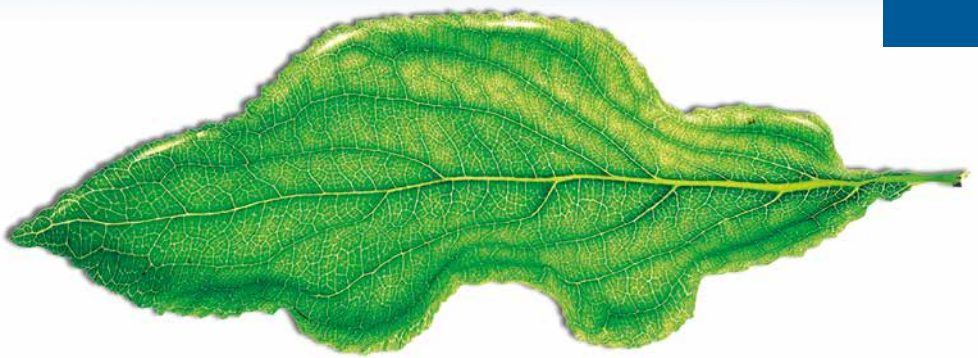
AVL



MOTOR & UMWELT – ENGINE & ENVIRONMENT

The Trend Conference in Graz

FROM NOW ON IN JUNE!

Again with high ranking speakers.

Program

Engine and Transmission between the Poles 12 – 48 – 96 – 400 – 800 Volt?

27th International AVL Conference "Engine & Environment"
11th - 12th June, 2015, Helmut-List-Halle, Graz, Austria

Scan the QR Code to access the Engine & Environment Mobile App.

FOREWORD

The electrification of the powertrain – in the form of hybrid or all-electric drive systems – is picking up pace all over the world. Different solutions are being proposed and pursued, each having their own benefits and drawbacks. An overwhelming preference for one of these architectures has not yet emerged. The same is true for the choice of voltage. There are as many arguments in favor of low voltage systems as there are for high voltage systems, with levels ranging from 12 volts to 800 volts.

During our conference, top international experts will be discussing the advantages and disadvantages of the different concepts and the interaction between engine and transmission. Aside from the technical sessions, as has become tradition with "Engine & Environment," attendees will be given ample opportunity to meet, socialize and exchange ideas at the high-level panel discussion and the social events.

We look forward to welcoming you at the conference.

Prof. Dr. h.c. Helmut List
Chairman and CEO
AVL List GmbH

Dr. Robert Fischer
Executive Vice President, Engineering and Technology
Powertrain Systems , AVL List GmbH

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Please see attachment for registration and hotel reservation.

GENERAL INFORMATION

Conference Office: AVL List GmbH, Hans-List-Platz 1, A-8020 Graz, Tel.: +43 (316) 787 927, Telefax: +43 (316) 231123 4490, E-Mail: event@avl.com

Conference Venue: Helmut-List-Halle, Waagner-Biro-Straße 98a, A-8020 Graz

Registration: In the Helmut-List-Halle on Thursday, 11th June, 2015

Conference Fee: € 1.190,- plus 20 % tax, Students € 110,- plus 20 % tax, Free of charge for members of the press. Fees include proceedings, 2 lunches and snacks, social evening events.

Conference Languages: German and English (simultaneous interpretation)

Conference Documents: An order form for additional conference documents is attached. Additional conference documents are also available at the registration desk (price: € 140,- plus 10 % tax)

Hotel Reservation: Please see the reservation form attached

Arrival: By plane: Graz-Thalerhof, by train: Graz Main Station, by car: see map of Graz (page 11)

Evening Program:
AVL Test Track in Gratkorn: 10th June, 3:00 p.m. with Welcome Reception at 7:00 p.m.
Social Evening: 11th June, 7:30 p.m. at the "Soap Factory", Graz

Partners' Program:
11th June: Cooking Class
12th June: Sightseeing Tour - Eggenberg Palace

PRESENTING AUTHORS

CONFERENCE AND SESSION CHAIRMAN

Dr. Robert Fischer, Executive Vice President Engineering and Technology Powertrain Systems, AVL List GmbH

Prof. Dr. h.c. Helmut List, CEO AVL List GmbH
Siegfried Nagl, Mayor of the City of Graz
Franz Voves, Governor of the province of Styria
Dr. Nikolai Ardey, Vice President Design and Integration Powertrain, BMW AG München
Dr. Thierry Baritaud, Direzione Gestione Sportiva - Head of Energy Recovery and Advanced Systems, Ferrari S.p.A.
Otmar Bitsche, Head of E-Mobility, Dr. Ing. h.c. F. Porsche AG
Christian Bock, General Manager Project Management Powertrain Grand Series, BMW AG München
Dr. Olivier Coppin, Powertrain Systems Innovation and System Engineering Director, Valeo
Dr. Stefan Kampmann, Executive Vice President Engineering, Gasoline Systems Division, Robert Bosch GmbH
Dr. Stefan Kilian, Senior Manager Product Line Hybrid, Transmissions, Business Unit Automatic Transmissions, Division Car Powertrain Technology, ZF Friedrichshafen AG
Gerald Killmann, Vice President R&D2, Toyota Motor Europe
Dr. Klaus Friedrich Küpper, Executive Chief Engineer Systems, Software and Vehicle, AVL List GmbH
Dr. Bernd Mahr, Executive Vice President of Hybrid Electric Vehicle Business Unit, Continental AG
Dr. Corrado Nizzola, Senior manager Hybrid, eDrive & electrical Motor - Advanced Engineering, Daimler AG
Thomas Pfund, Director Systems Engineering, Schaeffler R&D Automotive, LuK GmbH & Co. KG
Alain Raposo, Alliance Powertrain & EV Engineering Global VP, Alliance Renault - Nissan
Gary Reid, Senior Manager - Small Engines, Jaguar Land Rover
MS, MbA Peter J. Savagian, General Director Electrification Engineering, General Motors Powertrain
Dr. Michael Stapelbroek, Department Manager Hybrid & E-Mobility, FEV GmbH
Dr. Michael Winkler, Head of Powertrain, Hyundai Motor Europe Technical Center GmbH

CHAIRMEN

Dr. Robert Fischer, AVL List GmbH
Prof. Dr. Helmut Eichlseder, University of Technology Graz
Prof. Dr. Michael Bargende, Research Institute of Automotive Engineering and Vehicle Engines Stuttgart
Prof. Dr. Ferit Küçükay, University of Technology Braunschweig
Prof. Dr. Hans Peter Lenz, Austrian Society of Automotive Engineers

PANEL DISCUSSION

Moderator: Ulrich Walter M.A.
Members (in alphabetical order):
Dr. Nikolai Ardey, Vice President Design and Integration Powertrain, BMW AG München
Otmar Bitsche, Head of E-Mobility, Dr. Ing. h.c. F. Porsche AG
Dr. Robert Fischer, Executive Vice President Engineering and Technology Powertrain Systems, AVL List GmbH
Dr. Stefan Kampmann, Executive Vice President Engineering, Gasoline Systems Division, Robert Bosch GmbH
Gerald Killmann, Vice President R&D2, Toyota Motor Europe
Dr. Bernd Mahr, Executive Vice President of Hybrid Electric Vehicle Business Unit, Continental AG
MS, MbA Peter J. Savagian, General Director Electrification Engineering, General Motors Powertrain

CONFERENCE PROGRAM – WEDNESDAY, JUNE 10TH, 2015

15:00	**Welcome Reception** at the AVL Test Track in Gratkorn at the invitation of Provincial Governor Franz Voves, test drive start 15:00, opening address 19:00

CONFERENCE PROGRAM – THURSDAY, JUNE 11TH, 2015

Conference and Session Chairman: Dr. Robert Fischer, AVL List GmbH

09:00-09:10	**Welcome Address** Prof. Dr. h.c. Helmut List, Chairman and CEO, AVL List GmbH
09:10-09:20	**Welcome** Siegfried Nagl, Mayor of the City of Graz
09:20-09:30	**Opening of the Conference** Franz Voves, Governor of the province of Styria
09:30-10:00	**To support global warming improvement, how CO_2 regulations and next generation of batteries will change automotive power source by 2020 and after.** Alain Raposo, Alliance Powertrain & EV Engineering Global VP, Alliance Renault - Nissan
10:00-10:30	**Toyota Hybrid System – high voltage in high volume production** Gerald Killmann, Vice President R&D2, Toyota Motor Europe
10:30-11:15	**Coffee Break**
11:15-11:45	**Enabling Electrification** MS, MbA Peter J. Savagian, General Director Electrification Engineering, General Motors Powertrain
11:45-12:15	**Powertrain 2020+ - Driving Pleasure @ << 100 g CO_2/km** Dr. Nikolai Ardey, Vice President Design and Integration Powertrain, BMW AG München
12:15-14:00	**Lunch**

CONFERENCE PROGRAM – THURSDAY, JUNE 11TH, 2015

Chairman: Prof. Dr. Helmut Eichlseder, University of Technology Graz

14:00-14:30	**Electrical Power Networks for Future High Performance Vehicles** Otmar Bitsche, Head of E-Mobility, Dr. Ing. h.c. F. Porsche AG
14:30-15:00	**Can 48 V bridge the gap between 12 V and 800 V?** Dr. Michael Winkler, Head of Powertrain, Hyundai Motor Europe Technical Center GmbH
15:00-15:30	**48 V Hybrid – Fitting concept for all markets?** Dr. Michael Stapelbroek, Department Manager Hybrid & E-Mobility, FEV GmbH
15:30-16:15	**Coffee Break**

Chairman: Prof. Dr. Michael Bargende, Research Institute of Automotive Engineering and Vehicle Engines Stuttgart

16:15-16:45	**Efficient Powertrain Solutions for 12 V up to 800 V** Dr. Klaus Friedrich Küpper, Executive Chief Engineer Systems, Software and Vehicle, AVL List GmbH
16:45-17:15	**Future powertrain architecture from 12 V up to 400 V** Dr. Corrado Nizzola, Senior manager Hybrid, eDrive & electrical Motor - Advanced Engineering, Daimler AG
17:15-17:45	**Hybridization of F1 race powertrain** Dr. Thierry Baritaud, Direzione Gestione Sportiva – Head of Energy Recovery and Advanced Systems, Ferrari S.p.A.
19:30	**AVL Social Evening at the "Soap Factory"** Aperitifs at the Invitation of the Mayor of Graz Siegfried Nagl

CONFERENCE PROGRAM – FRIDAY, JUNE 12TH, 2015

Chairman: Prof. Dr. Ferit Küçükay, University of Technology, Braunschweig

09:00-09:30	**Ingenium - The New Diesel Engine from Jaguar Land Rover** Gary Reid, Senior Manager - Small Engines, Jaguar Land Rover
09:30-10:00	**The New X5 with Plug-in Hybrid: The best of both worlds for the SAV-Segment** Christian Bock, General Manager Project Management Powertrain Grand Series, BMW AG München
10:00-10:30	**From 12V+12V to 48V: a new road map for hybridization** Dr. Olivier Coppin, Powertrain Systems Innovation and System Engineering Director, Valeo
10:30-11:15	**Coffee Break**
11:15-11:45	**48V, HV – Schaeffler view of drive train electrification** Thomas Pfund, Director Systems Engineering, Schaeffler R&D Automotive, LuK GmbH & Co. KG
11:45-12:15	**The Future of Hybrid lies in the Transmission: 8-Speed PHEV Kit from ZF** Dr. Stefan Kilian, Senior Manager Product Line Hybrid Transmissions Business Unit Automatic Transmissions Division Car Powertrain Technology, ZF Friedrichshafen AG
12:15-13:30	**Lunch**

CONFERENCE PROGRAM – FRIDAY, JUNE 12TH, 2015

Chairman: Prof. Dr. Hans Peter Lenz, Austrian Society of Automotive Engineers

13:30–14:00	**1 + 1 > 2: The Electrical Powertrain** Dr. Stefan Kampmann, Executive Vice President Engineering, Gasoline Systems Division, Robert Bosch GmbH
14:00-14:30	**Quo Vadis Hybrid System** Dr. Bernd Mahr, Executive Vice President of Hybrid Electric Vehicle Business Unit, Continental AG
14:30-15:00	**Coffee Break**
15:00-16:15	**Panel Discussion** Moderator: Ulrich Walter M.A. Members (in alphabetical order): Dr. Nikolai Ardey, Vice President Design and Integration Powertrain, BMW AG München Otmar Bitsche, Head of E-Mobility, Dr. Ing. h.c. F. Porsche AG Dr. Robert Fischer, Executive Vice President Engineering and Technology Powertrain Systems, AVL List GmbH Dr. Stefan Kampmann, Executive Vice President Engineering, Gasoline Systems Division, Robert Bosch GmbH Gerald Killmann, Vice President R&D2, Toyota Motor Europe Dr. Bernd Mahr, Executive Vice President of Hybrid Electric Vehicle Business Unit, Continental AG MS, MbA Peter J. Savagian, General Director Electrification Engineering, General Motors Powertrain
16:15-16:30	**Closing Remarks** Dr. Robert Fischer, Conference Chairman, AVL List GmbH

THE PLEASURES OF GRAZ

Graz is indeed a striking beauty, to the point of rendering one sleepless. Self-confidently, the city presents itself both with new, fascinating landmarks and historic monuments, among them entire districts such as the Old City centre, honored and protected as a UNESCO World Cultural Heritage Site or the designation City of Design.

The city's 'lifeline' is the broad river Mur, providing a relaxed atmosphere to the rhythm of flowing water. But Graz is above all a melting pot of cultures. For centuries, musicians, writers, architects and designers have set the tone in this, the European Cultural Capital 2003.

So how do you go about exploring this impressive cultural heritage site? The answer is simply 'at your leisure'. Most of its many sights are located within easy reach of elegant coffee houses, fine restaurants, colorful country markets and trendy bars. Graz can be discovered and rediscovered time and time again. A noble flair reigns, as in the arcaded courtyard of the Landhaushof, a masterpiece of the Italian Renaissance.

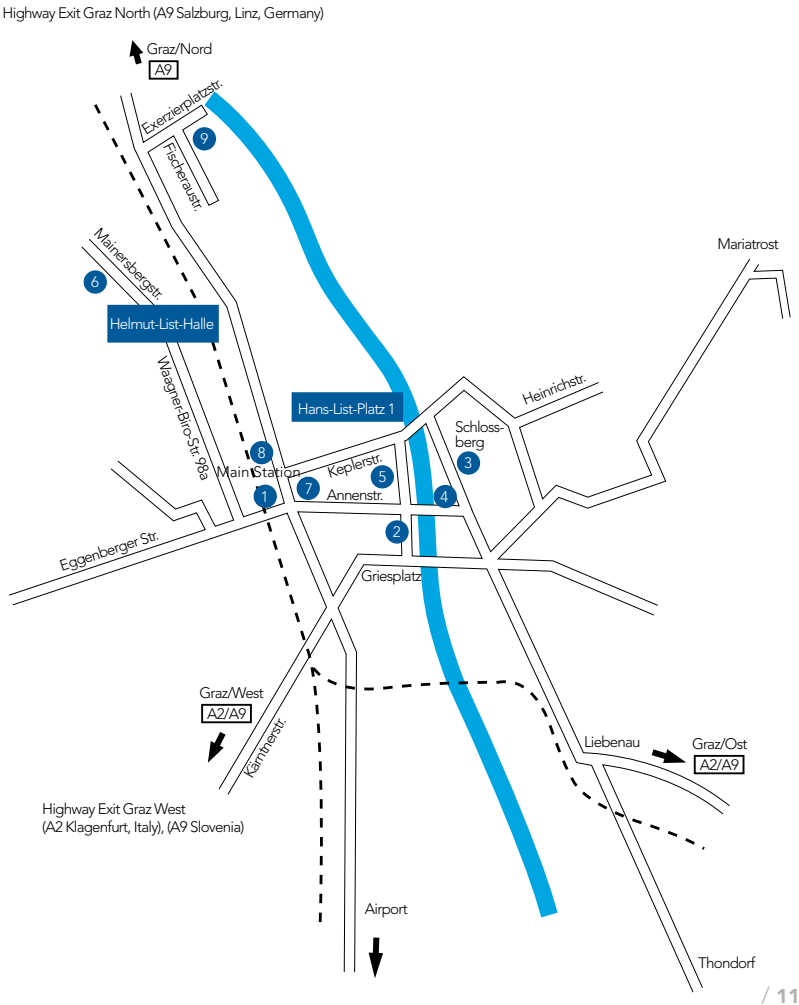
Have no second thoughts about visiting the attractions: Eggenberg Palace, the Museum of Contemporary Art (Kunsthaus), Island in the Mur, Schlossberg, Opera and all the rest, the 'compulsory' tourist program in Graz is a pure pleasure.

Hotel:

1. Hotel Daniel
2. Hotel Weitzer, Hotel Wiesler
3. Schlossberghotel
4. Hotel Erzherzog Johann
5. Mercure Graz City
6. Hotel Bokan
7. Hotel Europa
8. Hotel Ibis
9. Wohlfühlhotel Novapark

Taxi:

Phone: +43 (316) 28 01
Phone: +43 (316) 878
Phone: +43 (316) 889



PARTNERS' PROGRAM




THURSDAY, JUNE 11th, 2015
INDULGING CAN BE SO EASY!

Discover the inspiration for yourself and learn from a genuine professional chef tricks, sophistication and how to plan the preparation of dishes the best way at our "Kitchen Party". Sociability, fun and pleasure are of primary importance and make the work enjoyable.
And finally, you can relax while enjoying the meal you have prepared yourself.

09:00 a.m. Departure Helmut-List-Halle
03:00 p.m. Return Helmut-List-Halle

FRIDAY, JUNE 12th, 2015
A DAY IN EGGENBERG PALACE

The universe is in Graz! It's no joke, but rather a wonderful example of harmonious architectural skill: Eggenberg Palace on the edge of the city center. Set within a beautiful park is the main palace which was laid out as an architectural allegory of the universe. The day will be filled with a walk through the park and planet garden of Eggenberg Palace, a visit to the ornamented rooms and then a refreshment break at the Pavilion in the Park. At the end of the day you can enjoy the many shopping opportunities in the center of town.

09:00 a.m. Departure Helmut-List-Halle
01:00 p.m. Return Helmut-List-Halle

EVENING PROGRAM

WEDNESDAY, JUNE 10th, 2015
WELCOME RECEPTION

Join us and our team of experts to see how the latest technology performs and at the same time, test it yourself by taking the test vehicles out for a spin.

03:00 p.m. AVL Test Drives
followed by
07:00 p.m. Welcome Reception

THURSDAY, JUNE 11th, 2015
SOCIAL EVENING

Erected in 1872 as a "Poudrette Factory" and revitalized in 2001 as event center, the "Soap Factory", situated near the river Mur, is the perfect setting for our Social Evening. We invite you to continue networking in the relaxed atmosphere of the outdoor dining area in the shade of beautiful trees at our special event location. Don't worry, the historical timber-framed hall is an excellent weather-proof alternative.

07:30 p.m. Social Evening at the "Soap Factory"

AVL LIST GMBH

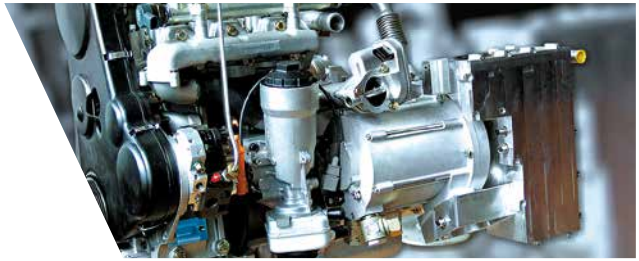
AVL is the world's largest independent company for the development of powertrains (engines, transmissions, e-motors, batteries and control systems) for passenger cars, commercial vehicles and industrial applications, as well as for instrumentation and test systems, with activities ranging from concept through to series development. Building on insights gained from its own research, AVL serves a global customer base by developing drive systems of all sizes and designs and integrating these into overall systems.

Although e-mobility has not been quite as triumphant a success as had been hoped, especially by the political sector, powertrain electrification continues to advance at a steady pace. The technology is driven by ever more stringent CO_2 limits, which, in many cases, can only be met with all-electric or hybrid drives.

Depending on the initial situation, various degrees of electrification are required, a fact that ultimately leads to a multitude of designs, varying both in size and system architecture.

Faced with such diversity of variants, powertrain developers must choose the solution that matches their application and boundary conditions best. To do so, they need suitable components that have to be developed accordingly.

In addition to having to decide on the basic configuration of individual components, such as e-machine, internal combustion engine, transmission, etc., automakers are time and again faced with the question at which voltage level the electric drive system should be operated. As the voltage level determines indirectly



the vehicle's performance levels, safety aspects and, ultimately, its costs, the question is a crucial one and will feature as one of the main topics at this conference.

As far as lower electric power levels up to 15 kW are concerned, the market is showing a clear trend toward 48-volt systems, enabling cost-efficient mild hybridization. Advancements, however, are also shaped by politics. In the U.S., for example, vehicles are required to have a voltage level of at least 96 volts to be recognized as hybrid.

For higher electric power levels (e.g. sports cars), it would also be conceivable to raise today's standard 400 volts to 800 volts in order to achieve the required power levels at a reasonable cost.

In view of cost-driven vehicles, work is also focusing on 12-volt systems. Although allowing a limited degree of electrification only, they are still capable of saving a significant amount of fuel. Such systems are at the other end of the voltage scale that spans almost two powers of ten.

Being closely linked to electric power, each voltage level results in typical powertrain architectures. Moreover, voltage levels higher than 12 volts may lead to the addition of further components; 48 volts, for example, could open up new possibilities such as e-chargers that enable further optimization of the internal combustion engine. Also where full hybrids are concerned, the architecture is far from being decided: novel structures, such as the AVL Future Hybrid, allow further efficiency enhancements

and cost reductions, and again highlight the great diversity of possible solution variants resulting from the different ways in which the transmission can accommodate the electric motor. This may directly result in a reduction of the number of gears, for example. With structures like these, it is generally wise to pay more attention to the number of drive modes than to the number of gears.

The engine is also heavily affected. In the coming years, technologies such as downsizing, fewer cylinders, new combustion methods, changes in the auxiliary systems or even entirely new combustion engines, ranging from "steady-state" range extenders to high-performance power units, will present developers with the greatest challenges.

As a forward-looking developer of powertrains, AVL has been viewing the entire powertrain as an integrated system for many years, not only focusing its research and development activities on electrical components but adopting an integrated approach to the combustion engine, electrical drive components, transmission and their interaction in order to find the optimum choice of system architecture for each customer. Having development expertise in each aspect of the powertrain (engine, transmission, e-drive, battery and control) and in the overall system, AVL is able to optimally support its customers in choosing the right powertrain architecture, defining the voltage level and optimizing all powertrain components.