

Conference:

Agricultural Engineering

2017

VDI-MEG

LAND-TECHNIK AgEng 2017
The Forum for Agricultural Engineering Innovations

Mit
USB-Stick

CONFERENCE

Agricultural Engineering

Conference:

Agricultural Engineering

Hannover 10. und 11. November 2017

2017

VDI-MEG

LAND ■ TECHNIK AgEng 2017
The Forum for Agricultural Engineering Innovations

Bibliographische Information der Deutschen Bibliothek

Die Deutsche Bibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliographie; detaillierte bibliographische Daten sind im Internet unter <http://dnb.ddb.de> abrufbar.

Bibliographic information published by the Deutsche Bibliothek

(German National Library)

The Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliographie (German National Bibliography); detailed bibliographic data is available via Internet at <http://dnb.ddb.de>.

© VDI Verlag GmbH · Düsseldorf 2017

Alle Rechte vorbehalten, auch das des Nachdruckes, der Wiedergabe (Photokopie, Mikrokopie), der Speicherung in Datenverarbeitungsanlagen und der Übersetzung, auszugsweise oder vollständig.

Der VDI-Bericht, der die Vorträge der Tagung enthält, erscheint als nichtredigierter Manuskriptdruck. Die einzelnen Beiträge geben die auf persönlichen Erkenntnissen beruhenden Ansichten und Erfahrungen der jeweiligen Vortragenden bzw. Autoren wieder.

Printed in Germany.

ISSN 0083-5560

ISBN 978-3-18-092300-0

VDI-Berichte 2300

Foreword

This book summarises the proceedings of the 75th conference “LAND.TECHNIK – AgEng 2017”, which took place in Hannover on November 10th and 11th following the tradition of odd years. Therefore it is a well established prelude to AGRITECHNICA, the world's most important fair for agricultural machinery, which started on November 12th with the preview days.

The conference was successfully organized in cooperation with the “Max Eyth Society for Agricultural Engineering” (VDI-MEG), a technical division of the Association of German Engineers (Verein Deutscher Ingenieure, VDI) and the European Society of Agricultural Engineers (EurAgEng). This collaboration has been accepted both by academia and industry at national and international levels. During recent years the number of participants has increased to about 1000 from more than 15 nations.

The conference offered 75 presentations about the latest innovations, machine developments, and technical concepts and methods as a foretaste of the firework of impressions at the AGRITECHNICA.

LAND.TECHNIK – AgEng is one of the most important events for the international community of agricultural engineers to discuss the possibilities of addressing future global challenges together. We hope that this book will stimulate the productive international dialog among decision-makers, developers, researchers and students to meet current and future challenges.



Prof. Dr.-Ing. Henning J. Meyer

Chairman of the Program Committee of the Conference LAND.TECHNIK – AgEng 2017



Claus Grøn Sørensen

President of European Society of Agricultural Engineers (EurAgEng)



Prof. Dr.-Ing. Peter Pickel

President of VDI Max Eyth Society for Agricultural Engineering (VDI-MEG)

Content

Page

Plenary Session

<i>K. T. Renius</i>	75 Conferences on Agricultural Engineering – a great Period of Innovations – Highlights of a Success Story	1
---------------------	--	---

Electric Drives

<i>W. Breu, B. Pichlmaier</i>	Electrified Utility Tractor	9
<i>J. Engström, O. Lagnelöf</i>	Battery electric autonomous agricultural machine – Simulation of all operations on a Swedish farm	15
<i>R. Bumberger, W. Klinger, D. Botev</i>	Electric traction drive on a plough – More power for the driveline	23
<i>R. Himmelsbach, B. Volpert, K. Grad</i>	Electrified Front-Wheel Drive Concepts for Tractors Designed for Improved Traction Functions	31

Decision Support and Documentation

<i>A. Johannes, M. Seitz</i>	Automatic plant disease diagnosis using mobile capture devices	39
<i>M. Schikora, M. Tempel</i>	Fully automated decision support for fungicide applications	61
<i>W. Maaß, I. Shcherbatyi, S. Marquardt, A. Kritzner, B. Moser</i>	Real-time Smart Farming Services – Yield optimization of potato harvesting	67
<i>J. Sonnen, J. Möller</i>	The Technical Concept of a Manufacturer-Independent Web-Based Data Exchange Platform for the Agricultural Sector	73

Automation Technologies

<i>J. Krzywinski</i>	Developing a User Interface for Controlling Swarm Technology	79
<i>C. Foster, J. Posselius, B. Lukac</i>	Autonomous Agricultural Machines – The Next Evolution in Farming	85
<i>H. Dietel</i>	High Voltage OnBoard Networks – The AEF Power Interface is ready to become an ISO standard	93

Combine Harvesters

<i>H. Vöcking, C. Heitmann, A. Wilken</i>	Automatic Adjustments of Combine Harvesters	99
<i>M. L. Bilde, T. T. Revsbeck</i>	Optimized material flow and cleaning capacity with new return pan system in a combine harvester	105
<i>B. Broholm, A. Morrison</i>	Combine Harvester Concave Adjustment System – Independent adjustment of the concave inlet and outlet clearance	111
<i>S. Pantke, C. Korn, T. Herlitzius, Th. Leonhardt, R. Zürn</i>	Concept for Weed Seed Separation in Combine Harvesters	117

Tractor Systems and Components

<i>F. Haussmann, R. Obermeier- Hartmann</i>	The CLAAS AXION 900 TERRA TRAC Product Range – Benefits of the CLAAS Axion 900 halftrack tractor concept equipped with CLAAS Big Driver Terra Trac	127
<i>S. Krieger, E. Schnur, M. M. Brenninger</i>	The Potential of CVTs in Tracked Tractors around 400 hp	135
<i>C. Ehlert, L. Erger</i>	Development of an Intelligent Stretch Brake System	143

Data Management and Simulation Concepts

<i>J. Schroeter, W. Angermair, S. Pauli</i>	Real-time View and Documentation of Manufacturer Independent Machine Data	149
<i>J. Redenius, M. Dingwerth, A. Ruckelshausen, J. Hertzberg, T. Krause, B. Kettelhoit</i>	A multilevel simulation framework for highly automated harvest processes enabled by environmental sensor systems	157
<i>B. E. Craker, R. A. Ferreyra, C. Graumans, U. Kaempf, M. Nachtmann, S. T. Rhea, F. Schuster, J. A. Wilson</i>	Reference Data and Collaborative Identifier Sharing in Agricultural Field Operations	165

Efficiency of Drives

<i>C. Geiger, M. Geimer</i>	Efficiency Optimisation of a Forestry Crane by Implement Hydraulics with Energy Recovery	175
<i>L. Meyer, P. Noyer</i>	Holistic Tractor Setup and Optimization System – CLAAS Electronic Machine Optimization for the Tractor	185
<i>T. H. Langer</i>	Model-in-the-Loop Tuning of Hitch Control Systems of Agricultural Tractors	191

Grain Process Simulation

<i>C. Korn, T. Herlitzius</i>	Coupled CFD-DEM simulation of separation process in combine harvester cleaning devices	199
<i>Á. Kovács, I. J. Jóri, G. Kerényi</i>	A new discrete element model (DEM) for maize	211
<i>F. Peters, H. Korte, R. Bölling</i>	Modelling method for analyzing grain harvesting concepts	219

	Page
CO₂ Emissions	
<i>B. Köber-Fleck, P. Ahlbrand, S. Böttinger, H. Korte</i>	Telematics and Big Data Analytics – An Effective Way to Quantify Fuel Saving Potentials – A Proof of Concept by the Joint Research Project EKOtech 227
<i>J. Schwehn, S. Häberle, S. Böttinger</i>	Development of energy requirements of tractors and implements 237
<i>A. Meiners, S. Häberle, S. Böttinger</i>	Advancement of the Hohenheim Tractor Model – Adaption on current demands 245
Vehicle Dynamics	
<i>J. Karner, C. Danner, A. Kerschbaumer, H. Prankl</i>	Definition of a test method to evaluate vibrations acting on a tractor driver 255
<i>A. Bürger, S. Böttinger</i>	Driving comfort analysis of an agricultural tractor with the Hohenheim Tyre Model on complex tracks 263
<i>B. Jung, B. Miller, T. Herlitzius</i>	Control concepts for ride comfort improvements of harvesting machines with large headers 273
<i>M. Sieting, J. Krüger, H. J. Meyer</i>	Evaluation of a Suspension Concept of a Hydropneumatic Full Suspended Tractor with Focus on the Dynamics in Combination with Implements 281
Drives	
<i>C. Körtgen, G. Morandi, G. Jacobs, A. Kramer</i>	Efficient development by automatic calibration of tractor transmission control units 291
<i>K. Ritters, P. Winkelhahn, L. Frerichs, B. Kriebel</i>	Determining saving potentials in a tractor drivetrain using a simulation model and measured operating data 297

	Page
<i>D. Engelmann,</i> <i>M. R. Unger,</i> <i>M. Geimer</i>	Testing and Benchmarking a Powertrain with Independent Wheel Control for Heavy Machinery 303
<i>F. Hantschack,</i> <i>R. Rahmfeld,</i> <i>J. Bagusch,</i> <i>A. Meyer,</i> <i>E. Dohm</i>	Development of a high performance continuously variable drive for mobile agricultural and construction machinery 315

Automation in Seeding Systems

<i>S. Meyer</i> <i>zu Hoberge,</i> <i>M. Liebich,</i> <i>P. Martella</i>	Counting seeds in air seeders 323
<i>G. M. Sharipov,</i> <i>D. S. Paraforos,</i> <i>H. W. Griepentrog,</i> <i>C. Gall</i>	Defining the dynamic performance of a no-till seeder by measuring the geo-referenced seeding depth 329
<i>A. Yatskul,</i> <i>J.-P. Lemièr</i>	Reasons of irregularity of seed's distribution in the divider heads of air-seeders 337
<i>A. Sharda,</i> <i>R. Strasser,</i> <i>M. Rothmund</i>	Development and Utilization of a Planter Automatic Downforce Evaluation Test Stand to quantify System Response and Accuracy 345

Technologies for Renewable Energy

<i>P. Hannukainen,</i> <i>R. Åman</i>	Biomethane as tractor fuel – Opportunities for customer, manufacturer or climate 355
<i>K. J. Shinnars,</i> <i>J. C. Friede,</i> <i>J. R. McAfee,</i> <i>D. E. Flick,</i> <i>N. C. Lacy,</i> <i>C. M. Nigon</i>	Conventional and Novel, New Approaches to Creating High-Density Biomass Bales 367

		Page
<i>K. Lüpping</i>	New Techniques for Mobile Pelletisation	375
<i>R. Pecenka, D. Ehlert, T. Hoffmann</i>	Field performance of a novel mower-chipper for the harvest of short rotation coppices	383

Tractor Tests and Emissions

<i>J. Ettl, H. Bernhardt, K. Thuneke, E. Remmele, P. Emberger, G. Huber</i>	Real driving emissions of tractors during field work and on the test stand	391
<i>W. Stark, C. Pieke</i>	Efficiency Optimization by Using "Vehicle in the Loop" Test Methodology	399
<i>K. Szalay, L. Kovács, G. Bércesi, I. Oldal, E. Piron, J. Charlat, T. Joly, C. Poncet, F. Tran</i>	Agricultural Tire Energy Efficiency test method and dedicated equipment to measure the fuel consumption and traction of agricultural tires under real field conditions	407
<i>J. Mengele</i>	Field test validation as part of the development of a narrow track tractor	417

Traction

<i>M. Peeters, V. Kloster, T. Fedde, L. Frerichs</i>	Integrated wheel load measurement for tractors	423
<i>J. Wieckhorst, T. Fedde, L. Frerichs</i>	A Traction Field Test – Real Time Tire Soil Parameters of a Tractor in Tillage Applications	431

		Page
<i>C. Birkmann,</i> <i>T. Fedde,</i> <i>L. Frerichs</i>	Influence of the Drive Train and Chassis on Power Shift Operations in Standard Tractors	439
<i>P. Vervaeet,</i> <i>M. Gandillet</i>	'2 in 1 tire' technology to allow maximal efficiency of the transmission chain in both road and field usage	447

Communication and Information Technologies

<i>M. Rothmund,</i> <i>S. Villwock,</i> <i>P. Pollinger</i>	Redundant Communication in Daisy Chains for Improved Diagnostics and System Reliability in Seeders and Planters	453
<i>T. Oksanen</i>	Extending ISO 11783 for four wheel steering and implement steering	461
<i>G. Happich,</i> <i>H. J. Nissen</i>	ISOBUS Automation – On the Road to TIM – How to secure liability for open TIM systems	469
<i>N. Schlingmann,</i> <i>H. Schallermayer,</i> <i>J. Witte,</i> <i>C. Gossard</i>	Challenges of digital revolution – How the AEF plans to manage interoperability	477

Harvesting Technologies

<i>D. Hermann,</i> <i>F. Schøler,</i> <i>M. L. Bilde,</i> <i>N. A. Andersen,</i> <i>O. Ravn</i>	Design of Laboratory Environment for Development of Cleaning System Automation	485
<i>J. Berberich,</i> <i>M. Huth,</i> <i>A. Feiffer,</i> <i>R. Tölle,</i> <i>U. Schmidt</i>	Online determination of hectolitre mass during threshing by analyzing air-filled pore volume in grain fills	491
<i>K. Wild,</i> <i>T. Schmiedel,</i> <i>D. Geißler,</i> <i>J. Rottmeier</i>	A hand-held measuring device for identifying the sharpness of knives in agricultural machinery	497
<i>D.-J. Stapel</i>	4-row potato harvester based on a mirrored product flow concept	505

Methods

<i>R. Schmetz</i>	Calculation of the losses in series-hybrid powertrains	513
<i>F. Balbach, E. Nacke, S. Böttinger</i>	Method for load-based evaluation of machines using the example of a tractor	521
<i>D. Hast, B. Rosenbaum</i>	Predict the unpredictable – Benefits and limits of machine data analytics and component health prediction	529

Information Systems

<i>K. Oetzel</i>	Tablet App to control safety critical functions on farming machines	537
<i>M. K. Sørensen, M. Beyer, O. Jensen, O. N. Bakharev, N. C. Nielsen, T. Nyord</i>	On-line monitoring of nutrients (NPK) in liquid manure by a nuclear magnetic resonance (NMR) sensor installed at a slurry spreader	545
<i>P. Hloben, J. C. Rousseau, T. Bals, I. Hostens, P. Balsari, M. Röttele, S. Rutherford</i>	STEP-Water: Information Tool on Sprayer Technology for Water Protection – A way to support sustainable and socially acceptable chemical application	553

Tillage and Spraying

<i>P. Riegler-Nurscher, J. Karner, J. Huber, G. Moitzi, H. Wagentrisl, M. Hofinger, H. Prankl</i>	A system for online control of a rotary harrow using soil roughness detection based on stereo vision	559
---	--	-----

		Page
<i>M. Marsel,</i> <i>T. Bögel,</i> <i>T. Herlitzius,</i> <i>B. Neunkirchen,</i> <i>H. Eidam,</i> <i>T. Sander</i>	Development of a tillage-machine for seed-bed cultivation of heavy soils	567
<i>C. A. Shearer,</i> <i>J. D. Luck,</i> <i>J. T. Evans</i>	Development of a Sprayer Performance Diagnostic Tool for Better Management Practices of In-Field Spraying Operations	575

Data Management and Exchange

<i>T. Herlitzius,</i> <i>R. Hübner,</i> <i>A. Günther,</i> <i>C. Korn,</i> <i>S. Kirstein,</i> <i>S. Müller,</i> <i>J. Miunske</i>	Sensor study to identify process characteristics of crop and air flow in a combine harvester	583
<i>N. Butts,</i> <i>B. Schleusner,</i> <i>M. Bremer</i>	Material and Distribution Sensor (MADS) for Combine Material Flow – How to design and build a low-cost material sensor	591
<i>D. Hermann,</i> <i>F. Schøler,</i> <i>M. L. Bilde,</i> <i>N. A. Andersen,</i> <i>O. Ravn</i>	Computer based Control of the Separation Process in a Combine Harvester	599

