

3<sup>rd</sup> International Conference

# CVT in automotive Applications

Enabler for Propulsion System Efficiency

March 19 - 20, 2019, Baden-Baden, Germany

- Future Requirements on traditional CVTs and CVTs in electrified Concepts
- Optimisation Issues for Push Belts and Chains
- Solutions for better Friction Properties by Fluids
- Advanced CVT Simulation Approaches
- Concepts for eCVT, DH-CVT and CVT-based e-axle

+ **Factory Tour at Schaeffler in Buehl, Germany**

+ **Workshop „System Design for Advanced CVT“**

+ **Evening Event at the Kurhaus Baden-Baden**

Meet international Experts from:



**BOSCH**



**FEV**



**IDEMITSU**



**Jatco**



**SCHAEFFLER**



**TU/e** Eindhoven University of Technology

An event organized by VDI Wissensforum GmbH

[www.vdi-international.com/01K0923019](http://www.vdi-international.com/01K0923019)



14:00 - 17:00 Plant Tour - **Limited Places: separate registration required!**  
Plant tour at Schaeffler in Bühl - Visit the production of pulley sets

## Tuesday, March 19, 2019

## 1st day

07:30 Registration & welcome coffee

08:15 Welcome and opening address

### The future Role of CVT – from the OE's and Supplier's Point of View

**08:30 Evolution of CVTs and Technologies realizing them - 20 years History of NISSAN CVTs and Future**

- CVT evolution and T/M efficiency
- Measurement technology
- Transient condition and ultra-high accuracy

**Yoshikazu Ota, B.Sc.**, Development Manager, R&D, Powertrain and EV Advanced Engineering Department, co-author: Dr. Ryoza Hiraku, both Nissan Motor Co., Ltd., Japan

**09:10 CVT Challenges in the Electrification Age**

- Role of the transmission even as powertrain electrification proceeds
- Changes in transmission requirements due to the decrease in the drive ratio
- Enhancement of CVT performance to the highest possible levels for electric drive

**Kiyonari Yamamoto**, Vice President R&D, Jatco Ltd, Japan

09:50 ☕ Networking & coffee break

### Influences of Markets and International Regulations

**10:20 Global CO2 Regulation Outlook and its Impact on Powertrain and Electrification Opportunities**

- 2025 CO2 compliance forecast of Europe, China and US market
- Technology options and electrification enablers on credit mandate in key markets enabling CO2 target achievement for car manufacturer
- Regulatory economics: Cost to Comply, WLTP, RDE, Taxation, NEV Mandate, Battery production, Brexit, Trade etc.

**Vijay Subramanian**, Director - EMEA Powertrain forecasting and CO2 Compliance, Automotive Department, IHS Markit, United Kingdom

**11:00 Calibration Variations: Market depending Driving Strategies for CVT**

- CVT driving strategy variations and market depending acceptance enablers
- Optimilization of CVT's large spread in driving strategy approach

**Dipl.-Ing Ralph Fleuren**, Product Manager, FEV Europe GmbH, Germany

### Improving traditional CVT concepts

**11:40 GM's New CVT for Passenger Vehicle Applications**

- Variator System Development
- Binary Pump Development and integrated Auxiliary Pump
- Protection for Critical Maneuvers

**John R. Maten, M.Sc.**, Assistant Chief Engineer, Automatic Transmissions, GM Global Propulsion Systems - Retired, USA

12:20 🍷 Lunch

### Challenges in Component Design: Actuation, Variator, Oils

**13:45 Twin-Drive Oil Pump - Mechanisms to increase CVT Power Density in Automotive Applications**

**Oscar Sarmiento**, Head of Engineering Japan, Global Head Advanced Development Systems & Innovation, BU Transmission, Powertrain, Continental, Japan

**14:25 The Pushbelt, designed for Change**

- A new generation single and double loopset belts
- Developments in efficiency, torque capacity, size and weight
- Supporting process developments

**Ir. Francis van der Sluis**, Senior Expert, Advanced Engineering, co-author: Ir. Pim Spiekermann, both Bosch Transmission Technology B.V., The Netherlands

**15:05 How the CVT Chain meets the Requirements of the future Market**

- Deep understanding of load by simulation
- Effect of pulley angle on load and required space
- Compact variator with very narrow chain (19 mm width)

**Dipl. Ing. André Teubert**, Development CVT / Senior Manager CVT Design, LuK GmbH & Co. KG, Germany

15:45 ☕ Networking & coffee break

**16:15 Contribution Ratio of compressive Forces on Rocker Pins for Chain Belt of continuously variable Transmission at Steady State**

- Clarification of mechanism of belt behaviour for chain type CVT
- Measurement of compressive force on rocker pins
- Behaviour of chain belt in pulley groove
- Contribution ratio of compressive force on two rocker pins

**Shun Hattori**, Department of Mechanical Engineering, co-authors: Professor Kazuya Okubo, Kiyotaka Obunai, Associate professor, all Doshisha University, Japan

**16:55 CVT fluids developments: Past 20 years and Future**

- Metal to metal friction
- Low viscosity
- Electrification

**Dr. Yasuhiro Murakami**, Senior Global OEM Relationship Manager, co-authors: Makoto Maeda, Prof. Yoshie Arakawa, Jatco LTD, Dr. Ramnath Iyer, all Afton Chemical Japan Corporation, Japan

## 17:35 Development of Chain type CVT Fluid

- Design concept and compatibility with seizure resistance and friction property
- Mechanism of high friction coefficient expression
- NVH measurement method

**Toshiaki Iwai**, Team Leader, Drive Train Lubricants Group, Lubricants Research Laboratory, co-author: Keiich Narita, PhD, both Idemitsu Kosan Co., Ltd., Japan

18:15 End of conference day one

## 19:00 Get-together

At the end of the first conference day we kindly invite you to use the relaxed and informal atmosphere for in-depth conversations with other participants and speakers.

# Wednesday, March 20, 2019

## 2nd day

08:30 Opening of conference day two

## 08:35 CVT close to a turning Point?

- Electrification trend sets CVT market under pressure, analyzing the impact
- Concept comparison of E-CVT and CVT-Hybrid
- Prepare CVT for the electrified drivelines architectures

**Dipl.-Ing. (FH) Holger Ubben**, Vice President Product Line CVT, LuK GmbH & Co. KG, Germany

## CVT in Hybrid Concepts P0 - P4

## 09:15 Dedicated Hybrid CVT Variator

- Design concept and presentation
- Pushbelt variator for dedicated hybrids
- Direct pressure control

**Ing. Mattijs Tweehuysen**, Project Manager, R & D, Engineering Transmission services, Bosch Transmission technology B.V., The Netherlands

## 09:55 Ford's New HF45 Power-Split Transaxle

- Design of a new FWD eCVT transmission
- Sub-systems & components of this new eCVT transmission
- Attributes of this eCVT trans

**Gregory Gardner**, Chief engineer of Transmission & Driveline Engineering, Ford Motor Company, USA

10:35  Networking & coffee break

## CVT Concepts for full electrified Vehicles

## 11:00 Variable Drive EV: Comfort Solution for full electric Vehicles

- Downsizing potential of the electrical machine
- Key technologies in Continuously Variable Driveline for EV
- System comparison between Variable Drivelines (CVTs) for EV and 1- and 2-speed transmissions

**Ingmar Hupkes, M.Sc.**, Project Leader, Engineering Transmissions, Bosch Transmission Technology B.V., The Netherlands

## 11:40 Chain CVT Highlights for new energy Vehicles

- Implementation of a CVT into an E-axle
- Impact of a CVT-based E-axle on the electric drive system
- Comparison of single speed and CVT-based E-Axle

**Dr. Christian Lauinger**, Advanced Development CVT / Senior Manager, co-authors: Dipl.-Ing. (FH) Bernhard Walter, Dipl.-Ing. Emmanuel Simon, Marcel Adrian, M.Sc., all LuK GmbH & Co. KG, Germany

12:20  Lunch

## Simulation and Testing in the Engineering Process

## 14:00 Advanced Simulation Approach for dynamic Behavior of Chain Type CVT

- Dynamic analysis for chain type CVT
- Introducing new contact algorithm between chain and pulley
- Applying new method in design stage of CVT development

**Youngsu Lee**, Senior Research Engineer, Engineering Analysis Technology Development Center, co-authors: Changhyun Kim, both JATCO Korea Engineering Corp., Dr. Chulho Lee, VirtualMotion, Inc, all: Korea

## 14:40 Smart Validation of a CVT Simulation Model

- Systematic validation of a CVT simulation model at component level with an adapted CVT system tribometer
- Derivation of suitable test runs in order to cover typical slipping spectrum
- Future goals for CVT development: increasing system safety and energy efficiency for electrified and autonomous driving application

**Dipl. Ing. Katharina Bause**, Head of Research Department of Drive Systems, Clutches and Tribology Systems, co-authors: Dipl.-Ing. Sascha Ott, Univ.-Prof. Dr.-Ing. Dr.h.c. Albert Albers, all IPEK - Institute of Product Engineering, KIT - Karlsruhe Institute of Technology, Germany

## 15:20 Methodology of Pulley Surface Wear Prediction of Chain Type CVT

- Estimated pulley surface wear by the formulae
- Evaluation of dynamic behavior in CVT by integration analysis of FEM and multi body dynamics
- Measurement of pulley surface wear before and after test

**Yoshiyuki Yomogida**, Engineer, CAE Department, co-authors: Yuusaku Ishii, Hiroko Aoki, Shougo Ookawara, all Subaru Corporation, Japan

## 16:00 Conclusion & closing remarks

## 16:15 End of the conference

# International VDI Workshop - System design for advanced CVTs

## Workshop Chair:

Dr. Theo Hofman, Associate Professor, Eindhoven University of Technology,  
Eindhoven, The Netherlands

## Date and Venue:

March 18, 2019  
Baden-Baden/Germany

## Time:

10:00 - 16:00

## Co-Speaker:

Marius Zuurbier, M.Sc., Eindhoven University of Technology  
Caiyang. Wei, M.Sc., Eindhoven University of Technology  
Chyannie Amarillio Fahdzyana, M.Sc., Eindhoven University of Technology  
Robert Verscheijden, B.Eng., Bosch Transmission Technology B.V., Tilburg

## Content:

The workshop will focus on understanding the concept of an integrated design approach for (strong) electrified powertrains from system level to component level.

Design processes are often based on sequential and iterative design steps, whereby for example, firstly, the transmission technology and, accordingly, the control system is optimized. For active dynamical systems with a strong mathematical coupling between the plant and the controller more iterations are required to improve optimality. However, in practice due to time and budget constraints finding an optimum can be compromised or may lead to costly redesigns more late in the design process.

In the workshop, a selection of aspects of an integrated design approach will be discussed. This starts at transmission level with the basic CVT concept, control design for drivability and its effects on actuator design in an iterative process. Followed by, a nested integrated design approach of the variator, actuator and control design, whereby a variator design analysis model is implemented and optimality is further enhanced. Moving towards the powertrain system level, the electric machine design and its effects on transmission design is discussed; and, finally, the integrated thermal and energy management design for a CVT-based hybrid powertrain is presented. We will look at the understanding the interfaces at the plant and control design and the effects of optimization frameworks. The workshop is of interest to any who has to deal with the challenging system design engineering aspects of future electrified powertrains.

## Supporting Experts

---

Univ.-Prof. Dr.-Ing. Dr. h.c. Albert Albers, Karlsruhe Institute of Technology,  
Germany

Dipl.-Ing. Dipl.-Wirtsch.-Ing. Andreas Englisch, LuK GmbH & Co. KG, Germany

Hong Jiang, Ford Motor Company, USA

John R. Maten, GIM Global Propulsion Systems - Retired, USA

Dr. Yasuhiro Murakami, Afton Chemical Japan Corporation, Japan

Shigeo Murata, Nissan Motor Co. Ltd., Japan

Tatsuya Osone, JATCO Ltd., Japan

Takashi Shibayama, SHIN NIPPON TOKKI CO. LTD, Japan

Han-Hein Spit M.Sc., Bosch Transmission Technology B.V., The Netherlands

## Sponsoring Partner

---



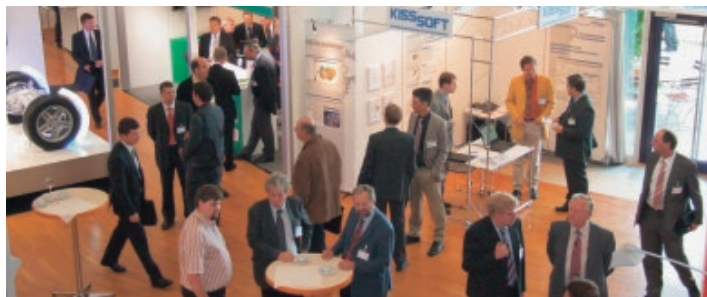
## Exhibition / Sponsoring

### Exhibition / Sponsoring

If you want to meet with and reach out to the first-rate experts attending this VDI conference and to powerfully present your products and services to the well-informed community of conference participants, please contact:

#### Christoph Brockerhoff

Project Consultant  
Exhibitions & Sponsoring  
Phone: +49 211 6214-228  
Fax: +49 211 6214-97228  
Email: brockerhoff@vdi.de



## Become a speaker

Become a speaker at our international VDI Automotive Conferences. Make yourself known in the industry and discuss best practice examples with other international experts. We are looking for speakers on: ADAS and AD Innovative Sensor Technologies, Sensor Data Processing & AI, Additive Manufacturing and Simulation in Automotive Lightweight Engineering.

Please submit your topic to:

#### Leonie Bohnstedt

Product Manager  
International Business Development  
Phone: +49 211 6214-461  
Email: bohnstedt@vdi.de

# Registration

## Terms and Conditions

**Registrations:** Registrations for conference attendance must be made in writing. Confirmation of your registration and the associated invoice will be mailed to you. Please do not pay your conference attendance fee until you have received our invoice and its invoice number to be stated for transfer. German VAT directives apply. Please state your VAT-ID with your registration.

### Conference venue

Kongresshaus Baden-Baden  
Augustaplatz 10  
76530 Baden-Baden, Germany  
www.kongresshaus.de



You will find more hotels  
close to the venue at  
[www.vdi-wissensforum.de/hr](http://www.vdi-wissensforum.de/hr)

### Hotel room reservation:

Various hotels in Baden-Baden – all centrally located – have room blocks at reduced rates for participants.

The complete list of hotels can be found on the event home page at <http://veranstaltungen.baden-baden.de/vdicvt19>.

Conference participants may book rooms either online or directly at Baden-Baden Kur & Tourismus GmbH.

For any further information please contact as follows:

Baden-Baden Kur und Tourismus GmbH  
Conventions & Events Team  
Tel.: +49 7221 275-271  
E-Mail: [sales@baden-baden.com](mailto:sales@baden-baden.com)

**VDI Wissensforum service package:** The conference package includes the conference documents (online), beverages during breaks, lunch and the get-together on March 19, 2019.

**Conference attendance conditions and terms:** By way of your registration you accept the conference attendance conditions and terms of VDI Wissensforum GmbH as binding. Any cancellation of your registration must be made in writing. We will charge you only an administrative fee of € 50.00 plus Dutch VAT if you cancel your registration earlier than 14 days ahead of the conference date. Any cancellation that reaches us after this deadline will entail the conference attendance fee as stated in our invoice to be charged in full. The date of the post office stamp of your written cancellation will be the decisive criterion. In that case, we will gladly mail you the conference documents on request. Subject to agreement, you may name a substitute participant. Individual parts and sections of conferences and seminars cannot be booked. You will be informed without delay if an event has to be cancelled for unforeseeable reasons. In that instance, you will be entitled only to a refund of your conference attendance fee if already paid. We reserve the right to exchange speakers and/or change the program sequence in exceptional cases. In any case, the liability of VDI Wissensforum GmbH is restricted exclusively to the conference attendance fee.

**Data protection:** VDI Wissensforum GmbH captures and processes the address data of conference participants for their own corporate advertising purposes, enabling renowned companies and institutes to reach out to participants by way of information and offers within their own marketing activities. We have outsourced in part the technical implementation of data processing to external service providers. If you do not want to receive any information and offers in the future, you may contradict the use of your personal data by us or any third parties for advertising purposes. In that case, kindly notify us of your contradiction by using the email [wissensforum@vdi.de](mailto:wissensforum@vdi.de) or any other of the contact options mentioned.

3rd International Conference

CVT in automotive Applications



Register online!

[www.vdi-international.com/01K0923019](http://www.vdi-international.com/01K0923019)



VDI Wissensforum GmbH | VDI-Platz 1 | 40468 Düsseldorf | Germany

VDI Wissensforum GmbH  
P.O. Box 10 11 39  
40002 Düsseldorf, Germany  
Phone: +49 211 6214-201  
Fax: +49 211 6214-154  
Email: [wissensforum@vdi.de](mailto:wissensforum@vdi.de)  
[www.vdi-international.com/01K0923019](http://www.vdi-international.com/01K0923019)

Yes, I will participate as follows:

☐ **Participation Fee + VAT**  
☐ **VDI Conference 19.-20.03.2019**  
(01K0923019) **€ 1790**

and/or

☐ **Workshop 18.03.2019**  
(01ST923001) **€ 950**

and/or

**Package Price** (Please tick the boxes)  
☐ (Conference + 1 Workshop) **€ 2460**

☐ **Plant Tour at Schaeffler in Buehl 18.03.2019 – € 50 Preis + VAT** (registration is necessary – limited places, only possible in connection with the conference registration)

☐ I am interested in sponsoring and/or exhibition

☐ Participation Fee VDI-Members\* Save 50 € for each Conference Day.

\* For the price category 2, please state your VDI membership number  
VDI membership no.

Title

First Name

Last Name (Family Name)

Company/Institute

VAT-ID

Department

Street

ZIP Code, City, Country

Phone

Fax

Email

Please state your invoice address if this differs from the address given

Participants with an invoice address outside of Austria,  
Germany and Switzerland are kindly requested to pay by  
credit card:

☐ Visa

☐ Mastercard

☐ American Express

Card holder

Cardno.

Valid until (MM/YYYY)

Security Code

Date

x Your Signature