugeot 307 petrol respectively).

There is little difference between the new, relaxed and normal style for consumption+CO_2 ; the relaxed driving style gives overall the lowest results with a largest difference to normal style of 20% for the Prius and Peugeot diesel on urban roads.

Of the four cars the Prius -that is largest and heaviest- has the lowest consumption on urban (5.0 to 6.4 l/100km when not driving aggressive) and rural roads (4.2 to 4.5 l/100km when not driving aggressive) and the Peugeot 307 diesel is lowest on the motorway (5.1 to 5.5 l/100km). The Seat Leon has the highest consumption followed by the Peugeot 307 petrol. The ascending ranges in l/100km are: Prius 5.1-7.3, Peugeot diesel 5.1-8.0, Peugeot petrol 7.7-11.7 and Seat Leon 10.1-11.9. The Otto engines consume more then the hybrid-Otto combination and the diesel engine.

Of the four cars the Prius has the lowest CO_2 emission on all road types. In the `1/1/1 road type average´ the ascending ranges in g/km are: Prius 119-170, Peugeot diesel 135-210, Seat Leon 164-193 and Peugeot petrol 181-276. Note the differences and the change in order compared to the order for fuel consumption.

The variations in consumption are lowest for the Prius indicating that the hybrid technology is less sensitive to differences in driving patterns.

KEYWORDS:
CO_2, fuel consumption, driving behaviour, road typ

HYBRID VEHICLE POWER-FLOW CONTROL

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ABSTRACT
The paper deals about analysis of power flows in the hybrid electric vehicle. This paper presents analysis of an optimal energy management and control system for a parallel hybrid electric truck. This paper deals about control strategy in efficiency mode for hybrid electric vehicle powertrains. Control strategies are algorithms that choose the power split between the engine and motor of a hybrid vehicle in order to minimize the fuel consumption or emissions. Control strategy in efficiency mode utilizes to minimize specific fuel consumption of engine and maximize an efficiency of internal combustion engine and hybrid electric vehicle powertrain too. Dynamic Programming techniques are utilized to determine the optimal control for a hybrid electric vehicle powertrain in order to minimize fuel consumption and maximize efficiency of hybrid electric powertrain. A dynamic programming method to determine the optimal power split between both sources of energy. In this energy control strategy are very important power characteristics of engine, motor and vehicles power for optimal control of engine load. In this paper are described an optimal characteristics of control strategy in efficiency mode and the dynamic characteristic of vehicle in ideal and efficiency mode of control strategy of hybrid electric vehicle powertrain. It is described an ideal distribution of energy flows or optimal energy flows of hybrid electric vehicle power-

train in which are not inclusive parameters like optimal engine temperature or state of charge etc.

KEYWORDS:
hybrid electric vehicle, energy control management, dynamic programming, vehicle Dynamics

OPTIMIZATION OF HYBRID ELECTRIC TRUCK

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ABSTRACT
Hybrid drivetrains for vehicles or trucks combine multiple power sources in order to increase the driving functions. Analysis of an optimal energy management and control system for a parallel hybrid electric truck are presents in this paper. The function can enhance the fuel consumption, emissions, comfort, driving performance and safety. In this paper the focuses is on fuel consumption reduction and maximize powertrain efficiency. The optimal energy management strategy is determined by using fuzzy logic in the simulations. This paper deals about optimization of energy control and power flow in the hybrid electric truck with parallel hybrid powertrain system. Optimal energy control strategy for hybrid electric truck is designed and shown in the diagrams. Optimal utilize specific fuel consumption of internal combustion engine in hybrid electric vehicle is depended on optimal power parameters of other parts on hybrid electric truck like electric motor, generator, batteries etc.. Vehicle load is very important argument to minimize specific fuel consumption of internal combustion engine and maximize energy efficiency of vehicle powertrain. Optimization of hybrid electric truck in this paper means optimization of energy control to minimize specific fuel consumption of internal combustion engine and maximize efficiency of hybrid powertrain. Paper describes operating points in the maps of internal combustion engine, electric motor and efficiency maps of internal combustion engine, electric motor. Optimal co-operation of internal combustion engine and electric motor is illustrated on the proposition control strategy.

KEYWORDS:
fuzzy logic, optimal energy control strategy, simulation results, efficiency

IN CYLINDER STRATEGIES AND ALTERNATIVE FUELS FOR LOWEST DIESEL EMISSIONS

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ABSTRACT
The aim of the present paper is focussed on the development of a combustion process for a competitive passenger car diesel engine to achieve oncoming emission limitations – espe-cially EU VI. The investigations at Graz University of Technology were covered by a project within the 'K-Net Competence Network' and later within the 'K2-Mobility' research program carried by the competence centre 'The Virtual Vehicle'.

- The experimental activities covered the following three strategies:
- Enlargement of the nearly NOx and soot free HCLI load area
- Potential of bio fuels at conventional and premixed combustion processes
- Assessment of a variable valve train on a supercharged diesel engine

Opposed to conventional diesel combustion alternative diesel combustion allows an almost NOx and soot free combustion using high EGR rates and early injection timing. The required EGR rates (> 40 %) have to be provided by the air management system. Due to the limited boost pressure capabilities of standard charging systems alternative combustion systems have been limited to low loads and are not able to cover the entire NEDC operating range. EGR rates have to be reduced and thus conventional combustion with higher raw emission is inevitable.

The challenge of this project was to perform and extend the load range of HCLI (Homogenous Charge Late Injection) combustion using an advanced two-stage turbocharging system to meet the emissions targets. However, beside the NOx optimization premixed combustion modes also have to fulfil other limitations like noise emission and efficiency. Analyzing the difference of spray penetration and mixture formation of bio fuel versus diesel was done by using sophisticated spray box equipment. All experimental activities were carried out on a highly flexible single cylinder research engine to determine the key criteria using alternative fuels and a variable valve train for lowest diesel emissions.

KEYWORDS:
HCCI, Miller, Fuels

THE INFLUENCE OF THE OPERATING CONDITIONS ON THE PERFORMANCES OF INNOVATIVE AFTERTREATMENT SYSTEMS

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ABSTRACT
The paper aims to analyse and compare the energetic performances of active and passive aftertreatment systems. To this purpose, a computational one-dimensional transient model has been developed. The numerical model has permitted to assess the heat exchange between the solid and the exhaust gas, to estimate the energy effectiveness and the fuel saving capability of the aftertreatment systems.

Furthermore, the effect of the engine operating conditions on the thermal behaviour of active and passive systems has been investigated. Specifically, the work showed the large influence of the exhaust gas temperature and mass flow rate on the energetic performances of the aftertreatment apparatus.

Finally, the effect of the initial solid temperature and unburned hydrocarbon content in the exhaust gas has been analysed.

KEYWORDS:
Aftertreatment system, active flow control, energetic analysis.

LIGHT METAL HYDRIDES AS HYDROGEN STORAGE SYSTEM FOR FUEL CELL POWER TRAINS

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ABSTRACT
The storage on solid materials appears a very interesting option for realization of hydrogen tank in fuel cell vehicles. In this paper the desorption properties of light metal hydrides are discussed evaluating hydrogen release rate as function of temperature. In particular the compound LiAlH4 (lithium alanate) was examined in this work, since it appears interesting for its high hydrogen content (10.5 wt%) and desorption kinetic properties at moderate temperatures. The properties of lithium alanate as hydrogen source for fuel cells were investigated in laboratory tests using a fixed bed reactor and nitrogen as carrier gas. The overall hydrogen release resulted about 7% in two successive steps (decomposition of LiAlH4, followed by decomposition of Li3AlH6) characterised by different kinetics, in a temperature range of 140-160 °C for the first decomposition and 180-210 °C for the second. Moreover, a laboratory device was designed and realized to use light metal hydrides as hydrogen source in fuel cell propulsion systems for road applications.

KEYWORDS:
Hydrogen storage, Light metal hydride, Fuel cell vehicle

VARIABLE INTAKE VALVE LIFT ON SPARK IGNITION ENGINE AND THE EFFECTS ON FUEL ECONOMY

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ABSTRACT
The reduction of fuel consumption is a fundamental aspect of the automotive industry. This comes from customers, as well as from legal demands like, for instance, still voluntary fuel economy agreement of the European Automobiles Manufacturers Association.

Variable valve actuation offers many opportunities to improve the spark ignition engine's performances in areas like fuel economy, emissions and power density.

This study will present a variable intake valve lift (ViVL) mechanism, used to enhance fuel economy in the area of idle operation and low part loads, which are mainly encountered in a vehicle's operation time. Currently, this mechanism is self-regulated thanks to a hydro-mechanical system and allows a continuously intake valve lift variation during engine's operation.

Our studies revealed that the ability to control valve lift certainly offers the ability to control intake air mass but also has the added benefit that it improves fuel-air mixing process and controls air motion. This is particularly important at idle and low part loads when low lifts are to be used for achieving the required power. Thus, the paper will focus on the experimental results obtained in the situation of approaching the same operating point with different configurations of the intake valve timing system. Results indicating the potential of our ViVL system for fuel economy improvement, as well as results regarding the in-cylinder pressure evolution will be presented in this paper.

KEYWORDS:
fuel economy, variable intake valve lift, combustion

THEORETICAL AND EXPERIMENTAL STUDIES OF HEAT RELEASE CHARACTERISTICS IN THE COMBUSTION CHAMBER OF CI ENGINE

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ABSTRACT
This article applies to the heat transfer in the combustion chamber of CI engine. The heat transfer is a subject of both theoretical and experimental analysis. The research has been directed at pressure measuring in the combustion chamber of CI engine. On the basis of the internal heat balance of CI engine with direct fuel injection, the quantity of heat transported during the combustion process from the combustion zone was determined. The real indicator diagrams are the bases for determination of the heat release characteristics during the combustion process and making up of the internal heat balance. These diagrams were worked out for the engine fuelled with diesel oil for three sets of the injection timing and for work of the engine according to the full load engine characteristics, and the load characteristics taken at the engine speed for the maximum engine torque.

Tests with the three different injection timing were carried out. The range of the changes of the injection timing was contained in αww {13, 17, 21} oCA. Tests with the load characteristics of the compression-igniting engine for five values of the power were carried out. The load characteristics for following values of the power: Ne {4, 8, 12, 16 and 20} kW was accomplished. The pressure in the cylinder of the engine during combustion process was recorded by means of liquid cooled a piezo-electric quartz sensor with a load amplifier.

Characteristics of heat release during the combustion process were determined based on the average and filed by 50-implementation of a real indicator diagrams. Characteristics of heat release depended on the composition, temperature and the mol quantity of the working charge in the cylinder during the combustion process. Characteristics of the heat release were determined with the use of the novel calculation program. The program was worked out by authors at the assumption that the process of complete combustion was finished at the moment of the opening of the engine exhaust valve. For purpose of simplification calculation of the quantity of heat lost into the cooling system, the radiation, dissociation and incomplete combustion, were assumed to change during the combustion process in a linear way.

KEYWORDS:
combustion engines, engine performance, heat release, pressure measurements

EVALUATION OF HEAT TRANSFER FROM COMBUSTION GASES TO COMBUSTION CHAMBER WALLS OF PISTON ENGINES

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ABSTRACT
Heat transfer calculations were based on measurements of instantaneous surface temperature during flame propagation. Measurements were made during downward propagation of a flat flame in a lean limit methane/air mixture. Detailed thermal flame structure was determined before measurements of temperature on the wall surface. It was observed that the limit flames are very thick and that heat loss to the walls caused extensive cooling of the product gases within 0.05m behind the propagating flame. Temperature measurements were accompanied by records of flame propagation made by photo-camera. Analysis of all these data from well synchronized measurements as well as the results of following to them numerical calculations made possible to understand in detail physical picture of heat transfer from the hot gases to the cold walls. Measurements and calculations were used to prepare heat balance in a flammability tube. In the next step measurements were carried out in a rotating cylindrical combustion chamber. This chamber was treated as a model of piston engine combustion chamber with swirl. Simultaneous temperature measurement at the radius r=23mm and r=28mm indicated that for a given mixture concentration and a given rotation velocity changes of heat flux density in time are practically the same. Presented novel techniques of temperature measurements and heat flux calculations make possible to estimate heat loss to the walls in a combustion chamber of piston engines. These techniques could be used to draw up chamber heat balance and are useful for combustion engine chamber design.

KEYWORDS:
combustion engines, flame propagation, heat transfer, temperature measurement

ASPECTS ABOUT DYNAMIC SIMULATION OF A CAR SUSPENSION ASSEMBLY

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ABSTRACT
The paper presents the mechanical model of a car suspension system. In the first part, it is detailed the steps to obtain the mathematical model of the suspension assembly. It is elaborated a mathematical model of motion for the case of quarter-car.

It is defined the conditions, initial parameters and the mechanical constraints of the suspension system. After the simulation process can be obtained the important kinematics results (positions, velocities and accelerations for all the parts of the assembly).

It is determined the transfer function corresponding to the vibrations of the sustaining and rolling systems in the analyzed case.

It is built a block scheme using MATLAB program (Simulink subprogram) corresponding to the mathematical model. Also, it can be studied the vibrations of sustaining and rolling system in different traffic conditions to analyze the dynamic behaviour of suspension.

The irregularities of road which influence the car motion are introduced in the block scheme as function input. It is made some simulations for different function input which describe different traffic conditions.

Finally, it is made an analysis concerning the results obtained after simulation. In the end of the paper it is presented important conclusions.

KEYWORDS:
simulation, suspension, vibrations

EFFECT OF OFFSETTING CRANKSHAFT ON ENGINE EFFICIENCY

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Abstract
The continuous requirement for enhanced efficiency of internal combustion engines has led to the development of techniques, such as offsetting the crankshaft from the piston plane along the longitudinal direction. The research in this area has been mostly based on experiments or simplified analytical techniques (Cho et al, 2003a; Cho et al, 2003b; Haddad and Tjan 1995; Nakayama et al, 2000). However, there are significant tribological implications which require a more detailed analysis, particularly with regard to the interactions between engine tribological issues and the multi-body dynamic behaviour of piston-connecting rod-crankshaft sub-system. These interactions are also subject to combustion loading and inertial imbalance, both of which affect structural behaviour of the ever increasing component flexibility. Therefore, a detailed multi-physics approach is required, comprising inertial dynamics,

assembly constraints, structural modal behaviour and lubricated load bearing conjunctions.

The rigid body dynamics of the assembly is modelled through constrained Lagrangian dynamics, whilst structural flexibility is represented by modal behaviour of components using finite element analysis and component mode synthesis. The lubricated contacts including piston skirt-to-cylinder bore, piston ring-to-cylinder bore and crankshaft journal bearings are also included. These conjunctions are subject to hydrodynamic regime of lubrication, viscous friction and heat generation.

The off-set crankshaft affects the frictional behaviour of these conjunctions, which in turn influence the overall efficiency of the engine. The reduction of thrust force on the piston skirt reduces the transferred energy to excite the harmonics of crankshaft torsional vibration spectrum.

Keywords:
Multi-Body Dynamics, Crankshaft Offset, Piston Friction, Ring Friction

THE NEW ECOTEC TURBO BIOPOWER ENGINE FROM GM POWERTRAIN – UTILIZING THE POWER OF NATURE'S RESOURCES

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ABSTRACT
After several successful introductions of engine variants from the ECOTEC engine family, General Motors now introduces the 2.0 L ECOTEC turbo BioPower in the model year 2007,5 Saab 9_3. The utilization of E85 as a fuel reduces the dependency of petroleum based fuels, thus limiting the CO_2 pollution in the world.

In-house controls development facilitated the rapid execution of the program. The same is valid for the base engine development. Experience from other GM developed E85 applications as well as close teamwork between all team members was vital when executing this program on such short time. The robust design of the base engine made it possible to just focus on the E85 specific areas.

Keywords:
turbo, ECOTEC, biopower engine, E85

COORDINATION OF FUEL SPRAYS CHARACTERISTICS WITH COMBUSTION CHAMBER PARAMETERS

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ABSTRACT
The area of scientific research: working process of direct injection diesel engines.

The aim of scientific research: an improvement of carburetion and combustion processes

in direct injection diesel engines by coordinating fuel sprays characteristics with combustion chamber parameters.

The method of coordination of fuel sprays characteristics with combustion chamber parameters has been presented. The mathematical model of fuel sprays development in combustion chamber of diesel engine in order to determine spray penetration, spray cone angle, average diameter of fuel spray drops and fuel distribution in spray has been developed. The computer model to observe fuel sprays development in diesel engine cylinder at any moment of injection, to calculate characteristics of fuel sprays taking into account the shapes and dimensions of combustion chamber as well as to determine position of fuel sprays with regard to combustion chamber and their interaction with a wall of combustion chamber has been created. Moreover the computer model allows to determine parameters of nozzle holes of injector nozzle, providing necessary fuel sprays characteristics, as well as to change shapes and dimensions of combustion chamber, fuel injection characteristics and supercharging parameters efficiently in a design stage of diesel engine. Combustion chamber parameters and fuel injection characteristics for 4ЧН11/12,5 diesel engine have been determined with the computer model.

KEYWORDS:
Direct injection diesel engine, fuel spray, combustion chamber, computer model.

PRE-IGNITION PHENOMENA – LIMIT OF SUPERCHARGING OF SI ENGINES

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ABSTRACT
The combination of direct injection and turbo charging is one effective method to reduce CO^2 emissions of an SI-engine due to higher mean effective pressure levels. Such systems give the opportunity to reduce the displacement, to shift the operating point to higher loads and to increase the efficiency of the engine. This strategy is called downsizing.

To develop further potential of this strategy, future engines have to reach a significant higher mean effective pressure level. The increase of the mean effective pressure is limited by the occurrence of pre-ignition phenomena.

This paper presents results of a common research project of the VOLKSWAGEN AG Group research and the Vienna University of Technology dealing with the unwanted pre-ignition phenomenon.

KEYWORDS:
pre-ignition, supercharging, downsizing

VEHICLE USE OF ETHANOL BLENDS – EMISSION PERFORMANCE AND POTENTIAL FOR CO^2-REDUCTION

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ABSTRACT
Biogenous renewable fuels are an useful alternative to conventional fossil energy sources. Their usage effects a reduction of greenhouse gas emissions and gives more independence from the international oil market. Due to the fuel characteristic an additional influence on engine performance, consumption and emission behaviour could be expected.

At the example of bioethanol a decrease of carbon dioxide and additional of limited emissions (CO, HC, NOx) could be measured during engine test. A higher octane number causes less knocking tendency and higher heat of vaporization stands for better cylinder charging.

Due to 35% less calorific value of ethanol the corresponding volumetric consumption increases, but the carbon dioxide emission decreases nevertheless thanks to its favourable carbon / hydrogen ratio and a higher degree of efficiency. One of the reasons for an optimized combustion process is the oxygen within the chemical structure of the alcohol. The combustion accelerates, this induces a better conversion of energy and the effect is an increase of the degree of efficiency.

The suitability for daily use was evaluated by a fleet test with mass-production vehicles and different ethanol blends. Blends with higher ethanol fraction have been used in so-called "Flexible Fuel Vehicles". Ethanol concentrations of 5, 10 and 85 percents have been tested. Additional the capability of ethanol blends for cold start was analyzed on a chassis dynamometer test bench. It could be clearly shown, that the cold start behaviour is close associated with the vapour pressure.

KEYWORDS:
Biogenous Fuels, Bioethanol, Emission Behaviour, Aldehydes

EFFECT OF EXHAUST GAS RECIRCULATION (EGR) WITH MULTIPLE INJECTIONS ON COMBUSTION PATTERN IN A COMMON RAIL DIESEL ENGINE

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ABSTRACT
Common rail fuel injection systems have been used extensively in modern diesel engines. Due to their benefits in high fuel injection pressure, precise injection timing and control, a reduction in exhaust gas emissions and engine noise are potentially viable. This paper present the experimental tests conducted on conventional V6 diesel engine equipped with exhaust gas recirculation (EGR), twin variable geometry turbochargers (VGT) and common rail injection system with multiple injection strategies. The engine operated with biodiesel (RME) and ultra-low sulphur diesel (ULSD) fuel as the baseline at steady state operating conditions. The analysis of experimental data mainly includes in-cylinder pressure, heat release rate and emissions of exhaust gases. The EGR system used in combination with double-injection strategies, comprising a main injection with a pilot injection showed large benefits of this strategy to reduce NOx and unburned hydrocarbons. The use of double injection without EGR shows a significant reduction of unburned hydrocarbons but it has major drawbacks of producing higher NOx. The experimental results also reveal that the pilot injection lowered the peak pressure and brake specific fuel consumptions regardless of EGR operations.

KEYWORDS:
Exhaust gas recirculation, multiple injection, biodiesel

INFLUENCE OF BACK PRESSURE ON THE SPRAY FORMATION OF LIQUID LPG IN A CONSTANT VOLUME CHAMBER

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ABSTRACT
Liquefied Petroleum Gas (LPG) is mainly used as a cooking gas, propellant and automotive fuel. Its importance as an alternative automotive fuel is determined by its lower cost, higher octane number and reduced level of weight-specific CO_2 emissions in comparison with gasoline. The combination of Direct Gasoline Injection (DGI) and downsizing is currently receiving growing attention worldwide due to its potential for reducing fuel consumption and increasing specific torque. Therefore, combining both LPG and direct fuel injection is considered as an interesting alternative to existing engines. The DGI combustion process requires extensive studies of the fuel-spray formation. Until recently, only single component fuels, i.e. fluids with a single boiling point thus lacking a boiling range as in the case of gasoline, have been used in spray simulation studies and research projects. The ambient conditions have prevented flash-boiling of these specific fuels. Detailed studies into the direct LPG injection process are however needed to enhance the development process for adaptation of the DGI engine.

Therefore, it was decided to record spray images of LPG injection with a high-speed digital camera. Two different swirl injectors were installed in a constant-volume chamber and their spray images were recorded and analyzed. The spray-angle images from LPG appeared to be significantly different from the standard gasoline images. Also, the spray angle, when applying different back pressures, showed a strong variation, probably due to flash-boiling. As a result, adapting the spray-guided DGI process to a single-cylinder test-engine as a next step proved to be extremely difficult. The fixed spray angle as required for the optimization of the position of both the injector tip and the spark-plug electrode appeared to be absent. More detailed research on the influence of fuel type and injector type (particularly multi-hole and A-type injectors) on spray stability in a second generation DGI engine during early and late injection is therefore proposed.

KEYWORDS:
LPG, DISI, flash-boiling

POTENTIAL OF A SUPERCHARGED PORT FUEL INJECTED HYDROGEN ENGINE

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ABSTRACT
In view of the ever more stringent exhaust gas regulations, attention is turned to new or improved engine technology and new fuels. An alternative gaseous fuel such as hydrogen offers the potential of very clean emissions. Even more interesting is the reduction of CO2 emissions, widely held responsible for the global warming of the planet. The authors are conducting a study on a single cylinder research engine. The standard test engine is modified to provide

reliable operation with hydrogen. The engine parameters (ignition timing, injection start and duration) are optimised for hydrogen operation.

In this paper, supercharging and a combination of supercharging and EGR is studied with the aim of increasing the power output of a hydrogen PFI engine with NOx emissions as a restriction.

KEYWORDS:
hydrogen, powertrain, NOX emissions

HEAT RELEASE PROCESS ANALYSIS OF AN SI ENGINE POWERED BY NATURAL GAS AND METHANE-HYDROGEN BLENDS

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ABSTRACT
Some important aspects of SI engines operation on hydrocarbons based alternative fuels were presented in this paper. The selected group of fuels included: CNG, and methane-hydrogen blends (with volumetric hydrogen shares – 5%, 10%, 15%, 20% and 30%). The tested engine was an Opel Astra naturally aspirated four-cylinder 1.6 l petrol engine with power output of 55 kW at 5200 rpm and torque of 128 Nm at 2600 rpm. This engine was modified in a way allowing its CNG propulsion without compression ratio variations.

The results show relations between heat release process and the basic parameters describing an engine cycle. Tests include dynamometer chassis test, as well as the detailed analysis of thermodynamic processes inside engine combustion chamber. During the dynamometer tests as the most important acquired parameter was the in-cylinder pressure. The application "EnComTwo", which resolves assumptions of mathematical model, was applied to heat release course and engine thermal balance analysis. The calculations enabled resolving: in-cylinder temperature, mass fraction burned, heat release flux, heat transfer flux and 10-constituent exhaust gas composition.

The main goals of presented analysis were: to describe the influence of combusted fuel type on characteristic parameters of tested engine, as well as to define the composition and level of exhaust gases.

KEYWORDS:
methane, hydrogen blends, heat released, SI engine

GREENHOUSE GAS EMISSIONS OF THE HUNGARIAN TRANSPORT SECTOR

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ABSTRACT
Transport cannot be replaced because it is the part of the production chain. The importance of the transport sector is indicated by the sector's production which is 10% of the GDP of the European Union and more than 10 million people are working in this sector. Economic growth contributes to the increasing demand of transport, consequently global demand for transport is unlikely to decrease in the future. Moreover transport is projected to grow by 58% by 2030. The transport sector, led by automobiles, has been cited constantly as a major contributor through human intervention to climate change. In the future greenhouse gas emissions and global warming will be key issues of the society. Other energy consuming sectors are unable to compensate for transport related emissions, therefore the transport sector has to contribute to emissions abatement itself. There is a need to investigate those action combinations which might be able to reduce the absolute amount of CO^2 produced by automobiles and as a consequence the greenhouse gas emission growth in a non-marginal way. However, the possible methods of greenhouse gas emission reduction must be assessed in the context of cost effectiveness. There are several ways to reduce CO^2 that deliver equivalent reductions; however some impose greater costs on society than others.

Recently, sectoral approaches have been gaining attention in international and national climate policies for emission reduction. A sectoral approach may be of particular interest for internationally oriented sectors and their businesses, where a fairly limited number of actors are given, such as, for example, the car manufacturing industry. An essential step to sectoral abatement targets is the quantification of global sectoral and regionalized baseline scenarios of CO2 emissions.

The aim of this paper is the estimation of transport related carbon dioxide emission in Hungary due to fossil fuel consumption. This could serve as a basis for further research on true cost estimation of transport related emissions.

KEYWORDS:
CO^2 emission, climate change, mobility

EXPERIMENTAL STUDY ON THE SPRAY CHARACTERISTICS FOR DIESEL FUEL AND BIODIESEL-DIESEL FUEL-BIOETHANOL BLENDS

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ABSTRACT
The article presents comparative experimental study of the main features of jet injection for four fuels: diesel fuel (100% D), biodiesel (100% B), a mixture of biodiesel-diesel (30% B and 70% D) and biodiesel blend of diesel-ethanol (25% B, 70% D and 5% E). In the experiments has been used biodiesel (methyl ester of rape oil), commercial diesel-type Euro 5 and ethanol with a purity

of 99.3%. Characteristics of jet injection were studied in a pressurized chamber in nitrogen, based on photographs made in the successive phases of its development. Injection pressure was 50 MPa and the chamber of 1 MPa. With a digital camera and a flash were photographed fuel jets. Injection synchronization command, the camera and the flash was done electronically. By adjusting the delay between triggering and flash Injection has been made images of jet fuel in consecutive phases of its development. Penetration and cone angle of jet injection were measured based on taken pictures and also was calculated the jet speed. After the evaluation there has been found that the main characteristics of jet formed from biodiesel-ethanol-diesel are the closest to those of diesel. On the other mixtures were significant differences particularly in the first moments of the formation and development of jet fuel. One can appreciate that the content of ethanol in the blend makes the biodiesel blend of ethanol-diesel has properties close to that of diesel. Also, we believe that the mixture of biodiesel-ethanol-diesel fuel can be used to power compression ignition engines in terms of forming a fuel-air mixture, but further research is needed in order to assess the efficiency, pollution and reliability of the engine running with this fuel.

KEYWORDS:
ethanol, biodiesel, spray, characteristics

ENVIRONMENTAL ADVANTAGES FROM BIOFUELS EMPLOYMENT

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ABSTRACT
The necessity to reduce green house gas emissions and connected climate changing requires a rational sources use and a massive renewable energy employ. Biofuel production gives potentiality to reach this goal, but land use competition has to be taken into account. Therefore a key action is to select the best energetic choice to convert biomass and waste in biofuels. In fact minimising land required for a given energy quantity, competition with others primary needs (food, textile, etc.) is consequently lower. First generation biofuels from energy crops, are more largely involved in this issue than second generation ones. Moreover, biofuels being a form of solar energy storage cannot be considered as the best solution of green house problems because a limited conversion efficiency (lower than 1%). In fact there are others forms of renewable energy with higher efficiency (10%-20% of photovoltaic solar panel). Otherwise biofuels from waste help to control the questions connected to waste disposal and to save part of the energy content.

The European Union policy promotes liquid biofuels utilization in transports. But even if gaseous biofuels are not widely spread in this field, their production could lead to higher benefits on carbon dioxide emissions reduction than liquid ones. In fact, the conversion pathway has a higher efficiency than liquids and they could easily substitute fossil gaseous fuels, that are largely used in others sectors different from transports (such as electric and heat energy production, domestic, etc.). These aspects are particularly important for biomethane, both from first or second generation, since it can be supplied in the existing network in substitution of fossil natural gas. In addition, since natural gas vehicles number is increasing, especially in urban areas, where environmental benefits are particularly appreciated, a larger gaseous fuel request in transport sector will be expected.

In this paper a holistic approach to the problems of biofuels production, energy saving and source use optimization is presented.

KEYWORDS:
Biofuels, renewable energy, green house effect, holistic approach to energy saving

THE IMPACT OF DIFFERENT BIODIESEL BLENDS WITH HIGH CONTENTS OF RME ON THE EXHAUST EMISSIONS FROM MODERN LIGHT-DUTY DIESEL ENGINE

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ABSTRACT
The use of biofuels (biodiesel and gasoline-alcohol blends) in vehicle powertrains is growing in last years in European Union countries, United States, Japan, India, Brazil and many other countries due to limited fossil fuel sources and necessary reduction of CO^2 anthropogenic emissions. European car manufacturers approved up to 5 percent of biodiesel blend in diesel fuel (B5 biodiesel blend) which meets European fuel standards EN 14214 and EN 590. The goal for research is to achieve higher biodiesel content in diesel fuel B10 and B20, without resorting to bigger diesel engines and fuel feed system modernization.

The paper evaluates the possibility of using the higher FAME content in biodiesel blends (mixture of diesel fuel and Fatty Acid Methyl Esters) in modern Euro 4/ Euro 5 direct-injection, common-rail, turbocharged, light-duty diesel engines. Influence of high quantity of RME in biodiesel blends (B30, B50 and B100) on the emission measurement of gaseous pollutants, such as: carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NO_x), carbon dioxide (CO_2) and particulate matter (PM) for light-duty-vehicle (LDV) during NEDC cycle on the chassis dynamometer were analysed. All test results have been presented in comparison to standard diesel fuel. The performed measurements and analysis show that the exhaust emissions are affected by the proportion of RME in biodiesel due to different chemical and physical properties of fuel blends.

The tests subject to analyses presented above have been performed in the Engine Research Department of the BOSMAL Automotive Research and Development Centre in Bielsko-Biala, Poland within the test program evaluating the biofuel influence on light-duty diesel engines for passenger cars and light-commercial vehicles.

KEYWORDS:
biodiesel, engine, exhaust emission, RME

KEY FUEL PROPERTIES OF BIODIESEL-DIESEL-BIOETHANOL BLENDS WHICH INFLUENCE THE SPRAY PROCESS

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ABSTRACT
One of the alternatives for a partial replacement of diesel fuel are the mixtures of diesel-biodiesel-bioethanol. The basic idea is that some physical properties, which affect injection quality, are complementary to each other in biodiesel and ethanol case.

There were prepared 28 triple mixtures, containing 5%, 10%, 15%, 20%, 25%, respectively 30% biofuel, of which 9 were chosen on the basis of their mixing capability, which have been the subject for the key properties determination that affect the injection process.

Research has shown that mixtures comprising up to 20% biofuels have properties very close to diesel. For example mixtures viscosity is very close to diesel viscosity, especially at higher temperatures then 40°C, and mixtures density is compensated if the biodiesel/ethanol report (% v/v) does not exceed 2. Similar conclusions could be drawn also with regard to surface tension.

The main features of injection jet (Sauter mean diameter and the angle of fuel jet) were evaluated on the basis of theoretical models from specific literature. The results will be used in future research but can also support the work of other researchers concerned with alternative fuels for diesel engines.

KEYWORDS:
ethanol, biodiesel, blend, key properties

INTRODUCTION AND VALIDATION OF A NOVEL TPA METHOD ON EXPERIMENTAL AND INDUSTRIAL CASES

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ABSTRACT
Despite the reliability of the classical Transfer Path Analysis (TPA), it has some disadvantages, the main one being the large measurement efforts. Due to this, a number of different alternative approaches have been proposed in the last years which aim at reducing measurement time by relying more on operational data. But these often suffer from significant limitations.

Therefore a new TPA method was proposed which overcomes these limitations but at the same time still requires less measurement time than TPA. It is a combined operational – experimental approach: besides the operational data, reciprocally measured noise transfer functions are also used. The main idea is to estimate a mount stiffness model instead of estimating the forces directly. The advantage of such an approach is that less data is needed to build up the TPA model since only a few parameters are used to describe the mount in the whole frequency range as opposed to the traditional inverse force identification method where the parameter estimation has to be done separately for each frequency line, requiring a much larger amount of data. This makes the new method more robust, faster and scalable, enabling the engineer to use a smaller amount of measurement data for quick troubleshooting.

In this paper, first the basics of the method will be introduced and the different mount models explained. Then a few validation cases will be presented showing the reliability of this new approach.

KEYWORDS:
Transfer Path Analysis, mount stiffness estimation, transmissibility

MISFIRE DETECTION IN SPARK IGNITION ENGINE – PART 1

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ABSTRACT
A fault diagnosis technique for internal combustion engines using time-frequency representations of vibration signal and wavelet transform (WT) are presented in this paper. Engine block vibration results as a sum of many excitations mainly connected with engine speed and their intensity increases with the appearance of many faults especially in combustion process. In this paper an application of SI engine block and head vibration signals for misfire recovery has been described. Engine body accelerations registered for seven simulated cases of misfire in four cylinder engine were an object of preliminary analysis. Changes of magnitudes of vibration in all analyzed cases, presented by succesively switched off engine cylinders were observed and analyzed. Pattern recognition and fault diagnosis derived from analysis of vibration signal are being presented as reliable tools for engine misfire recognizing.

KEYWORDS:
fault diagnosis, engine vibration, misfire, WT

THE VIRTUAL ACOUSTIC TEST TRACK: REAL TIME SIMULATION OF COMPUTED ENGINE BORNE SOUND FOR TRANSIENT DRIVING CONDITIONS

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ABSTRACT
In recent years, the quality of acoustic simulations of engines improved steadily. However, the demands for more detailed models and improved simulation quality increased even faster. To meet this challenges, redesigned simulation procedures and advanced interpretation methods were developed.

To allow the application of local damping for large FE-Models, a perturbation method was developed to substitute complex modal analysis. The perturbation method has additionally the advantage of automating the simulation processes for the response analysis.

The acoustic simulation is performed for a fine grid of quasistationary operating states, depending on load and speed of the engine. Primary results are surface vibrations of the engine, which can be transmitted by transfer functions to vehicle specific locations e.g. at the drivers ear position. The results of the acoustic simulations will be stored in "Operational Sound Maps". These are 4-dimensional complex valued data fields. They provide the data base for the acoustic sound generation by the Virtual Acoustic Test Track.

At the virtual test track, the torque characteristics of the engine are combined with basic driving dynamics properties of a vehicle, like weight and gear ratios. Responding to the driver actions, the vehicle physics are used to compute the vehicle state (acceleration, speed, position

at the track) and the corresponding engine speeds and loads. Basing on the engine state, the transient sound is generated. Depending on the predefined result points of the acoustic simulation, the sound can be generated for different positions, like engine surface points or airborne noise positions in the passenger compartment.

KEYWORDS:
acoustic, simulation, engine, vehicle

INVESTIGATION OF THE DYNAMIC PERFORMANCE OF A LIGHT VAN BODY-IN-WHITE STRUCTURE

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ABSTRACT
The demand for more refined vehicles has resulted in the steady improvement of the vibro-acoustic performance of motor vehicles over the years. This has been achieved by better design and optimization of the dynamic performance of the vehicle body structure which is a major contributor to the vibro-acoustic performance of the vehicle. Other requirements, such as low emissions and better vehicle performance, have led the trend to the manufacture of lightweight vehicle body structures. However, these requirements can negatively affect passenger comfort because lightweight structures tend to generate more vibration and interior noise. The design of a light commercial van structure has evolved over the years and trough optimization, the weight of the body-in-white structure has reduced by over 25% in the last 20 years, with the current production structure about 10% lighter than the previous one. Yet improvement in the structural dynamic performance over previous generations is required. In this study, the dynamic performance of a current production light van body-in-white structure is investigated. Its performance is compared to the structural performance standards for car body structures as well as the performance of the previous generation light van body-in-white structure to assess the success of the light-weighting process and the current status of light van structure performance.

KEYWORDS:
Dynamic performance, Body-in-white, vibro-acoustic, refinement

SIMULATION OF VIBRATION FATIGUE FOR TRANSIENT LOADED ENGINE COMPONENTS

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ABSTRACT
The paradigm shift in the automotive industry from hardware based developments to virtual prototypes requires advanced simulations approaches. A major difficulty for engineering applications is to find a suitable balance between sophisticated simulation methods and robust, fast, application-proofed analysis. Considering the reduction of hardware prototypes, vibration analysis of engine components becomes a critical issue. Due to the broad band excitation, resonant vibrations can generally not be avoided under all operating conditions. Moreover, vibrations are not a component but a system property.Therefore, the vibration analysis for an assembly of parts has to be performed, and the fatigue of the components under investigation has to be predicted for typical customer lifetime drive cycles. This paper shows the development of an industry-proofed application of a simulation method for the assessment of vibration fatigue. The method is adjusted to the requirements of the different development stages. Starting with simple analysis at the concept phase, the model and available data can be extended until the simulation of a fully functional virtual prototype can be performed.
The theoretical base of the method is:

- Assessment of total load by modal stresses and modal coordinates.
- Response analysis in the frequency domain for arbitrary number of excitation orders.
- Superposition of results of individual orders.
- Phase-correct transformation into time domain, using customer lifetime load scenarios.
- Transient multiaxial fatigue analysis.

The analysis method is realized by a combination of industrial finite elements software and dTechEndurance, an advanced in-house fatigue software. The application will be demonstrated for the vibration fatigue analysis of an integral aggregate mount bracket.

KEYWORDS:
simulation, vibration, fatigue, transient

AN INVESTIGATION OF THE MOVEMENT OF THE DISC/PAD CENTRE OF PRESSURE DURING A BRAKING EVENT

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ABSTRACT
This paper extends earlier work and discusses advances in the measurement of the dynamic centre of pressure (CoP) of a brake pad during a normal braking event using a purpose designed 12-piston opposed calliper. The design allows the centre of pressure at the disc pad interface to be controlled both radially and along the length of the pad as desired. The technique is unique in its design and implementation. Both the centre of pressures of the in-board and out-board pads are recorded simultaneously with varying pressures and speeds. The redesigned caliper

allows all pistons to be operated individually using their own master cylinder so giving absolute control over the pad backplate pressure distribution.

The results, which include pressure and force maps, show the position of the centre of pressure to vary considerably during a braking event, both radially and axially along the pad. It is shown that the CoP offset is related to the calliper mounting geometry which is subsequently compared to the effective "spragging angle" and the generation of brake noise.

It is seen that by inducing a leading offset then noise may be generated. Conversely if a trailing centre is then induced the noise will be eliminated. The results suggest that by careful selection of the backplate abutment friction level the CoP may be controlled to always fall within a "stable envelope" region and so resist the generation of noise.

KEYWORDS:
Noise, Spragging, Pad Pressure

THERMO- ELASTIC AND ELASTIC INVESTIGATIONS OF A BRAKE DISC DURING A HEAVY BRAKING EVENT

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ABSTRACT
Brake instabilities may be dynamic or mechanical. Dynamic instability results in brake noise with a frequency that is independent of wheel speed whereas mechanical instability has a frequency that is directly related to wheel speed. The mechanically induced vibration is often referred to as "judder", if the frequencies is two or three times wheel speed, or "drone" if the frequency is around ten times wheel speed. Judder may be experienced as high vibrations of the foot pedal and steering wheel accompanied by a drumming sound whereas drone is mostly observed as a low frequency "drone" in the passenger compartment. The mechanically induced vibrations are primarily a result of disc distortion or uneven disc wear and it is the purpose of this paper to demonstrate that such disc distortions may arise due to a high thermal input to the disc over a short period. The work shows that although the disc initially indicates a normal first order run-out (swash) it develops very readily to a second order after a heavy braking event. The paper will show that this deformation may be as a result of "in-service" stress relieving and that a second order mode is established if the disc is stress relieved after machining. In addition the paper shows that the disc may exhibit an elastic deformation during braking which cannot be measured once the braking event is stopped.

KEYWORDS:
Judder, Drone, Disc, Instability

ADVANCED SIMULATION TECHNIQUES FOR COSTUMER ORIENTED SEATING SYSTEMS DEVELOPMENT

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ABSTRACT
The seating system is probably the most underrated component of a car. A seating system can account for up to ten percent of the production costs of a car and represents the largest interface to the costumer. Today's product development processes for seating systems are characterized by shortened development cycles, increasing variance, additional requirements, and rising product content in terms of functionality. This paper describes an innovative approach and the respective application-specific simulation tools intended to cope with this situation. This approach presents a sensible product development process structure and integrates virtual and physical process segments into two control loops. The underlying process starts with a customer centred profile of objectives. These objectives are then transformed by means of transformation functions into parameters and characteristics describing the seating system. These parameters and characteristics are on the one hand used to develop the seating system using a parametric CAD system. On the other hand, these parameters and characteristics are used for validation purposes. As a result a continuous improvement cycle is achieved. This process and the advanced simulation tools allow a holistic, customer objective oriented realization of seating systems. The robustness and transparency of product development processes is enhanced and a capturing of knowledge is fostered. Components of the process were successfully applied in the product development of seating systems.

KEYWORDS:
Simulation, Seating Systems Development, Customer Orientation

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DESIGN AND OPTIMIZATION OF A CHASSIS FOR A FORMULA SAE RACE CAR

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ABSTRACT
In this paper, the design process of a new chassis for a Formula SAE car is presented. The chassis is undoubtedly one of the most important parts of the car, both for the influence that it has on the vehicle dynamic behaviour, and because it is the main component that assures the driver safety. The new designed chassis is composed of many structural tubular bars and has been equipped with systems for the joining of all the auxiliary members. After the definition of the masses distribution and the choice of the main dimensions, preliminary CAD and FEM models have been carried out for the evaluation of the structural behaviour of this kind of vehicle. Successively, in order maximizing the torsional stiffness and reducing the mass, different optimization processes of the chassis have been developed. To find the best solution many loops have

been carried out, also by modifying the definition of the design variable. At the end, a very good result has been achieved: the optimized chassis has a lower mass and a higher torsional stiffness value in comparison with the preliminary model.

KEYWORDS:
Formula SAE, Structural optimization, FEM analyses

SYNCHRONOUS HEIGHT CONTROL ALGORITHM BASED ON LQR FOR THE ELECTRONICALLY CONTROLLER AIR SUSPENSION SYSTEM

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ABSTRACT
The electronically controlled air suspension system is usually used to control vehicle height by regulating air mass of the airsprings. One of the control challenges of the air suspension system is how to handle the time varying model uncertainties, such as vehicle load and gas dynamics. This paper presents the air suspension height control to handle the model uncertainties. This height control methods controls four corners at the same time, while the conventional height control methods usually control only one axle between front axle and rear axle at a time. The conventional height control method regulates the height error of each corner, the difference between the target height and the actual height, without considering other corners. If the height of one corner reaches the target height, the solenoid valve of that corner is closed to maintain the height of that corner. Therefore, the reaching time from the initial to the target height of each corner may be different and so the vehicle body may have slanted attitude during the height control. This unevenness of the vehicle body during the height control degrades vehicle performance in terms of ride comfort and road handling capability. Therefore, mathematical model based control algorithm considering system properties is required to handle the difficulty caused by the uncertainties. The proposed control method uses the LQR (Linear Quadratic Regulator) method and control the vehicle body, considering the system properites such as coupled geometric property and gas dynamics. The LQR based synchronous height control (LQSHC) regulates the body bounce error, roll angle error and pitch angle error to achieve a smooth height transition which is desirable for passenger ride comfort and road handling capability. The accuracy and effectiveness of the proposed control methods are verified by the simulation.

KEYWORDS:
Vehicle Suspension, Air suspension, Airspring, LQR

MODEL- AND HARDWARE-IN-THE-LOOP-SIMULATION FOR PROBLEMS OF BUS DYNAMICS CONTROL

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ABSTRACT
The paper is devoted to the challenges of bus dynamics control with special emphasis on the problems of an objective vehicle model and its subsequent application to the procedures of Model- and Hardware-in-the-Loop-Simulation. The generalised theoretical propositions of the paper are illustrated with specific results applied to the intercity mid-sized bus.

KEYWORDS:
Vehicle dynamics, safety, control, hardware-in-the-loop

EFFECT OF AN ACTIVE ROLL SYSTEM IN THE BEHAVIOUR OF A BUS STRUCTURE

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ABSTRACT
One of the main causes of traffic accidents in which heavy vehicles are involved is the lateral stability loss. It is well known that heavy vehicles have relatively high centres of gravity and narrow track widths and can lose roll stability at moderate levels of lateral acceleration. Different active roll control strategies have been proposed in order to improve vehicle handling response and roll stability. All the active systems generate moments between the sprung and unsprung masses in response to roll motions which affect to the structure of the vehicle. The main objective of this paper is to analyze the effect of an active system based on anti-roll bars of a heavy vehicle structure such as a bus structure.

KEYWORDS:
Active roll control, lateral stability, bus structure.

SEMI-ACTIVE SUSPENSIONS FOR TWO AND THREE-AXLES OFF-ROAD VEHICLES

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ABSTRACT
Vehicles handling and ride comfort are essential subject because these vehicles operate at different environments. Improving the comfort ability enables the drivers to derive for a long time at critical situations with full activity. This paper deals with dynamics and control policies analysis of semi-active suspension systems for off-road vehicles. Three configurations of these vehicles; 2-axle, 3-xle and 4-axles have been studied and their performances are compared. The application of several control policies of semi-active suspension system, namely skyhook; ground-hook and hybrid controls have been analyzed and compared with passive systems. The results show that the hybrid control policy yields better comfort than a passive suspension, without reducing the road-holding quality or increasing the suspension displacement. The hybrid control policy is also shown to be a better compromise between comfort, road-holding and suspension displacement than the skyhook and ground-hook control policies. Skyhook control generally improves sprung mass responses while at the same time increase unsprung mass responses. On the other hand, ground-hook control generally improves unsprung mass responses at the expense of the sprung mass responses. Ground-hook control also found to take longer time to settle in transient state response. Results show an improvement in ride comfort and vehicle handling using 4-axle over 3-axle and 2-axle when emphasis is placed on the response of the vehicle body acceleration, suspension and tyre deflection.

KEYWORDS:
ride comfort; half-vehicle model; semi-active system; ground-hook; skyhook; hybrid; passive suspension system

DURABLE DESIGN OF TRANSPORT VEHICLES CALCULATION OF WELDING SEAM FATIGUE PROPERTIES

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ABSTRACT
Because of the increasing globalization in the last couple years and the market developments linked with it in Eastern Europe, car carrier manufacturers have to react with additional and optimized development activity to the prevailing bad road conditions. So Kässbohrer Transport Technik is investing great effort to further development of methods and technologies to increase the product durability without loading restrictions and loading operation. The load which is being exposed from the road the chassis is much higher on bad road conditions in Eastern Europe compared to good road conditions (for example Austrian Interstates), in frequency as well as in the amplitude spectra. These cognitions are shown through implemented measuring drives were structural loads have been measured through applied sensors, which conduces as input value of a specific development method from Kässbohrer Transport Technik as prognosis for durability. Beside the acceptance of the load collectives during measuring drives a stress-cycle diagram (Wöhler curve) was developed with the help of theoretical attempts in combination with field observations. That makes it possible to achieve a very realistic durability determination. This prediction gives the chance to accomplish specific weak point

analysis, to develop (weight)optimized constructions and layout criteria for the usage according to the road condition and in this manner to optimize the product quality.

KEYWORDS:
weld seam, measurement, fatigue, truck superstructures

A MODEL OF COORDINATE SYSTEM FOR BUS DYNAMIC ANALYSIS

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INTRODUCTION

From the first stages of bus superstructure design, consideration of its overall performance has to be taken into account. The aim is to design a bus structure with high stiffness, low weight and a reasonable cost considering safety. The driver and passengers of a bus are subjected during bus ride to strains due to pavement irregularities and to vibrations due to acceleration, braking and lane change manoeuvres leading to stress and strains in the bus structure.

In addition, to guarantee the passenger safety the bus is designed with a series of transversal rings along the bus structure. Each of the rings is subjected to movements and strains leading to torsions and bending of the structure.

For the final bus design safety rings placed along the length of the bus structure play an important roll, and therefore, it is very important to know in detail the behavior of each of the rings of the bus structure.

Due to the complexity and variety of bus superstructure configurations a general coordinate system which allows characterizing the absolute and relative movements of each of the sections of the bus structure must be defined. Therefore, the objective of this investigation is to establish a reference coordinate system that allows calculating the relative and absolute movements that take place due to bus dynamic ride as well as the stress of the different points of the bus structure. This model will allow analysing all of the temporary behaviours that take place in these types of vehicles making possible to identify undesirable effects that might negatively influence passenger comfort.

KEYWORDS:
model, bus dynamic,

FE ANALYSIS OF A TRUCK STRUCTURE IN ORDER TO PREDICT ITS CRASH BEHAVIOR

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ABSTRACT
A structure which will offer a good protection in traffic accidents must to be almost non deformable under the action of accidents exceptional loads. In order to make more safety cars is very important to predict the impact behaviour of the body structure. Standardized testing for passive safety is often computer simulated but, legally, some experimental testing is demanded.

This paper presents a simulation of the front impact on the upper corner of the cab that is made with a pendulum which hit the structure. The geometric model was developed starting from a real truck structure composed by two parts (the chassis frame and the cab) connected by a mounting system with springs and dampers. The analytical model of the truck presented in this paper includes its main subassemblies and the mounting systems that connect them.

FE method allows making deformable models of the body structure, models very useful to study the impact behavior. For good results is important to consider nonlinear materials for the body structure. The paper will present some results concerning this frontal crash simulation.

The method can be used for any test which must be performed using a pendulum with certain impact energy.

KEYWORDS:
truck, cab, safety, pendulum, FEM

THE MOLECULAR- AND THERMO-MECHANICAL ASPECTS OF JOINING MATERIALS – IDEAS AGAINST CERAMIC ELEMENTS OF THE ENGINE

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ABSTRACT
It turns out that not always compressive stress in the ceramic-metal couple (slab, sanwich) is healthy for the strength and performance of the couple, nor the close relation of the thermo-mechanical properties are necessary for the good (performing) join, especially coefficient of thermal expansion in general case! Good join may rather base on epitaxy (though polycrystals!!!), voids in the crystal structures, optics etc. There are several minerals and compounds which should be thermal shock resistant, but there is a blank (or overcrowded area) between the temperature computations using and non-using radiative approach there where the radiative should work, and no one procedure can perform well.. Also, some disorder can be necessary for good performance of the definite metal-ceramics couple. The problems of the grain or domain size, compressibility and langevity are also addressed. The paper is in the manner of hypothesis (ideas) or review, but several examples are given, either.

KEYWORDS:
joining of materials, voids, interstitial compounds, epitaxy, anionic potentials, IR, feldspars, compressibility, langevity

CREEP AND LOW CYCLE FATIGUE INVESTIGATIONS OF LIGHT ALUMINIUM ALLOYS FOR ENGINE CYLINDER HEADS

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ABSTRACT
An influence of the chemical composition, porosity and ageing on mechanical behaviour of light, multifunctional aluminium alloys (AlSi8Cu3 and AlSi7MgCu0.5) subjected to creep and low cycle fatigue (LCF) was investigated. The materials were tested to verify their applicability as the cylinder heads in car engines. During creep tests a strain response of the materials was observed under a range of the step-increased stresses and different temperatures. The LCF tests were carried out under strain control in three blocks of 100 cycles each with a constant strain amplitude. The results of creep and LCF tests were analysed with regard to chemical composition and porosity variations of the materials tested. An influence of porosity on the creep resistance was considered. The results of the LCF tests were compared for the materials in the as-received state and after ageing. An experimental evaluation of cyclic behaviour due to the LCF was carried out to check, whether the hardening effect can be observed in the materials? Taking into account the various history of loading a stress response of the materials was investigated.

KEYWORDS:
Creep, fatigue, cylinder heads, light alloys

MECHATRONIC OPTMIZATION IN INTELLIGENT VEHICLES: APPLICATION TO A ACTIVE AND PASSIVE DAMPERS

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ABSTRACT
An approach for the engineering of advanced mechatronic vehicle systems is presented. A key element is the integration between 3D geometry-based (FE, MBS) models and 1-D multi-physics system-theoretic models. This involves embedding or co-simulation of the state equations and/or reducing the 3D model into an approximative state-space model. Embedding control laws enables Model-In-the-Loop (MIL) and Software-In-the-Loop (SIL) applications. Linking real-time virtual models to actual hardware systems enables "Hardware in the Loop" testing (HIL). The MIL process is illustrated for the mechatronic optimization of an active suspension on two levels of the development V-cycle. In the first optimization stage, based on a high level 1-D model, controller gains are determined such that ride & handling performance criteria are met. The forces from the master controller are directly fed into the suspension. The second optimization stage uses a 1-D hydraulic design library to build a detailed damper model. Based on force-velocity couples of the first optimization stage, that represent the most occurring road profiles, optimal damper design parameters with respect to energy consumption are selected. The set of parameters is determined such that the performance criteria on the higher level are met. Next, the

concept of HIL is extended to advanced component testing and illustrated on a passive shock absorber. Main issues that need to be tackled are the transfer of the computed loads by the model to the physical component and the stability of the whole system. A methodology which is based on the separation of the two problems is presented on a simulation case.

KEYWORDS:
multidisciplinary design, mechatronics, simulation

CONTINUOUS VARIABLE VALVE TIMING CONTROL SYSTEM FOR MODEL SPARK IGNITION ENGINE

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Abstract
The optimization of valve train actuation for internal combustion engines through the fixed geometry camshaft is a compromise of the required torque, fuel consumption, idle characteristics and exhaust emissions. Varying the engine valve-open duration, lift and phasing are known ways to improve engine performance, increase fuel economy and reduce emissions. The objective of this paper is to meet the requirements of higher torque values at all engine speeds. This can be achieved by varying the valve timing automatically using a new variable valve timing system, which gives continuously variable valve actuation at all engine speeds. A model engine is designed using dimensional analysis methods and then implemented to verify the proposed control system. Moreover, microcontroller and computer-aided control systems are constructed and used to modify the variable valve timing control in the laboratory. In this paper, a mathematical model of variable valve timing is developed to obtain the best volumetric efficiency with optimum valve timing at different engine speeds. From this model, the look-up table is created at all ranges of the engine speed. A single cylinder engine is used to estimate engine performance characteristics for conventional camshaft. In addition, a model engine is designed and constructed to apply the Variable Valve Timing VVT control system. The investigations show that the system is flexible throughout the entire range of operation speeds and is able to alter valve timing concerning both valve opening and closing. The ability of valve opening and closing can be realized with rates higher than these of the conventional timing mechanisms.

KEYWORDS:
Valve timing, Variable valve timing, Spark ignition engine control.

TRANSIENT PROCESS MODELLING FOR CONDITION MONITORING OF COMPRESSION IGNITION (CI) ENGINE

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Abstract
To cope with the stringent automotive emission based legislative regulations and to increase the probability of timely repairability, availability and vehicle protection; engine condition monitoring and diagnosis models have become very important. The diagnostic models need a range of data sets to predict the condition response of the system and for this both the steady and transient data sets can be used. However, the condition monitoring parameters in transient condition of operation, which is frequently the case in urban and extra-urban places due to stop-go nature of traffic with worst pollutant emission have better potential to be used in diagnostic model development as compared to steady state condition parameters. This is because the transient state gives significant deviation in measured performance parameters in a reasonably limited time period. The aim of this study is to compare the suitability of transient and steady operating conditions for condition monitoring and to select performance parameters that can be used to develop a diagnostic tool for internal combustion (CI) engine running on biodiesel blends fuel. The parameters required for the model have been obtained from the simulation of a turbocharged, 4 cylinders, 4 stroke, and water cooled engine using Ricardo wave software. Basic and accumulated performance deviation equations have been developed to use for condition monitoring tools during transient operation. The measurable performance parameters such as brake specific fuel consumption, brake torque, exhaust temperature, carbon monoxide (CO) emission and cylinder pressure has been used to develop diagnostic model. These results show that the transient process gives better estimate of faults as compared to steady state process for engine diagnostics and condition monitoring.

KEY WORDS:
Transient Models; Condition Monitoring; Accumulated Deviation; Air Leak

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DEVELOPMENT OF BRAKE-BY-WIRE SYSTEMS FOR ALTERNATIVE VEHICLE CONCEPTS

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ABSTRACT
Today the Brake-by-Wire (BBW) technology is one of the most prospective decisions of the future taking into consideration constantly growing safety, reliability and performance requirements and also taking into account the expansion of vehicle concepts.

The update of conventional brake system for hybrid vehicle is obligatory condition for realization of regenerative brake system, since the additional control system for control of combined action of hydraulic/pneumatic brake system and of regenerative brake system is required.

Thus the brake system of hybrid vehicle with the possibility of brake energy regeneration is a

complex system that consists of BBW system, regenerative brake system and control system.

Investigations on development of BBW systems were carried out in Ilmenau University of Technology, Germany with the use of Multitronic Brake System (MBS) which bases on a Multicar commercial vehicle and AMESim software

KEYWORDS:
brake-by-wire system, AMESim software, regenerative braking, modeling.

INTEGRATED CONTROL FOR ESC AND TVD USING SIDESLIP ANGLE – SIDESLIP ANGULAR SPEED, SIDESLIP ANGLE – YAW RATE PHASE PLANE

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ABSTRACT
This paper presents a new integrated control algorithm for Electronic Stability Control (ESC), Torque Vectoring Differential (TVD). The main purpose of the proposed integrated chassis control algorithm is to improve vehicle stability and performance by using the phase plane method. While the conventional studies related to the integrated control for ESC and TVD use $-\beta^{\&}$ phase plane method, this study uses not only $\beta - \beta^{\&}$ phase plane but also $\beta - \Psi^{\&}$ phase plane to systematically coordinate the ESC and TVD in the wide range of the vehicle maneuver. In those phase plane analysis, control boundaries are gotten by lots of simulations. Control boundaries are set up in each phase planes' stable region to avoid that the vehicle is unstable. The integrated control algorithm has three steps to control the vehicle. First two steps are for the vehicle stability when the vehicle state is outside of control threshold in each phase plane. At the last step for the vehicle stability and performance, the vehicle is controlled by TVD to maximize the vehicle performance. Yaw error control is the control method in the last step. In this paper, control algorithm is programmed with MATLAB / Simulink. And in order to verify that, MATLAB / Simulink simulation is to work with CarSim. E-Class SUV Sprung Mass model given by CarSim is used for simulation. The integrated control algorithm is compared to the combined system which has no integrating algorithm with some simulation tests. Consequently, the integrated chassis control algorithm proposed by this paper controls a vehicle to improve stability and performance, efficiently.

KEYWORDS:
Phase plane, Electronic Stability Control, Torque Vectoring Differential, Integrated Chassis Control

MULTI-BODY WHEEL MODEL DEVELOPMENT FOR SIMULATING THE TIRE DEFORMATIONS DURING PLANAR MOTION

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ABSTRACT
Road vehicles are equipped with pneumatic tires for two main reasons. First, due to their flexibility the tires can absorb the high frequency vibrations; otherwise these vibrations would be transferred from the road to the vehicle body. The second purpose is the adhesion. Because of the flexibility the tire has a significant drawback: it deforms if forces and torques are acting on the wheel, which results in the change of the heading direction and of the motion vectors. If we would like to analyse the motion of a tired vehicle, we should calculate with this deformation effect. The simplest solution is to model the wheel as a multi-body system. The wheel rim is a rigid body, which has mass and inertia around its vertical and rotation axis. Although the tire is a continuum, it can be discretised along its circumference. The tire is represented by tire elements, which are mass points, and they are described by their coordinates. These tire elements are connected to each other and to the wheel rim with springs and dampers. Friction force arises as well on that tire elements which are in the contact patch; therefore that elements are gripped on the ground. Static and sliding friction forces are differentiated. The roll effect is simulated so, that rotation torque is acting on the wheel, which causes tire deformation so longitudinal force arises. With the above described method we can simulate the wheel sliding and rolling behaviour due to different forces and torques acting on it. Using this model we are able to analyse the deformation of the tire or we get information about the forces and torques arising on the tire. The trajectory of the wheel can be plotted and analysed as well. Various simulations can be made with different friction coefficient, mass, or stiffness, further more it can be implemented into a vehicle model too.

KEYWORDS:
Tire model, Wheel model, Motion simulation

VALIDATION PROCESS FOR VEHICLES EQUIPPED WITH ESP

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ABSTRACT
The global economic crisis showed car manufacturers and their suppliers that R&D and the minimizing of costs is essential for survival on the market. According to this the simplification of different processes could serve as a solution to produce cheaper products. As a part of the current development the adequacy of the model is checked by a validation process with a continuous feedback. Our goal is to compare the predictions of the model and the measured data. However, the comparison of measurements on a test track with a vehicle model equipped with ESP requires more measurement processes. These measurements are time consuming and in order to provide accurate reproducibility they account for a significant part of the end-price of the product, which the costumer is not willing to pay in some cases. This paper deals with

the validation process of the ESP systems on commercial vehicles. These vehicles have different superstructure and different subsystems, although a properly homologised model gives us the possibility to leave the multiple validation process decreasing the final costs of the vehicles. Such differences are the number of the axles, the axlebase and track width, the type of the suspension, the type of the springs and the shock absorbers, and several other differences which have influence on the dynamics of the vehicle.

The model used for the homologation should be complex and flexible enough, and it should be appropriate on international level, therefore we have to choose a highly adequate simulation environment. Therefore we have chosen the simulation software called Simpack, which is a multi body simulation programme. With this, we are able to model a complete vehicle, and after the validation of this model we can substitute the measurements with simulation. The homologation process ensures the model based adequacy, so if any parameter of the vehicle changes, we can choose a different vehicle unit, so finally we get appropriate simulation results. To reach this, it is necessary to create a model -in SimPack environment- which contains the properties of the fore mentioned vehicles. It is also important to name the input parameters that are relevant to different vehicles. This way, the model has to be able to handle the dynamic behaviour of a two axle medium duty trucks and a four axle four wheel steered heavy duty trucks too.

After all if we have a basic vehicle model then with an appropriate validation the model will be proper for model-based homologation (in case it contains the changed parameters and the connections between them) skipping the expensive measurements on test tracks, and evaluating the results.

KEYWORDS:
ESP, Homologation, Validation, Model

APPLICATION OF ACTIVE ANTI ROLL BAR SYSTEMS FOR ENCHANCING YAW STABILITY

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ABSTRACT
The Active Anti Roll Bars (AARB) are getting more and more popular nowadays. These systems are usually designed for vehicles with high centre of gravity, and their purpose is to change the roll stiffness of the vehicle for comfort reasons, or for preventing a potential roll-over. In the present paper the use of AARB will be analyzed from different perspectives. An actuator will be presented which allows the proper control of vehicle's yaw stability.

First, the basic vehicle dynamic laws are described that show, why and how it is possible to control the handling of the car, with the different stiffness on the front and rear anti roll bars. It is followed by the short description of the applied vehicle model, which helps to analyze the effects of the ARB parameters.

Following, conclusions are drawn about the applicability of the possible control laws. Starting with a standard PI controller, the advantages and disadvantages of the system is shown. Putting a driver model into the system, the motion of the closed loop driver-vehicle system is simulated under several conditions (eg. sudden lane change maneuver or side wind disturbance). Analyzing the results of the simulation, improved stability can be seen. Improved stability of the vehicle at the tire grip limit is also shown. After this the virtual model following control is presented.

The yaw moment production capability of an AARB system is shown, and a calculation method is presented, that creates the "yaw moment map" for such system.

KEYWORDS:
anti roll bar, stability, roll stiffness, axle characteristic, weight transfer

REAL-TIME SIMULATION OF HYDRAULIC CONTROL UNIT FOR BRAKE SYSTEMS

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ABSTRACT
The development of mathematical descriptions for vehicle systems makes possible the application of simulation techniques during the design and development phases and represents an efficient tool for analysing the system behaviour, reducing costs and time-to-market. A major topic during the system modelling process, especially when real-time capability is required, is the balance between both its accuracy, related in general to an increase of the model complexity, and the computational cost. In this work, a real-time capable model for an Electro-Hydraulic Control Unit (EHCU) for advanced brake functions is developed, to be used in Hardware-in-the-loop (HIL) testing and verification of the Electronic Control Unit (ECU). The continuous-time dynamic model of the system involves the coupling of multiple physical domains (hydraulic, electromagnetic, mechanic and control electronics) for the simulation of main braking functions (ABS, TC and ESP).

Simulation accuracy and robustness has to be assured in all operation conditions during long tests. Therefore, the model must be able to simulate the brake fluid in high and low pressure situations even in presence of mixed gas, which means that it must describe the variations in its compressibility. The proposed model has proved to be an effective and efficient way of representing the EHCU system under such variable conditions. It is based on representations of the hydraulic capacities and resistances in terms of the changing density and bulk modulus of the fluid in such a way that mass conservation is assured. This model results in a good correspondence between the simulated and the experimental data, without the computational costs associated with more complex models.

KEYWORDS:
Real-time simulation, Electro-Hydraulic Control Unit, Cavitation, Hardware-in-the-loop

MULTIBODY SIMULATIONS OF A BRAKE BOOSTER SYSTEM BY MEANS OF FINITE ELEMENT ANALYSIS

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ABSTRACT
A very useful tool to support the design and development processes for various mechanical engineering sectors, including automotive industries, is the Finite Element Method. This tool, apart from enhancing the overall product quality, can also reduce product cost significantly, especially if applied early in the design cycle, as well as the number of prototypes required. The application of multibody calculations to the study of complex components is also widely used in the industry to analyse system dynamics. This paper describes the steps followed to develop a multibody model to analyse a brake booster system using a finite element code as ABAQUS.

Usually, in complex systems, each component that takes part of the whole system must be analysed using the finite element method separately in order to build up models that can be feasible from the points of view of time and complexity of the calculations. The aim of this paper is to show a new methodology of calculation by means of the finite element method, taking the brake booster system as example of application. This methodology reduces the complexity of the model not including each component (parts of the system physically), but taking into account only their equivalent stiffnesses calculated previously from simulations of reduced models for the critical parts. Additionally, the modelling of multibody systems including rubber parts, as the brake booster, is quite challenging since this material has non-linear behaviour, and at component level exhibits strong dependencies not only on its dynamic behaviour but also in the static one. The model built up uses connector elements for joining each part involved in the system, including some of them as flexible or rigid parts, depending on its relative stiffnesses. The flexible parts are included in the model by means of their equivalent stiffnesses associated to connector elements, which have been previously calculated in reduced simulations of those parts.

KEYWORDS:
Elastomers, multibody simulations, brake booster system, finite element method.

ECOMATIC HYBRID SYSTEM FOR A HYBRID UTILITY VEHICLE

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ABSTRACT
The paper presents some aspects regarding the EcoMatic Hybrid System (Energy conversion with autoMatic Hybrid System) developed in a modular solution for research the different

alternative propulsions systems for passenger cars and utility cars developments from these. In the plug-in motorized solution, E-4WD architecture it is mounted on the Ecological Hybrid Utility Vehicle (Eco HUV), concept car named GRAND SANDERO. This original vehicle is in progress within the new Automotive Engineering Research Centre of the University of Pitesti on the versatile mechanical platform of Dacia MCV (Multi Convivial Vehicle). The hybrid system for this experimental vehicle is a parallel two shafts, with torque addition. The thermal powertrain mounted in front side with Renault K4M (1.6- 16V) engine is fuelled with LPG. The electric powertrain is mounted in rear side in an original solution with an H type axle with a twisted traverse. In order to perform the tests of the vehicle prototype, the electric powertrain and the thermal powertrain the new laboratory Alternative Propulsion System & Renewable Energies will be used. It has a dynamometric roller test bench and an eddy-current engine/motor brake arranged in an original architecture. The EcoMatic Hybrid System was developed in such way that allows it's application to the whole Dacia-Renault utility family cars.

KEYWORDS:
Passenger car, PHEV (plug in Hybrid Electric Vehicle), Parallel HEV

RELIABLE VEHICLE DYNAMICS SIMULATION IN SPITE OF UNCERTAIN INPUT DATA

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ABSTRACT
The mission of this paper is to demonstrate the contribution of the tyre model TMeasy to reliable and accurate full-vehicle dynamic simulations, which are carried out in the MSC.Adams environment. Increasing demands in accuracy and reliability of vehicle dynamics simulations require refinements of the models, particularly of the tyre models. On the other hand, however, there is still a lack of reliable tyre input data, which does hardly correspond to the achieved level in tyre modelling. Remarkable deviations of the measured tyre data from the tyre's capacities on a real roadway are caused by the testing procedure itself as well as by the testing conditions. As one pragmatic approach, lean semi-physical tyre modelling may help to overcome this shortcut, if the set of tyre model parameters is manageable and has got clear physical meaning. Simulations are increasingly supported by prototype measurements in the advanced stages of development. It is crucial for the simulation to react quickly to the engineering development steps. However, even is that phase not all of the necessary input data is complete and sufficient.

Based on a passenger car application, the procedure of parameter identification and estimation respectively is shown in the paper. The availability and sensitivity of the main parameters are qualitatively classified. Finally, the comparison of simulation results with measurements from testing manoeuvres allows it to rectify the chosen assumptions.

KEYWORDS:
Vehicle, tyre, modelling, dynamics simulation.

CAE DRIVEN VEHICLE DEVELOPMENT USING MESH MORPHING FOR WEIGHT REDUCTION & FUEL ECONOMY

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ABSTRACT
In this paper, a proven Finite Element (FE) and Computation Fluid Dynamics (CFD) mesh morphing based BIW development is presented. This proven methodology relies on morphing FE/CFD models of previous vehicles to fit new styling themes. Complete full vehicle crash, NVH, durability and CFD models can be obtained in a matter of 2 man weeks as opposed to several man months using the conventional approach!

The morphed full vehicle models can be converted to serve as intelligent parametric CAE models that can be used in Design of Experiments (DOE) and Optimization schemes to optimize for weight & fuel economy targets while 'balancing' vehicle performance requirements.

KEYWORDS:
Mesh Morphing, Parameterization, DOE, Optimization

CONTRIBUTION TO HIGHLIGHT POSSIBLE IMPACTS OF UNPROFESSIONAL REPAIR ON THE QUALITY AND SAFETY OF VEHICLES

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ABSTRACT
There is a positive indication that the number of bad unprofessional repaired cars involved in accidents will increase with consequences of catastrophic structural deformation and loss of occupant lives. Poorly repaired vehicles may previously have been involved in side, rear, oblique, or frontal crashes. After panel beating them to shape, sometime there are variations in the quality of repairs, in the equipment used, in maintaining the tolerances and geometrical parameters, and in choice of materials used. This unprofessional attitude has negative influence on vehicle structural collapse mechanisms and should no longer be tolerated as occupant lives could unnecessarily be lost when in reality they would have survived such crashes if repairs were properly done to high quality and workmanship. In the age of new sophisticated material use and advanced production techniques employed by the OEMs, it has become increasingly important to emphasise the need to maintain quality of repairs, hence assure the survivability of occupants.

This paper contributes to the understanding of this problem and how it could be alleviated through employment of good workmanship that extends in sound repair of structural components, sub-assemblies and assemblies. The project initiated by DEKRA and its partners is named "Fair Repair" and some of its preliminary results are described herein. A case study of a poorly repaired car in frontal 40% offset impact at 64 kph (as of Euro NCAP) with previous record of being involved in a pole-to-side-impact scenario is presented. A partial collapse of the occupant compartment is evident of deteriorated safety. Numerical simulations in particular show the

influence of local degradations in load paths, diminished resistance, alternate deformation characteristics and a sporadic change of stress pattern within the car body. To assess the potential of possible impacts of unprofessional repairs to the safety of vehicles being driven on European roads, the occurrence and characteristics of cars damaged after real-world accidents are also analysed. A proposal is outlined on how to cope with today's problems of unprofessional workmanship that induce negative influences on safety, overall structural quality and long-term upholding of value.

KEYWORDS:
Vehicle repair, crash test, numerical simulation, occupant safety

STIFFNESS AND FATIGUE LIFE INVESTIGATIONS OF DIFFERENT SPOT WELD MODELING TECHNIQUES

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ABSTRACT
For lightweight automotive body structures, the stiffness and the fatigue behaviour is highly influenced by the number and the distribution of the joints as well as the used joining technology. Numerical simulations, mainly based on the Finite Element Method (FEM) are implemented in the development process to reduce or even avoid testing loops and prototyping. On the market several methods are available to simulate different joining technologies. But it is still often not clear which modeling and assessment method is appropriate for each specific application.

It is necessary to have in mind that vehicle bodies have to withstand high dynamic loads while each joint represents a potential crack initiation location.

In the field of simulation the main goal of the spot weld modeling using the Finite Element Method is to connect the shell elements of the metal sheets and to lead to reasonable results regarding local stiffness and stresses. The so called "second generation" of spot weld models, with the advantage of mesh independent sheet connections which leads to quicker mesh generation, are now state of the art.

The software package FEMFAT (fatigue life prediction), supports different kinds of spot joint modeling techniques. Beside the "stress based concept" with a necessary local remeshing at each spot location to derive more accurate local stress results the "force based concept" was developed to enable the assessment of the "second generation" of spot welds. The combination of both methods within one FE-model is one of the main focus of this presentation. The advantages and handicaps of the different available modeling possibilities (fast modeling vs. detailed results) will be represented.

KEYWORDS:
Finite Element Method; Fatigue; Spot Weld; Body Structures

A NEW DESIGN FOR A VAN BONNET TO MEET LIGHTWEIGHT AND PEDESTRIAN SAFETY TARGETS

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ABSTRACT
In the last years the structure lightweight and the safety performance have become more and more important in the vehicle design. On one hand the lightweight is a necessity to meet the strict emission limits, in particular in terms of CO^2, established by the EU regulations, on the other hand, after obtaining excellent results for the safety of the occupants of the vehicle, recently the attention has been oriented toward the protection for the vulnerable road users, pedestrian and cyclist. In this perspective this work describes the development of a hybrid metal plastic bonnet for a light commercial vehicle. The main target has been a relevant decrease in weight together with a design suitable for the pedestrian safety. Starting from a defined concept made by an outside metal skin and an inner thermoplastic structure, which can integrate an air intake in its design, the development has considered different types of performance (stiffness, pedestrian safety, denting resistance) and at the end also some economic and manufacturing considerations have been done. The development phase and the main interesting results will be illustrated and discussed.

KEYWORDS:
pedestrian head impact, lightweight, multi material, bonnet

INVESTIGATIONS IN ADVANCED BRAKE ASSISTANT SYSTEMS

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ABSTRACT
The state-of-the-art in the automotive active safety points to the insufficient potential of driver assistance systems and to a number of unsolved challenges in the driver support during the critical and pre-critical road situations. The proposed work introduces some results in the advancement of theory and practice for such systems as applied to the braking.

The research analyzes the structure of a generalized automotive assistance system. The feasible criteria are considered to recognize the drivers on gender, age and physical features.

The performed investigations discussed the following issues:

- Development of an energy-information model of the system "Human-Vehicle-Road" to research the distribution of information flows and energy losses;

- Analysis of professional techniques for emergency braking as a basis for the development and application of special devices and control methods for functions of the electronic driver's assistant.

With regard to these propositions the paper gives outlooks to:
- Concept for an advanced assistant, which is the superstructure on the human-machine interface;
- Requirements for the advanced brake assistant;
- Illustrative modelling of the operation of the advanced assistance system during the braking process.

KEYWORDS:
braking, transmission, assist system.

FAULT DETECTION AND ISOLATION STRATEGY IN PARALLEL HYBRID ELECTRIC VEHICLES

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ABSTRACT
This paper presents the fault detection and isolation (FDI) strategy for a parallel hybrid electric vehicle (HEV). The powertrain of the target parallel HEV consists of an internal combustion engine, an integrated starter and generator (ISG), a traction motor, an ISG belt as a pulley system and an engine clutch between the engine and the traction motor. In this study, the model-based FDI algorithm for the current sensor and the angle sensor in the ISG and the traction motor is developed. The FDI algorithm for a hard fault for the ISG belt is also developed by structural analysis of the ISG belt. The proposed FDI algorithms consider residuals, which are determined by differences between measurements coming from sensors and models. The models include the ISG belt model, the engine model, the engine clutch model, and two permanent magnet synchronous motor (PMSM) models which are the ISG model and the traction motor model. These residuals are utilized as discrepancies between the models and the respective processes. The time varying adaptive thresholds of the residuals are used to consider the modelling errors during the transient maneuvers. A complicated and extended dynamic model for the target HEV is developed to simulate the behavior of the system and to verify the proposed FDI strategy.

KEYWORDS:
Hybrid electric vehicle, Fault detection and isolation, PMSM, ISG belt

DEPENDABILITY IN DESIGN OF AUTOMOTIVE SYSTEMS REGARDING LEGISLATIVE REQUIREMENTS

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ABSTRACT
The road transport is becoming more and more problematic in the countries of the European Union. Some predictions show an increase of 80-100% of the current volume of goods and passengers will be transported in the EU within the next decade, and most of this increase – despite of the efforts made in promoting the rail and waterway transport – will be added to the already overloaded roads. It seems, the only feasible solution to fulfill this transportation demand is to increase the vehicle overall length and weight at the lowest complexity, providing the maximum utilization of the existing vehicle units only with smaller modifications and higher reliability.

The importance of safety is also increasing in the automotive industries. This includes making driving and the components, their architecture safer. This latter, system safety depends strongly on the failure probability of individual components and how the system handles different faults, errors and failures. In wide interpretation, under the notion of dependability, system safety expresses operation without catastrophic events harming users and the environment, while reliability and availability presents the continuity in system readiness. Regarding reliability is more precise concerning its time dependence from which availability can be derived.

KEYWORDS:
safety; reliability, safety-critical

MODERN RECYCLING METHODS OF CAR WRECKS, CONSIDERING RECOVERY POSSIBILITIES OF SHREDDED LIGHT FRACTION

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ABSTRACT
Presently it is a significant problem how to handle the tremendous amount of car wrecks. This is a continuously developing area because of its necessity and because of the strict rules of the European Union.

Today's most efficient car wreck recycling solution and the mostly used method for separation is the shredder technology that follows the pre-dismantling and liquid removal process. The revolving hammer crushers grind the car wrecks and after that comes the separation of the different materials based on their properties, such as density, magnetic and electric conductivity. At the entrance of this machine the feed materials are car bodies, mixed scrap, scrap bales, and on the other side arrive the output materials separately: ferrous and non-ferrous metal, and mixed non-metals. The mixed non-metals fraction includes: rubber, glass and plastics. The name of this fraction is shredder light fraction (SLF) with high calorific value. This technology could be found on the market, however the issue of shredder light fraction needs increased development because of the strict expectations of environment protection. The majority of the output materials – being about 76-82% of the processed quantity – are considered as utilizable, and the rest non-metal (SLF) 18-22% means the problematical part. This waste material

has high percentage of plastics that have high volume/mass ratio and very slow degrading time. That is why it is very important to find a solution for this problem, that decreases efficiently the amount of materials taking to landfills.

There are two kinds of technologies for residue utilization: material recovery (e.g. technology of Volkswagen SiCon, technology of MBA Polymers) and energy recovery (e.g. burning, pyrolysis). European Union directives expect to increase significantly the usage of material recovery instead of energy recovery. The most important aim is to change the present practice by lowering the volume of waste getting into the landfill.

KEYWORDS:
Recycling, Shredder Light Fraction, Material and Energy Recovery

ON-BOARD EMISSIONS MEASUREMENT FROM LIGHT DUTY DIESEL VEHICLES

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ABSTRACT
In order to measure the concentration of toxic compounds a mobile analyzer for toxic tests SEMTECH DS by SENSORS Inc. was used. In the study the results of the vehicle emission tests in the road conditions were presented as this was the only way to obtain the information on real vehicle emissions. They include information on the emissivity of the vehicles in operation and deal with the real conditions of the vehicle motion. Reliable measurement results were obtained which were verified in simulated conditions on a chassis test bed. The obtained data were used to specify the dependence characteristics for the influence of the dynamic engine properties on the harmful compound emissions. The dynamic engine properties were indirectly taken into account using all the speed range and the range of acceleration calculated for the city traffic in order to prepare a matrix of emission intensity. The data used were averaged within each speed and acceleration range, which generated a characteristics of engine operation in each range and a characteristics of the emission matrices of each harmful compound. The largest share of engine operation in the studied traffic conditions was obtained for the minimum and medium speeds and zero vehicle acceleration. The obtained data enabled to define the vehicle emission factor which can be used to classify fleets of vehicles in relation to toxic compounds emissions that differ e.g. in production date, i.e. limits of exhaust emissions, mileage of vehicles or operation conditions.

Keywords:
exhaust emission, diesel engine, road test

PARADIGM SHIFT IN PRODUCTIVITY FOR ROBOTIC MIG WELDING

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ABSTRACT
The contact tip is a critical element in welding guns for electric arc welding with a consumable electrode. Its main function is to enable electric current from a welding power supply to be continuously transported to a wire or strip comprising the consumable electrode.

MIG welding contact tips have been in existence for decades and the basic design principle has not changed over time. Most are hard drawn copper bodies with a machined through hole which generates multiple points of contact and therefore a fluctuating arc. This paper discusses the benefits of a patented contact tip design which enables improved control over electrical contact and which, as a consequence, produces a more stable, predictable and energy efficient arc.

The tip design addresses the fundamental physical issues of wire transfer through the tip and continuous current delivery and as such, the tip enhances the performance for a wide variety of GMAW applications.

The MIGfast tip significantly advances the control of the arc by creating a single point of continuous contact within the copper body via a guiding insert and a ceramic insulator. The benefits of which are, up to 40% faster welding speeds, reduced spatter (reduced wire wastage & clean up), reduced shielding gas use, reduced fume pollution, longer tip life, reduced energy consumption and a reduced carbon footprint.

All these add up to a paradigm shift in MIG welding productivity over traditional MIG welding contact tips on the market today.

KEYWORDS:
welding, green technology, productivity, robot

IMPLEMENTING A COMPONENT FROM A NEW SUPPLIER

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ABSTRACT
The paper present some issues encountered in the practice of auto components.

When changing the components´ suppliers an automotive manufacturer has to submit the new components to several tests in order to verify their capability to replace the old ones.

Thus, it is to be taken into account the risks associated to such a change, risks with respect to the component's complexity level, its role in the assembly and also aspects related to the new component validation procedure, problems that may occur and solutions.

In order to emphasize these, for example, a cylinder head from a new supplier, had to pass, up to validation, the following tests: material, filling analyses, work bench comparison (with the actual cylinder head "in use"), scavenging test, seizing test, hot-cold test.

Taking into account the results of those tests, it is to be mentioned that the filing of the actual cylinder head is better that for the new one (this having an impact on the power output and the global exhaust temperature).

In addition one may say that there exists differences between the two components from the different manufacturers, but these do not influence the validation conditions and their behavior during the clients´ use of the car.

KEYWORDS:
replacement, automobile, component, provider, validation.

THE NATIONAL AUTOMATIC TOLL COLLECTION SYSTEM (NATCS) - PROPOSITION FOR POLAND

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ABSTRACT
The paper refers to implementation of electronic toll collection system for motorways and expressways in Poland. According to Directive 2004/52/EC, these systems should use one or more of the following technologies: satellite positioning, mobile communications using the GSM-GPRS standard and 5,8 GHz microwave technology. Author has analyzed different types systems which meet these requirements. It has turned out that only system using satellite positioning technology (GPS) and mobile communications (GSM/GPRS) is the best toll solution of unique capabilities and this kind of technologically sophisticated system should be implemented in Poland.

Motor Transport Institute has developped the structure of the National Automatic Toll Collection System (NATCS) for motorways and expressways for Poland. NATCS consists of National Automatic Toll Collection Centre, OBU and control subsystem. NATCS system is based on a combination of mobile communications technology (GSM) and the satellite-based global positioning system (GPS).

An innovative element of NATCS is the On-Board Unit (OBU), which automatically calculates the amount of charge due taking into account the vehicle category (admissible weight, number of axles), road distance and the emissions class (ecological aspect). The control subsystem distinguishes between automatic enforcement through control gates, enforcement by mobile teams, and patrol teams (police, Road Transport Inspection).

KEYWORDS:
Electronic toll collection, microwave technology, on-board unit (OBU)

RESEARCH CONCERNING THE VEHICLES CLASSIFICATION AND IDENTIFICATION WITH LASER SENSOR

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ABSTRACT
A part of the vehicle counting operation consists of its classification according to the vehicles class categories. Different device types and basic principles were used to develop more precise and reliable equipment in the past years, able to deliver relevant data for vehicles class identification, together with other traffic parameters.

The aim of the research carried out was to develop a new method for vehicles class identification using a laser sensor to scan the vehicles on the vertical axe and to compute the vehicle shape captured on the PC screen with typical shapes from a data base, which describes different vehicle types, respecting the basic vehicle dimensions (length and height).

Two research steps were competed so far: laboratory test to calibrate and evaluate the basic proprieties of the laser detection in order to capture the exact basic dimension of the simple moving objects. The results conclude an accuracy of the dimension and shape detection with an average error under 1,5 %. The second research stage consists of the vehicle detection in the research area. One M1 class automobile was used and it ran at different speeds. The carried work contribute to increase to the vehicle identification accuracy using a single sensor the laser detection with L-Gage programming sensors offers the possibility to count at the same time the vehicle speed and basic dimensions in real time. The contribution in this field consists in the described new approach using the real time scan procedure and data compute device design by the authors.

KEY WORDS:
laser, scan, dimension, vehicle class, speed, real time.

IMPROVEMENT OF THE HMI DEVELOPMENT PROCESS THROUGH MODEL BASED SPECIFICATION

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ABSTRACT
During recent years the functional range of automotive infotainment systems has rapidly increased and with each generation of new infotainment systems it will continue to increase. This increase of functions is due to the increasing number of driver assistance systems and the integration of new media and information sources from the consumer market.

The display of information provided by the functions and the operating are challenges for the development of operation and display systems. These challenges are much bigger in the automotive environment than in the field of consumer electronic products. For instance, in the car, due to safety reasons, the effects of distraction whilst using a device should be as low as possible. The information of the driver's assistance systems has to be displayed dynamically and the user should be able to seize it intuitively and rapidly and functions from different domains should be displayed by HMI. During the development process all these requirements have to be combined with the demands of shorter development time, earlier decision making and lower error rates.

This presentation gives an overview of the combination of methods to analyse, conceive, design and carry out an automotive user interface and how a model based system specification can efficiently support these work areas.

KEYWORDS:
HMI, Model based specification, DIN EN ISO 13407

ASSIGNMENT PROCESS OF THE EMERGENCY SERVICES IN THE E-CALL PROJECT

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ABSTRACT
Nowadays, the main fields of research in the automotive industry are safety and environment care. Inside the former field, one of the main targets is to improve the work of the emergency services, where the accident takes place, to decrease the total time needed to attend the victims. This is included in the postcrash safety.

The e-Call project can be found into this matter as all the developments and equipments are included in the vehicle to make the emergency call. This call contains all the information to make better and more efficient the action of the emergency services. Moreover, the telephone number 112 is being introduced in Europe, and will receive all the messages sent by the crashed vehicles. The organization that controls the telephone calls would distribute information and assign the units to be sent to the place of the accident.

The main target of this research project is to develop an algorithm to optimize the assignment process of the most suitable units of each brigade to be sent where the accident has taken place. The main input information comes from the vehicle about the accident in the emergency call. More necessary information to introduce is the real time traffic information which is registered in the mobility centre. As the state of the units of the brigades is known, the target is to assign the required units, minimizing the time to arrive to the place of the accident.

This research project takes into account the fact of three kinds of brigades can be assignment to go to the accident place. These brigades are the emergency services, the police and the fire brigade. The fire brigade only takes part when a victim is trapped into the car. So, there are many people involved in the first action in the accident place and many roads to be covered by the different bases; it is necessary to make automatic the assignment and decision making processes.

The algorithm designed has been tested with a stretch of one of the main roads in the area of Barcelona. There have been considered four bases of the emergency services, five police bases and three fire brigades, which are the nearest to the test road.

If a comparison between the nowadays protocol and the automatic assignment method, a reduction of 5 minutes is achieved and the maximum response time fixed, which is 20 minutes, was not exceed in none of the simulations.

As future works, a simulation with a complete scheme of the surrounding roads and all the bases of the three corps will be raised to extend the application and compare the results obtained with this first basic model.

KEYWORDS:
e-Call, emergency services, assignment process

REAL TIME INFORMATION PROCESSING FOR CAR TO CAR COMMUNICATION APPLICATIONS

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ABSTRACT
In this paper an information processing framework for car-to-car communication (C2CC) is presented. The information processing is integrated into a C2CC system based on reconfigurable hardware presented in [1]. It offers processing and data aggregation for a variety of applications and the possibility to implement the whole application layer. Information is presented on a signal level granularity with event driven characteristics. To avoid unnecessary application calls we provide an interface that features a subscribing methodology. Any application can subscribe to different information services providing data in various detailing and processing stages. We identified several derivates (i.e. vehicle trajectories) that are useful for many applications. These are calculated in advance and given to the subscribing application. As generating this information is relatively time consuming in software, hardware support has been added for such computations. Furthermore, the architecture supports a modularization approach as new additional applications can be added easily and without changing the overall framework. The capabilities of the framework are depicted using an application example. The methodology and functionality is given in detail and also measurements and results of the implementation are provided.

KEYWORDS:
C2X, C2C, VANET, reconfigurable hardware

GLUED FUNCTIONS BASED ASSESSMENT OF APPROXIMATION ACCURACY OF SELFIGNITION ENGINE REAL INDICATOR DIAGRAM

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ABSTRACT
The paper aims to provide an analysis and accuracy assessment of the approximation of real indicator diagrams, averaged over 50 runs, performed with the use of glued functions which analytically describe the form of those diagrams. The analysis and accuracy assessment were carried out for values of mean indicated pressure pi and indicated efficiency determined for real and approximated diagrams.
The paper also presents the analysis and assessment of error in the determination of the mean maximum pressure value in the working cycle of the AD3.152 UR engine fuelled by diesel oil, pure methyl ester of rapeseed oil fatty acids FAME and the blend of both fuels marked B20. When the indicator diagram was taken experimentally, the engine operated in the mode of external speed characteristics at the crankshaft rotational velocity n=2000 rpm.

KEYWORDS:
combustion engine, approximation, indicator diagram, spline function

DEVELOPMENT OF THE ACTIVE REGENERATION SYSTEM FOR THE DPF OF MIDDLE DUTY VEHICLES WITH PLASMA ASSISTED BURNER

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ABSTRACT
The application of diesel particulate filter (DPF) as after-treatment system has been studied to reduce particulate matter (PM) in exhaust gas from vehicle, but there is one challenge which is a regeneration method in the low temperature region. The active DPF system with a burner is one of the promising solutions for heavy duty diesel vehicles because the regeneration of the filter at all the engine condition could be possible.

This study describes the development of the active DPF system using a plasma assisted burner regeneration considering the stability of flame, efficiency of regeneration and control logic for the system. Engine bench tests and field tests were performed to evaluate these performances of the burner system.

Results from these tests show that exhaust gas was heated and maintained at above 600 ^{0}C at all operating condition with below 26 Ampere of the electric power consumption. The fuel for regeneration was increased step-by-step to have flame stability and prevent fuel slip. This burner system also showed high reliability in regeneration efficiency and durability.

KEYWORDS:
Active DPF (diesel particulate filter-trap), Plasma burner, Regeneration, Particulate matter

NUMERICAL MODEL AND PROGRAMME FOR SIMULATING WORKING PROCESS IN THE COMPRESSION-IGNITION ENGINE WITH EGR

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ABSTRACT
This paper presents a computational model for simulation of the working cycle of a compression-ignition engine based on experimental measurements. The parameters of the model were obtained during calibration by application of the Nelder-Mead optimization method using results of a wide range of engine measurements. The approximating functions for predicting values of model parameters and emission levels were formulated in the next step. This enables us to use the model for any possible values of the control parameters. An example of application of the computational model was presented. The model was used to control engine emission of nitrogen oxides. In this task an optimization method was also used in order to find the set of engine control parameters leading to minimization of nitrogen oxide emission. Additionally, the

applied procedure ensures proper engine operating parameters like mean indicated pressure, thermal efficiency and limited maximal pressure in the cylinder. Suitable results of numerical calculations are presented.

KEYWORDS:
CI engine, modelling, emission

HYDROGEN BASED OPERATION OF INTERNAL COMBUSTION ENGINES

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ABSTRACT
The article describes various aspects of internal combustion engines running on hydrogen. Properties of hydrogen are displayed with special regard to application in internal combustion engines. Physical properties, flammability limits, ignition energy, energy density and value are listed. Modes of on-board storage, such as high pressure gas bottles, storage in liquefied form, absorption, adsorption and storage in form of chemical compounds are dealt with. Combustion properties are analyzed in deeper details, their effect on engine operation is pointed out. Contributors are the broad range of flammability of hydrogen-air mixture, low minimum ignition energy, high spontaneous ignition temperature, low extinction distance (that makes it difficult to extinguish its flame), high combustion velocity, high diffusion velocity and extremely low density. Ignition problems such as spontaneous ignition mostly appearing at low rpm at large spark advance and engines of external carburetion; backfire and end-gas detonation (knock) are analyzed. Emissions, nitrogen-oxide formation issues are described. Mitigation of ignition problems such as change in spark advance, mixture dilution, water injection and exhaust gas recirculation are showcased. Alternatives of fuel supply systems such as continuous drag from near to atmospheric pressure, sequential multi port injection and direct injection are detailed, together with their advantages and disadvantages.

Keywords:
hydrogen, fuel, combustion

SOME ASPECTS OF BIFUEL SI ENGINE RUN ON ALCOHOL AND GASOLINE

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ABSTRACT
The paper presents test results of an engine run on gasoline and methyl alcohol. Initial tests were performed on Fiat 1100 MPI, four cylinder, spark ignited engine. Injection of the alcohol took place in area near inlet valve, via additional injectors assembled in suction manifold. Developed system enabled engine operation which, is run on gasoline or alcohol (methyl or ethyl one) and simultaneous combustion of a mixture of the both fuels with any mass fraction of the alcohol. Performed tests have shown advantageous effect of methyl alcohol on efficiency and concentration of nitrogen oxides and hydrocarbons in exhaust gases. Analysis of combustion parameters calculated on base of recorded indicator diagrams pointed at rapid combustion process of the alcohol in the initial stage of combustion. It effects in growth of maximal pressures and increased heat release rate. Higher combustion rates effect in higher temperatures of working medium during combustion of methanol, what could increase thermal load of the engine.

KEYWORDS:
bi-fuel engine, share of alcohol, efficiency, toxicity of exhaust gases.

PRODUCT DESIGN AND VEHICLE TESTING OF AN ELECTRIC PARKING BRAKE ACTUATOR

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ABSTRACT
Electric parking brake (EPB) is one of innovations for advanced vehicle electronic systems over recent years. It enables the driver to apply and release the parking brake by touching a simple button or can activate automatically. This paper presents a new product design process of EPB, which includes the benchmarking, mechanism design, control design, system integrating, and prototype tests will be performed. These headlines are illustrated in detail respectively in several sections of this paper. Finally, several items of test are presented and discussed with some experimental data, which explain the feasibility and advantages of the proposed EPB product design.

KEYWORDS:
EPB, parking brake

THE DYNAMIC ANALYSIS & SIMULATION OF THE GUIDING – SUSPENSION SYSTEM OF THE MOTOR VEHICLES USING THE VIRTUAL PROTOTYPING TECHNIQUE

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ABSTRACT
The revolutionary evolutions in the field of motor vehicles imposed the development and utilization of high technologies both for manufacturing and design. The simulation techniques allow the engineers to conceive and equip virtual prototypes, which permit a large-scale evaluation of the system behaviour. In this paper, we attempt to carry out the dynamic analysis of a motor vehicle, using the virtual prototype developed with the MBS software ADAMS of MSC Software. The dynamic model takes into consideration the geometric restrictions as well as the nonlinear characteristics of the elastic and damping elements. The virtual prototype includes the front and the rear suspension subsystems, the steering subsystem, and the car body subsystem. Two double-wishbone mechanisms are used for the suspension of the front wheels. The steering subsystem contains a central pitman arm that rotates to impart motion to the left and right tierods. The rear rigid axle is guided by a three-bar mechanism, which is a dependent suspension model. The experiment designed is one frequently carried by the automotive manufacturers, namely dynamics with shock, the interactions between wheels and road (ground) being modelled by using impact-type contact forces. On the virtual prototype, a lot of measurements have been made having in view to evaluate the dynamic behaviour of the vehicle. One of the most important advantages of this kind of simulation consists in the possibility of make easy virtual measurements in any point and/or area of the system and for any parameter.

KEYWORDS:
Motor vehicle, Multi-body system, Virtual prototype, Dynamics.

MECHANISMS FOR THE INTEGRAL STEERING

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ABSTRACT
The preoccupations with increasing the manoeuvrability and stability of the passenger cars involve a special attention to the steering system on four wheels. In comparison to the classical car with front steering axle, in the case when the rear wheels that are steering in an opposite direction as those in the front, the desired reduction of the turning radius is accompanied by a reduction of the stability, the fictitious axle base being reduced, which can be dangerous when running at high speed. In the case of steering of the rear wheels in the same direction as the front ones, we notice an improvement of the stability while turning, but also the increase of the radius.

The passenger cars with two steering axles, rear and front, to which the steering of the rear wheels is made in opposite direction as to the front ones, can complete tighter turns, but they

have more reduced stability when speeding. To improve the stability, in the situation where the turning radius is reduced, is taken into consideration the integral steering, to which at the beginning of the turn the rear wheels are in the same directions as the front ones and only afterwards they are aligned and steering in opposite directions. In these terms, our paper presents a series of mechanisms for the steering box of the rear axle, with a control depending on the steering wheel's rotation angle and on the driving speed of the car.

KEYWORDS:
steering box, steering rear axle, integral steering.

ASPECTS REGARDING THE ANALYSIS OF THE CAR GEOMETRY INFLUENCE OVER THE PEDESTRIAN INJURY SEVERITY AND DISTRIBUTION

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ABSTRACT
Worldwide, the road traffic accidents resulted injuries represent one of the top major factors to reduce life expectancy. Statistical analysis reports show that, while the general trend in some industrialized regions is to reduce the effects of traffic accidents by the means of imposing programs involving the car manufacturers, the research institutions and the society (i.e. APROSYS and PReVENT for E.U.), for the regions under development there is room for improvement in this area. In example, for E.U. member state Romania, the percentage of pedestrian casualties of all road traffic victims not only surpasses several times the mean value for the European Union, but is also having an increase trend, thus creating the need for developing new solutions in the field of pedestrian protection, or improving the ones that are already taken into consideration.

When regarding the vehicle to pedestrian accident from a systemic point of view of a Haddon matrix, the frontal body design can be identified crossing the vehicle as factor with the main collision as event phase. Along with other body design components, the vehicle frontal geometry plays an important role on the dynamics and outcome of traffic accidents involving pedestrians. The manuscript outlines the connection between the variation of several vehicle geometrical parameters and the injury severity and its distribution on pedestrians.

KEYWORDS:
safety, pedestrian, impact

ENHANCED ANALYTICAL VEHICLE STABILITY MODEL

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Abstract
With ever-increasing speeds on roadways, road vehicles are becoming more vulnerable to accidents. Commercial vehicles in particular are more prone to overturning accidents due

to adverse conditions like cross winds and abrupt acceleration/braking conditions. Thus, it is essential to investigate vehicle stability under various conditions of manoeuvring, cross winds and on inclined ground planes. This paper presents an extended analytical model to analyse the stability of vehicles exposed to various destabilising factors. A wide range of destabilising factors have been investigated. These include the longitudinal and lateral inclination of the ground plane, acceleration and braking effects, centrifugal cornering effects as well as the effect of aerodynamic cross winds at various wind speeds and angles of attack. These destabilising factors have been described in detail. A four-equation model has been proposed to evaluate the vertical ground reaction forces at each wheel, based on the force-moment system created by the above-mentioned destabilising factors. A parametric study is carried out to investigate the influence of various parameters on the overall stability of the vehicle. It is noted that higher magnitude of wind velocities cause a reduction in the maximum safe vehicle speeds. Moreover, for high magnitude of wind speeds, it is also seen that wind angles as low as 5° can cause overturning accidents, even at low vehicles speeds of 15 m/s (33.5 mile/hour, 54 km/hour). An increase in vehicle mass is seen to be beneficial as it increases the maximum safe vehicle speeds for a given set of wind conditions, thus making the vehicle more stable. The proposed vehicle stability model can predict stability characteristics of a wide range of vehicle types.

KEYWORDS:
vehicle stability, aerodynamics, rollover, analytical model

INTENSIVE USE OF ALUMINIUM IN CAR BODY CONSTRUCTION

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ABSTRACT
The developments in materials over the last decade have been considerable within the automotive industry, being one of the leaders in innovative product applications. Sustainable product development of an automotive structure requires a balanced approach towards technological, economical and ecological aspects. The introduction of new materials and processes is dependent on satisfying different factors. Competitive and legislative pressures, creating the need for change, affect these factors considerably. The process, direction and speed of change are often reactive. Current paper shows the application of aluminium alloys, for the use in the bottom structure of a car to face the problem for the weight of the entire bottom structure under static load conditions, including stiffness, strength and buckling constraints. In addition to minimized mass and materials' price, the assessment of an environmental impact of materials-candidates during the entire life cycle of the structure is considered.

KEYWORDS:
Vehicle engineering; Body construction; Structural optimisation; Light weight body

SERVICE NEEDS FORECASTING AN APPROACH FOR THE AUTOMOTIVE INDUSTRY USING ANALOGIES WITH MEDICAL ER MANAGEMENT MODELS

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ABSTRACT
During the past years, the industry has shifted position and moved towards "the luxury universe" whose customers are demanding, treating individuals as unique and valued customer for the business, offering vehicles produced with the state of the art technologies and implementing the highest finishing standards. Due to the competitive level in the market, car makers enable processes which equalizes customer services to E.R. management, being dealt with the maximum urgency that allows the comparison between both, car workshops and emergency rooms, where workshop bays or ramps will be equal to emergency boxes and skilled technicians are equivalent to the health care specialist, who will carry out tests and checks prior to afford any final operation, keeping the "patient" under control before it is back to normal utilization.

This paper establishes a valid model for the automotive industry to estimate customer service demand forecasting under variable demand conditions using analogies with patient demand models used for the medical ER.

KEYWORDS:
Vehicle engineering; Body construction; Structural optimisation; Light weight body