Automotive engineering symposium

Automotive Engineering Symposium

Intelligent Choices For Future Automotive Technologies

Proceedings

Monday 6 April 2009
Auditorium, Eindhoven University of Technology

IEEE Student Branch Eindhoven

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Preface

The automotive world is in a big transition: traditional technologies will slowly disappear from the roads. This is mainly due to a social awareness towards sustainability: being green is fashionable and the greenhouse effect is the nightmare of the new generation. This request for environmentally friendlier technologies may however not be at the expense of mobility, safety, speed and interior space. Conflicting demands as these create huge challenges for engineers in the automotive world. Should we make our petrol powered cars more fuel-efficient by making them hybrid? Or should we switch over to fully electric cars or hydrogen drive trains? And are these solutions even feasible?

These questions are very relevant and have to be answered in the next decade. Therefore we decided to organize this symposium. The future of hybrid and electric drive trains and the necessary adaptations to the infrastructure for these solutions form the main theme of the day. Experts from industry and the academic society will share their latest insights on these topics. Furthermore there will be several demonstrations to show some applications of these newest developments.

Visiting this symposium will give an insight in the challenges the automotive world faces. We hope that the participants actively join the debate and that this will be a pleasant and interesting day.

Yours sincerely,

Roy Warmerdam
Chairman Automotive Engineering Symposium

Program

Time	What / Who	Where
09:00	**Registration**	Senaatszaal
09:30	**Opening by Chairman of the Day** prof.dr.ir J.H. Blom (TU Eindhoven)	Blauwe Zaal
09:35	**Introduction Automotive Research at TU/e** prof.dr.ir. M. Steinbuch (TU Eindhoven)	Blauwe Zaal
10:00	**Introduction Automotive Industry** ir. R.J.H. Deckers (Automotive Technology Centre)	Blauwe Zaal
10:30	**Introduction Hybrid/Electric Drive Trains** dr. N. Schofield (University of Manchester)	Blauwe Zaal
11:00	**Introduction Hybrid/Electric Infrastructure** ir. P. van der Laag (ECN)	Blauwe Zaal
11:30	**Demonstrations**	Parking lot / Senaatszaal
12:00	**Lunch**	Senaatszaal

Time	What / Who	Where
13:00	**Parallel Sessions (see details on next page)**	
	Parallel Session A: Drive Train Solutions	*AUD 11*
	Parallel Session B: Infrastructure Solutions	*AUD 12*
14.30	**Coffee & Tea break**	Senaatszaal
14:45	**Cooperative Adaptive Cruise Control** ir. G.J.L. Naus (TU Eindhoven)	Blauwe Zaal
15:15	**Bearings for Electric Vehicles** ir. H. Mol (SKF Research & Development Company)	Blauwe Zaal
15:45	**Traffic Infrastructure Sensor NETwork (TISNET)** ir. J. Sijs (TNO Science & Industry)	Blauwe Zaal
16:15	**Closing**	Blauwe Zaal
16:30	**Drink**	Senaatszaal
17:30	**End**	

Program - Parallel sessions

Time	What / Who	Where

Parallel Session A: Drive Train Solutions

13:00	**Electric: The Future Drive Train** dr. P.A. Veenhuizen (HAN University Arnhem)	AUD 11
13:30	**Future Mobility with Hybrid Electric Vehicles** dr.ir. J.T.B.A. Kessels (TNO Science & Industry)	AUD 11
14:00	**Discussion**	AUD 11
14.30	**End of session**	

Parallel Session B: Infrastructure Solutions

13:00	**Hydrogen as Future Fuel** prof.dr. G.J. Kramer (Shell Global Solutions)	AUD 12
13:30	**The Mobile Smart Grid the Enexis Solution** A. Postma (Enexis)	AUD 12
14:00	**Discussion**	AUD 12
14.30	**End of session**	

Introductions

Opening by Chairman of the Day

prof.dr.ir. Jan Blom
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Jan H. Blom received the M.Sc. degree in Electrical Power Engineering from Eindhoven University of Technology in 1966. He worked as research associate in the field of Magnetohydrodynamical power generation from 1966 until 1973 at Eindhoven University of Technology, where he obtained his Ph.D. in 1973. From 1973 until 1974 he was a visiting professor at Stanford University in California, USA.
From 1974 until 1981 he worked as associate professor at Eindhoven University of Technology as project manager of the "MHD blow-down experiment". In 1981 he joined KEMA NV, first as manager of the Electro Technical Research department (1981-1984), then as deputy manager and manager of the R&D Division. In 1988 he was appointed as managing director of KEMA. He was chairman of the Board of Subsidiaries of KEMA in the USA, Russia and China. In 1998 he left KEMA and joined KPMG as senior consultant "Knowledge management". From January 2000 until 2008 he served as full professor in "Electrical Power Systems" in the Electrical Engineering Department of Eindhoven University of Technology. From 2002 until 2006 he served as Dean of the same department. Currently he is consultant in the field of energy technology.

Jan Blom served as member and chairman of numerous committees in the field of energy technology. He was chairman of the "Research Specific Committee" (Corech) of UNIPEDE, chairman of the "Task Force Research" of Eurelectric, member of the Research Advisory Council of EPRI (Electric Power Research Institute, Palo Alto, USA) and member of the board of ECN (Energy Research Foundation). He is member of the "Academy of Technology and Innovation". In 1980 he received the Siemens Award for outstanding achievement in the field of energy research.

Introduction Automotive Research at TU/e

prof.dr.ir. Maarten Steinbuch
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Maarten Steinbuch (1960) is full professor in Systems & Control at Eindhoven University of Technology. He received the M.Sc. degree (cum laude) in Mechanical Engineering from Delft University of Technology in 1984. From 1984 until 1987 he was a research assistant at Delft University of Technology and KEMA (Power Industry Research Institute), Arnhem, The Netherlands. In 1989 he received the Ph.D. degree from Delft University of Technology. In 1987-1998 he was with Philips Research Labs, Eindhoven as a Member of the Scientific Staff, working on modelling and control of mechatronic applications. In 1998-1999 he was manager of the Dynamics and Control group at Philips Center for Manufacturing Technology. Since 1999 he is full professor of the Control Systems Technology group of the Mechanical Engineering Department of Eindhoven University of Technology. His research interests are modelling, design and control of motion systems and automotive powertrains. He was an associate editor of the IEEE Transactions on Control Systems Technology, of IFAC Control Engineering Practice, and of IEEE Control Systems Magazine. He was editor-at-large of the European Journal of Control. Since October 1, 2008, he is Editor-in-Chief of IFAC Mechatronics. In 2003, 2005 and 2008 he obtained the 'Best-Teacher' award of the Department of Mechanical Engineering, TU/e. Since July 2006 he is also Scientific Director of the Centre of Competence High Tech Systems of the Federation of Dutch Technical Universities.

Abstract
Within the Brainport region, Automotive is one of the technological fields of growth and R&D interest. Eindhoven University of Technology plays an active role within this field as the prime technical university in the Netherlands focussing on high tech automotive technology. The Dutch High Tech Automotive Systems Innovation Programme covers R&D in the areas Driving Guidance and Efficient Vehicle (see www.htas.nl). Also, an 'Enabler' programme has been started on automotive education and business development. One important element is the start of a full Master of Science in Automotive Technology at Eindhoven

University of Technology. This multi-disciplinairy research-based master has the same focus themes as the HTAS programme, and is a joined effort of six departments of the Eindhoven University of Technology. The Master AT (www.tue.nl/at) is strongly based on the current and future research at the various groups and labs.

Introduction Automotive Industry

ir. Roger Deckers
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Roger Deckers achieved the M.Sc. in Mechanical Engineering from RWTH Aachen in 1979. He held several management positions in automotive industry, which started in 1979 at BMW AG Munich as a specialist in R&D engines.

In 1983 he continued his career by a new assignment at Volvo Car BV in Helmond, The Netherlands, during which advanced power trains and later on the Technology Group belonged to his responsibility. A highlight was the ACCESS project – a “quantum leap” concept car launched during Geneva Motorshow in 1996.

In 1997 a new challenge at FEV Motorentechnik Aachen passed his road as senior business development manager Western-Europe, followed by program management of a large engine development project for an Asian OEM.

In 2000 he was asked for another large challenge as the General Manager Powertrain R&D at Peugeot Citroën, Paris/La Garenne. In a period of 2 years new gasoline and diesel engine families were launched under his responsibility.

From 2002 onwards Siemens VDO Automotive contacted him for a special project as project director powertrain motorsports. After that he had the responsibility of the Technology Board setting up and governing innovation management and strategy organizing and stimulating system oriented innovations amongst others.

Since August 2008 he is managing the clustering of automotive innovations as the director of the Automotive Technology Centre in Eindhoven. In this role he stimulates know-how transfer as open innovation and supports Dutch automotive industry in techno-economical growth. At the same time Deckers Mobillity Consulting, Maastricht, was founded consulting international automotive industry, oil and gas industry, governments, institutions and other relevant stakeholders in techno-economical matters.

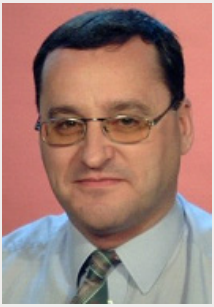
Many publications, presentations as well as patents have been realized.

Abstract

Energy and the environment are listed on top the agenda of almost all managers. A lot of measures are taken and industry and all stakeholders are jointly active to develop new solutions for road transportation. New drive train concepts, new and alternative energy sources, besides light materials and intelligent communication systems offer good opportunities to fulfill the increasing demands. Restraints are imposed on CO2 (and therefore fuel consumption), nitrogen oxides and particulates ('fijnstof'). Mobility is becoming more expensive and the automotive industry deals with it by a more intensive collaboration between suppliers and producers. The current automotive crisis demands for quick and new solutions. In particular, short term high impact innovations are needed, mainly related to 'green' (e.g. electrical) vehicles, especially with focus on the fastly expanding small car market. The electric car will be developed from a combination of the established automotive industry together with new partners like energy suppliers and distributors, battery manufacturers, knowledge workers and developers of drive train systems, modules and components. It is envisaged that the first large scale applications will be at companies that own a large fleets of cars. This gives the possibility to monitor regulated and realize fast sales despite higher initial price per kilometer, due to a higher cost price. The justification is among other things the high marketing value, good exposure and the ability to test market acceptation, economic aspects and the collaboration of the new partners under realistic conditions. New initiatives to stimulate this new mobility arise worldwide, however, in Japan, the US and Europe in particular. The automotive suppliers are not yet very enthusiastic, but active small companies and investors are evermore appearing. The established automotive industry is hesitant due to the enormous cost or (de)investments that electric cars bring along. The main cause is the expensive battery technology which still has functional disadvantages, e.g. low energy density and thus a low range. Also challenges in crash safety, comfort and EMC have to be dealt with. The new partners and technical concepts for vehicle architectures, modules and components demand for complete new business approaches.

Morning Session

Introduction Hybrid/Electric Drive Trains



dr. Nigel Schofield
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Dr. Nigel Schofield received the degrees of B.Eng. (Hons) in Electrical Power Engineering, and Ph.D. for research on the field-weakening capability of brushless permanent-magnet traction machines, from the University of Sheffield in 1990 and 1997, respectively. During the period 1993 to 1995 he served as a Senior Experimental Officer in the Department of Electronic and Electrical Engineering (EEE) before taking up the post of Design Engineer in industry. From 1997 to 2001, Dr. Schofield was a post-doctoral researcher in the Electrical Machines and Drives Research Group, Dept. of EEE, University of Sheffield, and from 2001 to 2004 a Lecturer in the Department. On 1 July 2004 he was appointed to a Mechatronics Lectureship in the School of Electrical and Electronic Engineering, at the University of Manchester, UK. His research interests include electro-magnetic power trains for all- and hybrid-electric vehicles, the vehicular application of hydrogen fuel cell systems, aerospace machines and actuators, the industrial applications of electro-magnetic devices and novel machines. Dr. Schofield is a Chartered Engineer and member of the IET.

Abstract

The impetus for more energy efficient and environmentally friendly road vehicles is motivating research and development into electrically powered vehicles for road transport applications. The presentation will aim to give an appreciation of the issues encompassing the move to lower emission and more-electric road transportation and help the understanding of the technical and economic aspects of new vehicle drive-train technologies.

Introduction Hybrid/Electric Infrastructure

ir. Peter C. van der Laag
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Peter C. van der Laag (M.Sc.) graduated in Applied Physics (Transport Phenomena) at Delft University of Technology, the Netherlands. In 1989 he joined the System Assessment Group of ECN, as a researcher. Since 1990 he is involved as a project manager in national and international fuel cell systems development activities for various types of fuel cell and for various application areas (CHP and transport). Since 1990 he is Dutch representative in various Annexes of the IEA Implementing Agreement on Advanced Fuel Cells. Peters team developed the first Dutch hydrogen fuel cell utility vehicle, HydroGEM. In 2008 Peter joined the Intelligent Energy Grids program and specializes on grid interaction of plug-in (hybrid) electric vehicles. Since 2000, he is a board member of the Energy Technology Group of the Royal Dutch Institution of Engineers (KIVI-NIRIA).

Abstract

Electric mobility receives increasing interest from the general public. Highly efficient electric mobility offers a new way to combat greenhouse gas emissions. Either directly by replacing internal combustion engines, or indirectly by storing excess power from wind turbines during night times. Especially in densely populated areas the air quality will improve to the benefit of human health. The electrical infrastructure for refuelling plug-in (hybrid) electric vehicles is in place and can be used for this purpose. However, when large numbers of electric vehicles are on the road, it becomes necessary to automatically control the battery recharging process. Otherwise electricity consumption peaks may overload parts of the electricity grid. The ECN PowerMatcher technology may provide a solution to this problem.

Parallel Session A
Drive Train Solutions

Electric: The Future Drive Train

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Dr. Bram Veenhuizen received his M.Sc. degree in Experimental Physics from the Free University of Amsterdam, The Netherlands in 1984. In 1988 he received his PhD degree from the University of Amsterdam on the subject of Electronic properties of Ce- and U-based compounds. In 1988 he joined SKF Engineering and Research Centre where his work focused on electromagnetic detection techniques for material characterization and X-ray characterization of material fatigue. In 1995 he joined van Doorne's Transmisie BV, where he was group leader for the systems design group. In 2002 he was appointed assistant professor in the CST group of the ME department of the Eindhoven University of Technology. Since 2005 he is also professor in vehicle mechatronics at the HAN University in Arnhem. His research interests focus on advanced (hybrid) vehicle drive trains, system design and fuel cell technology.

Future Mobility with Hybrid Electric Vehicles

dr.ir. John Kessels
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Dr. ir. John Kessels received the B.Sc. degree in Electrical Engineering from Fontys Hogescholen, Eindhoven, The Netherlands, in 2000 and the M.Sc. and Ph.D. degrees in Electrical Engineering from Eindhoven University of Technology in 2003 and 2007, respectively. His Ph.D. research project has been executed in cooperation with Ford Research Center, Aachen, Germany.

After working as a Postdoctoral Researcher with Eindhoven University of Technology, in 2007, he joined the Automotive Group of TNO Science & Industry, Helmond, The Netherlands. Since September 2008, he has been appointed as assistant professor (part-time) at the Control Systems Group, Eindhoven University of Technology. His research interests include energy and emission management for (plug-in) hybrid electric vehicles, with emphasis on integrated powertrain control.

Abstract

In this presentation, an overview will be given of modern hybrid electric vehicle technologies. It is explained how vehicle hybridization will become a world-wide standard for all new vehicles. To that end, illustrative examples are given about the economic and environmental impact of hybrid vehicles. Based on these results, also research challenges for future hybrid electric vehicles are discussed. The presentation concludes with an analysis on plug-in hybrid vehicles and their impact on the electricity grid.

Parallel Session B
Infrastructure Solutions

Hydrogen as Future Fuel

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prof.dr. Gert Jan Kramer (1961) is a Principal Scientist at Shell Global Solutions. He studied experimental physics at Leiden University, where he obtained a Ph.D. in solid-state physics.
In 1988 he joined Shell at its Amsterdam Research and Technology Centre (SRTCA). He worked on a variety of topics, ranging from quantum chemical modelling of catalysis to reactor engineering. In the late 1990s he was part of a Shell / Daimler project team that developed a fuel processor for on-board hydrogen production for reformer fuel cell vehicles. This brought him into the field of hydrogen, in which he has provided technical support to Shell Hydrogen. In recent years his activities have broadened to other alternative transport energy options, including electric mobility.
Since 2007 he is the Shell representative on the Technical Committee of the Energy Technologies Institute, a large UK public-private partnership for the acceleration of new energy technologies.
In addition to his work at Shell, Gert Jan is also a part-time professor of Hydrogen Technology at Eindhoven University of Technology.
He has co-authored over 60 scientific papers and holds 12 patents.

Abstract
In this lecture the role that hydrogen can play in a sustainable transport future will be discussed. Aspects of hydrogen production and how the chicken-and-egg problem of introducing new vehicles (fuel cell vehicles) which require a new fuel (hydrogen) can be overcome, will be reviewed.

The Mobile Smart Grid the Enexis Solution

André Postma
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Andre Postma was employed at energy company PNEM from 1985. Nowadays he works for Enexis (former network company of Essent). He is mainly occupied with the technical realization and maintenance of the medium and low power net. In the last 10 years he focused on the structure of future medium power nets and diagnostic techniques to determine the condition of components.
In the last 2 years he was occupied with the application of superconducting technology and the introduction of electric cars.
He won the 2008 Dutch Power Innovation Award.

Abstract
Enexis stimulates electric transportation with the necessary adaptations to the power grid and by specifying the required software. The main concern is the synergy between electric transportation and sustainable generation of power through the coupling via the net. Electrical vehicles have to be charged and can supply a storing capacity. This gives the opportunity to transport much more energy with the current net capacity. The hidden transport capacity of the net will be released. If this will be managed in an intelligent way, this can facilitate the required energy for electric vehicles as well as the varying production of wind farms.
Enexis started the development of the Mobile Smart Grid to realize this. This distribution concept implies data collection and control systems. Internet can facilitate the data flow necessary to load electrical vehicles in a regulated and intelligent way, without car users making sacrifices.

Afternoon Session

Cooperative Adaptive Cruise Control

ir. Gerrit Naus
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ir. Gerrit Naus received his M.Sc. degree in Mechanical Engineering from Eindhoven University of Technology in September 2005. From August 2005 until December 2005 he worked as a Research Engineer at the Research & Development group of Fontijne Grotnes, Vlaardingen. Since 2006, he is a Ph.D. student in the Control Systems Technology Group within the Department of Mechanical Engineering at Eindhoven University of Technology. The Ph.D. project is performed in cooperation with DAF Trucks and TNO. His research focuses on the application of modern model-based control design techniques in the automotive industry.

Abstract

The lack of a visible cause for many traffic jams is an annoyance for drivers. Is there an accident, construction work or just a bottleneck? No, just too much traffic or erratic driving behavior. Cooperative Adaptive Cruise Control (CACC) is a possible solution to this problem. CACC combines wireless vehicle-to-vehicle communication and inter-vehicle radar measurements to automatically control the velocity of a vehicle. Up to now, however, CACC is not commercially available. In this talk, a CACC design is presented, focusing on feasibility of actual implementation. Simulations indicate the benefits of CACC regarding traffic-flow efficiency.

Bearings for Electric Vehicles

ir. Henk Mol
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ir. Henk Mol works for SKF, a worldwide operating rolling bearing and actuator maker, in their Engineering and Research Centre in Nieuwegein, the Netherlands. He is responsible for sensor integration and strategic technology development regarding sensors and mechatronics. He has a M.Sc. in Electrical Engineering (TU Delft, 1987), and has worked since for SKF on topics regarding factory automation equipment, vibration quality control, machine condition monitoring, and new product development. The focus is now on development and integration of sensors for determining vibration, temperature, angular position, speed, force, water, and chemical environment in and around rolling bearings.

Abstract

SKF, a worldwide supplier of rolling bearings, has a track record when it comes to initiatives in alternative vehicle systems like the demonstration Drive-by-Wire cars Filo, Novanta, the hydrogen based General Motors Hy-Wire, and the Hydraulic-free electric forklift truck. These spectacular demonstrations have lead to low profile commercial products which can be illustrated by looking at the technology that is now applied in a few business cases from SKF. Specialised units are now made for the modern electrical vehicles: examples are a bearing unit specifically made for a starter-alternators in cars, and specialised bearing units for the electric motors of trains and trams. They feature very low friction losses, long-life lubricant and seals, easy mounting, thermal stability and a specific problem for electric traction motors: a high degree of electric isolation between shaft and housing. Without this, such bearings will not have any economic life. A special aspect with rolling bearings is their sensitivity to hydrogen gas. Rolling bearings are made from special grade heat treated steels, and hydrogen gas is a grave threat to the structural strength of these metals. Very low concentrations (50 ppm or less) have already shown significant life reduction due to steel embrittlement in the rolling contact stress zones. Hydrogen intrusion must therefore be avoided.

The most important new function in traction bearings is the integration of real-time angle sensing. It is needed for efficient and smooth control of the electric traction in driving and braking manouvres. This can be a high precision absolute positioning sensor to commutate DC brushless motors, but also more simple high precision speed sensors to enable accurate frequency and voltage control of AC induction motors. Recent commercial products from SKF will be featured.

Traffic Infrastructure Sensor NETwork (TISNET)

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ir. Joris Sijs received his M.Sc. in Electrical Engineering from Eindhoven University of Technology in 2006. Currently he is working at TNO Science & Industry in the department of Monitoring Systems. In 2007 he started his Ph.D. research in the field of estimation in (wireless) sensor networks in collaboration with the Eindhoven University of Technology. His current research topics are mainly focused around distributed state estimation (object tracking), parameter estimation and control.

Abstract

In this talk about the next Traffic Management System the participants will be taken on a tour to mobility in the future. Inhabitants and drivers in Europe suffer from delays, unreliability, accidents and pollution. The expected growth of the amount of kilometres for travellers and products is expected to grow 30% until 2020, which is growing faster than the available infrastructure is. Moreover, no European country is able to build new roads at the same pace as the growth rate of transport. At present road traffic congestion is estimated to affect 10 % of the road network, and yearly costs amount to 0.9-1.5 % of the EU GDP. Congestion is also the reason for substantial environmental problems caused by vehicle emissions. In 2002 the transport sector consumed 338 million tonnes oil equivalent (MToe) representing 31% of the total energy consumption in the EU. These are just two issues as a consequence of the increase in mobility and aspects like safety were not yet addressed. Therefore mobility demands one integrated solution instead of different solutions for each different issue, starting with the very basics of retrieving information about drivers, vehicles and traffic conditions.

Background information

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prof.dr.ir J.H. Blom	Scientific Advisor, Associate Professor

IEEE Student Branch Eindhoven

The IEEE Student Branch Eindhoven (IEEE SBE) is an association of the IEEE run by students of the Eindhoven University of Technology. The IEEE SBE organizes activities in the field of Electronic Engineering and Information Technology for students and Ph.D. students of the departments of Electrical Engineering, Information Technology and Computer Science.

Our mission is to bring students in touch with the diverse world of electronics and to prepare them for the industry in a better way by giving them a chance to develop their interests.

Some activities we have brought in the past: evening lecture sessions, excursions, symposia and study tours. Besides, there are activities just for fun, such as the New Year's Drink and a barbeque.

Just like the IEEE, the IEEE Student Branch Eindhoven is not strictly Electrical Engineering and Information Technology minded. Often we try to seek the interface with other technical fields, such as Biomedical Engineering, Physics, Mechanical Engineering and Technical Management.

IEEE is strongly international orientated. This allows members to visit international congresses and to meet other students from all over the world.

www.ieee.tue.nl

Electromechanics and Power Electronics (EPE)

The mission of the EPE group in the fascinating field of electrical power engineering is research, education and transfer of knowledge on advanced methods and tools to enhance the analysis, design and multi-objective optimization of innovative electromechanical structures and cyclically switched networks.

The group aims to perform innovative research by choosing relevant topics in the basic electro technical disciplines electromechanics and power electronics. The strategy is to carry out fundamental research on enabling theory, methods and technologies on which developments in electromechanics and power electronics are depending. The group works on novel analytical and numerical tools in order to better understand and describe the stationary and transient behaviour of power engineering devices, and to improve the multi-objective optimization techniques. Most projects are structured with a particular application in mind and therefore very suitable for industrial cooperation. Nevertheless, they are intended to enhance the fundamental insight. These projects serve to verify experimentally the newly developed models and tools, occasionally resulting in new problems that again require original research. Although two sub-programmes are involved, the development of novel methodologies, such as multidisciplinary optimization techniques, is shared. The success of several projects relies on the combination of both electromechanics and power electronics.
It should be emphasized that due to the multidisciplinary nature of all the projects a mechatronic research approach must be applied in which electromechanics and power electronics are combined with other engineering disciplines such as electromagnetism, thermodynamics, material science, mechanics, and dedicated analogue and digital electronics for control purposes. State-of-the-art analysis, synthesis, design and optimization facilities are extensively used. The laboratory facilitates prototype building, testing and developing methods and apparatus to measure functional system parameters; these activities are considered essential and integral parts of the research programme.

Electromechanics
The research in electromechanics spans a broad spectrum, ranging from computational multi-physics to the design of advanced actuators and contactless energy and data transfer systems. Driving forces are the increasing demands

for computationally efficient methods, the need for linear/planar drives and wireless transfer of energy and data in the precision-engineering technology, and the growing trust in the application of innovative electromagnetic and thermal solutions in the automotive industry.

Power electronics

The driving forces behind the research activities on power electronics are twofold. First, power electronic converters are key components enabling efficient decentralized energy generation systems and, secondly, continuous improvement in the overall performance and effectiveness of converters is required to encourage the deployment and enhance the reliability of such systems.

w3.ele.tue.nl/en/epe

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‘Overal is de boodschap hetzelfde. Wil je kennismaken met de nieuwste generatie technieken in automotive, je specialiseren en tegelijkertijd verbreden, dan moet je in Eindhoven zijn. Misschien is het even slikken voor die Duitsers die nog denken dat zij voorop lopen in technologie, maar het is niet bezijden de waarheid.’ Met deze woorden onderstreept Maarten Steinbuch - hoogleraar Power Trains en kartrekker van de nieuwe master opleiding – de campagne om studenten naar zijn faculteit te lokken.

Multidisciplinaire denkers

Coördinator Automotive aan de TU/e Anget Mestrom onderstreept deze woorden. ‘Ons vakgebied heeft met de uitermate snel evoluerende automotive industrie een enorme vlucht genomen. Het traditionele voertuig bestaande uit moeren en bouten heeft de afgelopen decennia een enorme transitie ondergaan en is nu een high tech product boordevol complexe mechatronica, elektronica, sensoren en informatiesystemen dat voldoet aan allerhande nieuwe wensen. Er is behoefte aan multidisciplinaire denkers; technici die zich niet beperken tot kennis van afzonderlijke componenten maar in staat zijn tot een systeembenadering. Daarvoor moet je op een bepaalde manier leren denken en natuurlijk de bijhorende bagage in huis hebben. En dat is nu juist waar onze masteropleiding voor staat. Het is een gezamenlijk initiatief van zes faculteiten van deze universiteit. Onze studenten kunnen, na afronding van het verplichte systeemdeel in de opleiding - acht vakken op technologische sleutelgebieden en een integratieproject - dan ook kiezen uit meerdere specialisaties. Jaar twee staat met een Master Traineeship en afstudeerproject geheel in het kader van de praktijk. Ook in gerelateerde sectoren waar materialen, energie en high-tech systems centrale elementen zijn kunnen de studenten straks prima terecht. De automotive-sector is immers niet de enige die schreeuwt om systeemdenkers, dat geldt bijvoorbeeld ook voor de mechatronica en ruimtevaart.

Brainport

In september 2008 startten de eerste veertien studenten (waarvan 5 uit het buitenland) met de masteropleiding Automotive Technology, vooruitlopend op de officiële accreditatie. De TU/e werkt mee om de ambitie van Brainport te verwezenlijken. ‘We willen bijdragen aan de verdere ontwikkeling van een hoogtechnologische regio – het neerzetten van een Europees centre

of excellence. Studenten die hier naartoe komen krijgen niet alleen een geweldige opleiding, maar tevens een omgeving waar ze hun beroep naar hartenlust kunnen uitoefenen. Daarvoor hoeven ze na hun studie niet meer weg. En behouden we ze voor deze regio, dan draagt dat bij aan de kracht van Brainport', aldus Maarten Steinbuch.

Recessie

De huidige economische recessie is voor de TU/e geen reden om haar ambities op het gebied van automotive- onderwijs bij te stellen. Steinbuch: 'Natuurlijk gaat kwaliteit daarbij boven alles, maar ik zie voor de rest weinig beperkingen. Ook niet als gevolg van de huidige economische situatie. Zes maanden geleden zat men te schreeuwen om hoogopgeleide technici binnen de automotive-industrie. Nu is dat misschien even anders, maar het tij zal snel weer keren, zeker wat betreft de mensen die wij hier afleveren. Wat wel van belang is, is dat we de kenniswerkers die hier nu al wonen en werken aan onze regio blijven binden. Bedrijven moeten blijven investeren in vernieuwing en hun mensen, hoe moeilijk dat ook is. De TU/e is op haar beurt ook bereid om haar steentje bij te dragen. Even geen werk voor je techneuten? Laat ze hier maar colleges lopen en werken aan hun kennisniveau. Alles om ze voor Brainport te behouden. Het oude gezegde geldt nu meer dan ooit: *De winnaars van morgen worden nu geboren*. Dat geldt voor bedrijven maar ook voor regio's. En daarbij is de aanwezigheid van goed opgeleide mensen wiens kennis direct aansluit op de behoefte van het bedrijfsleven van levensbelang.'

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w3.wtb.tue.nl/en/education/programs/msc_automotive_technology/

Notes

Colophon

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