

CVT-2010 Organization of the Symposium

Organizing Committee

Prof. Dr. K. Berns	University of Kaiserslautern
Dr. K. Dreßler	Fraunhofer ITWM, Kaiserslautern
O. Hermanns	Fraunhofer ITWM, Kaiserslautern
J. Hirth	University of Kaiserslautern
K. Huff	University of Kaiserslautern
Dr. B. Jörg	CVC, Kaiserslautern
R. Kalmar	Fraunhofer IESE, Kaiserslautern
S. Mörsdorf	CVC, Kaiserslautern
Prof. Dr.-Ing. C. Schindler	University of Kaiserslautern
G. Zolynski	University of Kaiserslautern

Organizers

Center for Commercial Vehicle Technology (ZNT)
University of Kaiserslautern

Fraunhofer Innovation Cluster Digital Engineering for Commercial Vehicles
(DNT)

Fraunhofer Institute for Experimental Software Engineering (IESE)
Kaiserslautern

Fraunhofer-Institut für Techno- und Wirtschaftsmathematik (ITWM)
Kaiserslautern

Commercial Vehicle Cluster – Nutzfahrzeug GmbH (CVC)
Kaiserslautern

Program Committee

Prof. Dr.-Ing. C. Schindler	University of Kaiserslautern
(Speaker of the Program Committee)	
Prof. Dr.-Ing. J. C. Aurich	University of Kaiserslautern
Prof. Dr. K. Berns	University of Kaiserslautern
Dr. K. Dreßler	Fraunhofer ITWM, Kaiserslautern
Prof. Dr.-Ing. P. Eberhard	University of Stuttgart
Dr. B. Jörg	CVC, Kaiserslautern
R. Kalmar	Fraunhofer IESE, Kaiserslautern
Prof. Dr.-Ing. P. Liggesmeyer	University of Kaiserslautern
Prof. Dr.-Ing. Steven Liu	University of Kaiserslautern
Prof. Dr. J. de Maré	Chalmers University Göteborg
Dr. J. F. Reid	John Deere, Moline, Illinois USA
Dr. F. Sager	BPW Bergische Achsen, Wiehl
B. Walter	VOLVO CE, Konz
G. Weiberg	Daimler AG, Stuttgart

**K. Berns, C. Schindler, K. Dreßler, B. Jörg,
R. Kalmar, and J. Hirth (Eds.)**

Commercial Vehicle Technology 2010

Proceedings of the
1st Commercial Vehicle Technology Symposium
(CVT 2010)

March 16-18, 2010
University of Kaiserslautern
Kaiserslautern, Germany

Shaker Verlag
Aachen 2010

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.d-nb.de>.

Copyright Shaker Verlag 2010

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publishers.

Printed in Germany.

ISBN 978-3-8322-9040-5

ISSN 0945-0742

Shaker Verlag GmbH • P.O. BOX 101818 • D-52018 Aachen

Phone: 0049/2407/9596-0 • Telefax: 0049/2407/9596-9

Internet: www.shaker.de • e-mail: info@shaker.de

Preface

These proceedings are a collection of selected papers presented at the 1st Commercial Vehicle Technology Symposium (CVT 2010). The symposium organized by the Center for Commercial Vehicle Technology (ZNT), the Fraunhofer Innovation Cluster Digital Engineering for Commercial Vehicles (DNT), and the Commercial Vehicle Cluster (CVC), is held on March 16 to 18, 2010 at the University of Kaiserslautern.

The CVT 2010 is a forum for researchers and developers from industry and academia to exchange ideas on current topics and discuss the latest trends in this field. At Kaiserslautern, innovation in the domain of commercial vehicles that includes trucks, buses, agricultural, and construction machinery, as well as special-purpose vehicles is driven by a constantly growing network encompassing development, research, and communication. In 2005 the Commercial Vehicle Cluster (CVC) was founded by the state of Rheinland-Pfalz in cooperation with University of Kaiserslautern and Daimler AG. It serves as an information and co-operation platform for companies from this domain and drives continuous exchange with research institutions. The two Fraunhofer institutes (ITWM and IESE) founded the Fraunhofer Innovation Cluster Digital Engineering for Commercial Vehicles (DNT) as a research group since 2006. University of Kaiserslautern itself established the Center for Commercial Vehicle Technology (ZNT) as a technology focus in 2007 and offers an international and inter-disciplinary master course of studies in Commercial Vehicle Technology (CVT) since 2008.

The CVT 2010 attracted great interest in the international scientific and industrial community. A lot of very sophisticated papers have been submitted. After a careful review process carried out by international experts in this area, 50 papers were selected for oral presentation. Furthermore, 16 posters are presented during the venue of this conference. The international interest is shown in the number of represented countries. In total researchers from eleven countries (Austria, Belgium, France, Germany, Hungary, Iran, Italy, South Africa, Sweden, Switzerland, and the USA) participate in CVT 2010.

The conference is organized in two plenary, twelve technical and two poster sessions. The technical sessions are held in two parallel tracks. In the two plenary sessions international experts give keynote speeches. These include:

- Dr. John F. Reid: *Increased Productivity and Convenience through Automated Worksite Solutions*
- Prof. Dr.-Ing. Dr. h.c. Hans-Heinrich Harms: *Innovationen in der CVT-Getriebetechnik – Ein Überblick aus der Sicht der Wissenschaft*

We would like to take this opportunity to thank all those involved in organizing CVT 2010. In particular we are very grateful for the outstanding work performed by the organizing committee. Furthermore we would like to thank all the members of CVC, IESE, ITWM, KIMA, and RRLab who helped us organizing and running the symposium. Last but not least we thank John Deere and VOLVO for supporting CVT 2010.

Editors of Commercial Vehicle Technology 2010
Kaiserslautern, March 2010

Contents

Keynote

Innovationen in der CVT-Getriebetechnik – Ein Überblick aus der Sicht der Wissenschaft

H.-H. Harms, K. Steindorff

Technische Universität Braunschweig 3

Driver Assistance Systems

Process Capable Alignment of Driver Assistance Systems in the Production of Commercial Vehicles

T. Tentrup, C. Heintz, H. Borkeloh

Dürr Assembly Products 17

Feasibility Study for the Automation of Commercial Vehicles on the Example of a Mobile Excavator

C. Hillenbrand, D. Schmidt, N. Bennett, P. Bach, K. Berns, C. Schindler

University of Kaiserslautern/VOLVO 22

Operator Assist System for Agricultural Vehicles – Overview about Guidance and Automation Solutions

G. Kormann

John Deere 32

CRUV - A Collaborative Route-Planning System for Utility Vehicles

C. Tuot, D. Obradovic, F. Fichter, A.A. Dengel

University of Kaiserslautern/DFKI Kaiserslautern 38

Product Development

PHYBAL – Eine physikalisch basierte Methode zur Lebensdauerberechnung für dynamisch hochbeanspruchte Bauteile von Nutzfahrzeugen

P. Starke, D. Eifler

University of Kaiserslautern 49

New Approaches for Efficient Statistical Fatigue Validation

N. Weigel, S. Weihe, M. Speckert, S. Feth

Daimler, Fraunhofer ITWM 59

Computer Aided Engineering of hydraulic filter elements – From theory to patent and products <i>O. Iliev, A. Schindelin, A. Wiegmann</i> <i>Fraunhofer ITWM, ARGO-HYTOS</i>	68
Piraterieschutz für Ersatzteile von Bau- und Landmaschinen <i>J.C. Aurich, J.-N. Kranz, C. Bohr</i> <i>University of Kaiserslautern</i>	76
Concept of a Lightweight Heavy Truck Frame for Increased Transportation Efficiency <i>M. Winter, K. Puchner, K. Prenninger, G. Schwarz</i> <i>MAGNA Powertrain, Engineering Center Steyr</i>	85
Zuverlässigkeitsabsicherung bei EvoBus – Zuverlässigkeitsplanung und Fahrerproben <i>J. Hörschele, F. Grueder</i> <i>EvoBus</i>	94
Modeling requirements of product-lines <i>C. Robinson-Mallett, J. Wegener, M. Grochtmann</i> <i>Berner & Mattner Systemtechnik</i>	101
Towards more Insight with Functional Digital Mockup <i>A. Stork, P. Schneider, T. Bruder, T. Farkas</i> <i>Fraunhofer IGD/Fraunhofer EAS/Fraunhofer LBF/Fraunhofer FOKUS</i> ..	111
Mehr Effizienz in der Produktentwicklung – Lean PLM-Prozesse mit Engineering-Cockpitsystem <i>R. Oetinger</i> <i>HTW des Saarlandes</i>	121
Entwicklung eines Messinstruments zur Leistungsermittlung und Absicherung von klimatisierten Fahrzeugsitzen EDAG Klimadummy EDDY 2.0 <i>M. Schultheiß, A. Wehner</i> <i>EDAG</i>	127
Netzwerkmodell für die Unterstützung des Produktentwicklungsprozesses und ihre Anwendung im kommerziellen Fahrzeugbau <i>K. Szeghő, T. Bercsey</i> <i>Budapest University of Technology and Economics</i>	137

Energy-Efficient Vehicles

Prädiktives Energiemanagement in Hybridfahrzeugen <i>M. Klinger, R. Bartholomäus</i> <i>Fraunhofer IVI</i>	149
Analysis of Power Flows and Efficiency in Infinitely Variable Transmissions of Agricultural Power Machines <i>Z. Farkas, I.J. Jóri</i> <i>Budapest University of Technology and Economics Budapest</i>	163
Potentials of electrification and hybrids in off-road machines <i>M. Mohr, M. Götz, M. Fellmann, R. Kuberczyk</i> <i>ZF Friedrichshafen</i>	173
Smart Hybridization for Reduced Fuel Consumption and Improved Emissions – Integrated development approach for tailored hybrid powertrain layouts with application specific operating strategies <i>C. Menne, H. Kwee, T. Körfer, H. Kemper, M. Lamping, A. Wiartalla, S. Pischinger</i> <i>RWTH Aachen/FEV Motorentechnik</i>	184

Production

Chassisstruktur für ein Niederflurfahrzeug – Selbsttragendes Gitterrahmenchassis für Fahrzeuge der Klasse M2 oder N2 als Basis für Fahrzeuge des ÖPNV oder Verteilerverkehrs <i>O. Glinka, M. Betz</i> <i>AL-KO</i>	197
Launch management in a global production network <i>F.H. Lehmann</i> <i>Daimler</i>	207
LinScan Duo – A semi-automatic testing system for the electronically synchronised multi-channel inspection of weld seams on agricultural chopper drums <i>B. Valeske, S. Caspary, F. Walte</i> <i>Fraunhofer IZFP</i>	213
COCOBOND – Beständigkeit geklebter bandbeschichteter Blechverbunde im Nutzfahrzeugbau <i>P.L. Geiß, M.P. Kötter</i> <i>University of Kaiserslautern</i>	218

Domänenspezifische Modellierung der Mensch-Maschine-Interaktion im Automobilbereich – Praktischer Einsatz aufgabenorientierter Modellierungsmethoden <i>D. Görlich, D. Zühlke</i> <i>Fraunhofer IESE/DFKI Kaiserslautern</i>	228
--	-----

Chassis

Electro Mechanical Brake system on heavy vehicles <i>F. Seglö, J. Svendenius</i> <i>Hallex Brake Products</i>	237
---	-----

Fahrwerkgeometrievermessung von Nutzfahrzeugen – Verbrauchs- und Kostenreduzierung mittels hochgenauem Prüfstand <i>R. Müller, M. Esser, J. Eilers, T. Tentrup, J. Boes</i> <i>RWTH Aachen/Dürr Assembly Products/HTW des Saarlandes</i>	245
---	-----

Highly loaded chassis components in polymer composite design – Trailing arm of a heavy duty vehicle trailer axle made of continuous glass fibre reinforced thermoplastic <i>F. Sager, B. Walter, M. Steffens</i> <i>BPW/ADETE</i>	253
---	-----

Improved Ride Comfort of a Commercial Vehicle – Cabin using an Active Air Suspension <i>C. Graf, J. Maas, H.-C. Pflug</i> <i>Ostwestfalen-Lippe University of Applied Sciences/Daimler</i>	265
---	-----

Durability

Reliability based design optimization of the fatigue behaviour of a suspension system based on external loads <i>M. Hack, R. d'Ippolito, N. El Masri, S. Donders, N. Tzannetakis</i> <i>LMS International/NOESIS Solutions</i>	277
---	-----

Einsatz eines Fahrerleitsystems zur Qualitätssicherung bei der Betriebsfestigkeitserprobung schwerer Lastkraftwagen <i>R. Teutsch, J. Ritter, C. Weber, G. Kolb, B. Vilecens, A. Lopatta</i> <i>Daimler/ICT Software Engineering</i>	287
---	-----

Customer Usage Profiles, Strength Requirements, and Test Schedules in Truck Engineering <i>M. Speckert, N. Ruf, K. Dreßler, R. Müller, C. Weber</i> <i>Fraunhofer ITWM/Daimler</i>	298
---	-----

Methodischer Ansatz zur vergleichenden Bewertung alternativer Fahrtriebssysteme in mobilen landwirtschaftlichen Arbeitsmaschinen Lastdatenermittlung – Prüfzyklusgenerierung – vergleichende Prüfstandsversuche <i>M. Heckmann, H. Bernhardt</i> <i>Technische Universität München</i>	308
---	-----

Ground and Material Simulation

Simulation von Verdichtungsvorgängen in Böden mit Hilfe der Finite- Elemente-Methode <i>P. Erdmann</i> <i>BOMAG</i>	319
Towards realistic prediction of soil-bucket interaction – Cosimulation between LMS Virtual.Lab Motion and DEMeter <i>B. Tijskens, J. De Cuyper</i> <i>KU Leuven/LMS International</i>	330
Simulation of soil behavior in virtual product development <i>M. Obermayr, Y. Öngün, K. Dreßler</i> <i>Fraunhofer ITWM</i>	340
Simulating sloshing liquids in tank vehicles <i>A. Lehnart, F. Fleissner, P. Eberhard</i> <i>University of Stuttgart</i>	353

Vehicle Simulation

Gesamtsystemsimulation zur Entwicklung von Brems- und Fahrdynamikregelungen für Traktoren <i>B. Müller, K. Tischler, U. Neumann</i> <i>Bosch Rexroth</i>	365
ESP of Commercial Vehicles – Which Benefits result of the Simulation in the Homologation Process? <i>B. Schick, U. Wurster, M. Ortlechner</i> <i>IPG Automotive</i>	375
Optimal Control of Multibody Systems for the Calculation of Invariant Input Loads <i>M. Burger, M. Speckert, K. Dreßler</i> <i>Fraunhofer ITWM</i>	387

Objective Handling Evaluation of Heavy Commercial Vehicles by Means of Model Based Parameter Identification <i>K. Prenninger</i> <i>Engineering Center Steyr</i>	397
Unternehmensübergreifende Simulation mobiler Arbeitsmaschinen – Ein Vorschlag für eine standardisierte Vorgehensweise <i>L. Völker, S. Han, M. Geimer</i> <i>Technische Hochschule Karlsruhe</i>	407
Software Architecture for Interactive Simulation of Mobile Machinery – Efficient Design and Simulation of Virtual Prototypes <i>G. Kunze, C. Schubert, W. Esswein, S. Lehrmann</i> <i>Dresden University of Technology</i>	417
Hydropneumatische Fahrwerksmodelle in der Gesamtfahrzeugsimulation von Nutzfahrzeugen <i>M. Kremb, C. Schindler, C. Scholler</i> <i>University of Kaiserslautern</i>	427
Einsatz von FE-MKS gekoppelten Systemen zur Abschätzung der Lebensdauer von Stahlbaukomponenten an mobilen Arbeitsmaschinen <i>P. Bach, T. Däuwel</i> <i>VOLVO</i>	437

Electric-Electronic Architecture

Methodical Approach to the Analysis of On-Board Electrical System Architectures – Fundamental Research into the Future Provision of Electrical Energy in Commercial Vehicles <i>R. Oberfell, S. Gast, A. Schwarzhaupt, F. Gauterin</i> <i>Daimler/Karlsruhe Institute of Technology</i>	447
Architecture-centric configuration management – Controlling the evolution of large software systems <i>M. Anastasopoulos, T. Keuler, A. Silva, S. Wanisch, M. Höb</i> <i>Fraunhofer IESE/John Deere</i>	458
Entwicklung eines CAN-Bus basierten Bedien- und Steuerkonzepts für die Arbeitshydraulik eines selbstfahrenden Futtermischwagens <i>J. Michaelis, B. Johanning, M. Kreyenhagen</i> <i>FH Osnabrück</i>	470
A Case Study towards Evaluation of Redundant Multi-Sensor Data Fusion <i>S. Blank, T. Föhst, K. Berns</i> <i>University of Kaiserslautern</i>	475

Functional Safety

Management der funktionalen Sicherheit einer Entwicklung eines sicherheitskritischen Systems im Bereich Nutzfahrzeuge <i>D. Goldbach</i> <i>EDAG</i>	487
Risk-based Testing of Automotive Systems by Applying Model-based Approaches <i>R. Eschbach, J.H Poore, T. Bauer, J. Kloos</i> <i>Fraunhofer IESE/University of Tennessee</i>	496
Model-based software development and functional safety – With focus on commercial vehicles <i>M. Götting</i> <i>ITK Engineering</i>	505
Kraftfahrzeugmechatronik als Bindeglied zwischen Bedienkomfort und Sicherheit – Realisierung eines automatisierten Schaltsystems im Nutzfahrzeug <i>K.-L. Krieger, S. Gast, C. Rustige</i> <i>Universität Bremen/Daimler</i>	515

Model-based Diagnosis

Online Condition Monitoring based on Real-Time System Simulation <i>L. Engelhardt, G. Bitsch, C. Schindler</i> <i>Fraunhofer ITWM/University of Kaiserslautern</i>	529
Improving pesticide spray application in vineyards by automated analysis of the foliage distribution pattern in the leaf wall <i>T. Braun, H. Koch, O. Strub, G. Zolynski, K. Berns</i> <i>University of Kaiserslautern/DLR Rheinhessen-Nahe-Hunsrück</i>	539
Modellbildung für eine Funktionsdiagnose auf Basis objektorientierter Modellierung <i>S. Gong, M. Kokes, S. Liu</i> <i>Daimler/University of Kaiserslautern</i>	549
Condition Monitoring System for Harvesting Machines <i>F. Beck, J.E. Lenz</i> <i>John Deere</i>	560

Requirement Analysis, Specification, and Automated Testing for Embedded Real-time Systems <i>J.M. Carter, J.H. Poore</i> <i>University of Tennessee</i>	567
Ein Beitrag zur Schädigungsmodellierung von Komponenten eines Nutzfahrzeugs <i>C. Prothmann, M. Kokes, S. Liu</i> <i>Daimler/University of Kaiserslautern</i>	578

Author Index
