

# iVT electric & hybrid industrial vehicle technology CONFERENCE

**FEBRUARY 13-14, 2019**  
**KÖLN MESSE, COLOGNE, GERMANY**

**THE PATH TO INCREASED ELECTRIFICATION AND HYBRIDIZATION  
OF INDUSTRIAL VEHICLES**



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## **PRELIMINARY PROGRAM**

Taking place at

**iVT EXPO**  
INDUSTRIAL VEHICLE TECHNOLOGY

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**The Path to Increased Electrification and Hybridization of Industrial Vehicles**

Electric & Hybrid Industrial Vehicle Technology Conference is exclusively dedicated to the design and development of electric and hybrid vehicle technology for the construction, agricultural, industrial and off-highway vehicle industries.

**Hear from leading industry experts, network with over 350 delegates across four conferences. PLUS: Discover the next generation of industrial vehicle components, materials, concepts and manufacturing technologies at iVT EXPO – Entry included with your delegate pass!**

The conference will bring together R&D engineers and heads of design and engineering from around the world to discuss, debate and analyze the growing possibilities and future developments for the hybridization and full electrification of construction, industrial and off-highway vehicles.



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- Entry to three other parallel conferences
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**2-DAY PASS**  
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**DAY 1 WEDNESDAY FEBRUARY 13**

**Beachheads for change – the global urban drive to zero and impact on industrial vehicles**

**Bill Van Amburg**, executive vice president, Calstart, USA  
Based on research into market economics, technology readiness and component transferability, there is a clear emerging pathway for electrified on- and off-road commercial vehicles and equipment. With the advent of a new Global Commercial Vehicle Drive to Zero program targeting major urban regions, what is the impact on and benefit for industrial vehicle electrification and where will it be targeted? This presentation will review these emerging market segments, identify the top geographies driving this change and provide insights into what industrial segments will benefit from these markets and also may be required to electrify rapidly.



**Marketable electric drivetrain concepts for small tractors**

**Dr Stephan Hammes**, skill team leader powertrain integration, AVL TEG GmbH, Germany  
Battery-electric vehicles will be the key factor for zero-emission standards. Replacing conventional powertrains with electric drivetrains is currently the most applied concept in agricultural business. The new structured e-Tractor creates the basis to exploit the potential of electric drives. The operational time is maximized with an innovative power chassis, system costs are reduced by flexible vehicle use and working processes are optimized by smart implementation solutions. The vehicle is based on a new modular system: the power chassis provides up to 75kW and serves as a base platform for modules such as implements, power packs and autonomous driving unit.



**Electric Site: the future of quarries is electric**

**Uwe Müller**, chief project manager - advanced engineering, Volvo Construction Equipment, Sweden  
Volvo CE teamed up with its customer Skanska and other collaboration partners on a groundbreaking study to create the world's first 'emission-free' quarry. The results beat all expectations, including a 98% reduction in carbon emissions, driving a transformation of the quarry and aggregates industry. Uwe Müller, chief project manager of the Electric Site at Volvo CE, shares insights from the project and its huge potential for environmental, efficiency, safety and cost benefits. The prototype line-up at Electric Site included a dual-powered, cable-connected excavator, an autonomous, battery-electric load carrier, and a hybrid-electric wheel loader.



**Powertrain optimization using electrohydraulic system**

**Jean Heren**, system advanced engineering manager, Poclain Hydraulics, France  
Partial or full integration of electric solutions into off-highway vehicles is an opportunity for optimization of working equipment such as excavators, harvesters or material handling machinery. When used in closed-loop circuits, hydrostatic drives offer a simple, robust and efficient solution for energy recovery and performance optimization. Poclain Hydraulics and its customer engineering experts have developed innovative solutions taking the best of both worlds thanks to hydraulic high-performances solutions and electrohydraulic systems. This will be illustrated during the presentation using real case applications, such as excavator slew drive, harvester ground drive and winches.



**Energy reduction and clean technology**

**Willem Nieuwland**, project leader/system group leader, Hyster-Yale Group, Netherlands  
Hyster is developing a zero-emissions version of its Laden Container Handler. A key element is high efficiency of the vehicle to provide long operation without refueling hydrogen or recharging the battery. Two functions of the vehicle have the highest energy consumption: traction and lifting the load. Other functions like tilting or steering require less energy. Energy recovery in traction is standard on most EVs; new for container handlers is energy recovery while lowering the load. In other words: regain the energy needed for lifting. Hyster will present the first results of its patent-pending hydraulic full flow recovery system.



**Designing electrified heavy equipment using system simulation**

**Romain Nicolas**, system engineer - Simcenter Amesim for Trucks, Buses and Off-highway applications, Siemens PLM, France  
Heavy equipment electrification needs to occur early in the product design development cycle to define the best systems architecture of the machine, while balancing attributes such as fuel efficiency, productivity and autonomy. System simulation is a key methodology that can support predicting the performance of electrified systems as early as possible in the design process. In this presentation we will show the method of electrifying a heavy excavator from hybrid architecture selection to electric system optimization. The objective is to reach the best compromise between total cost of ownership (fuel efficiency) and productivity (cycle time).



### Hybrid powertrain and traction battery for hybrid refuse vehicles

Greg Harris, global electrification services leader, Horiba Mira, UK

The presentation discusses the development of the hybrid powertrain and traction battery for the next generation of hybrid refuse vehicles. Horiba Mira has recently developed the series hybrid powertrain and high-voltage lithium-ion battery for the next generation of efficient, lightweight Dennis Eagle vehicles within the UVR (Urban Vehicle Range) program. This presentation will cover key aspects of the powertrain control and battery development program, including requirements definition, concept development, controls software, battery design, design validation planning and functional safety.



### E-motor design using multi-physics optimization

Dr Lars Fredriksson, business VP – simulation-driven innovation, Altair Engineering GmbH, Germany

The study shows how Altair has approached the challenge of improving the total design balance in e-motor development. It has been executed with active support from Porsche AG. The classical motor efficiency/power design problem is coupled with other physics to account for thermal effects, structural boundary conditions and vibrations. Additional effects of the inverter on the motor performance will also be evaluated by integration of controls and physical modeling. The objective of the design optimization is to maximize torque and power under defined driving conditions. Simultaneously, rotor stresses, motor vibrations and motor temperature must be kept within certain limits.



### Energy efficiency improvements for hydraulic linear drives

Dierk Peitsmeyer, product portfolio manager, Bucher Hydraulics, Germany

Hybrid and electrically driven machines with powerful linear drives will use hydraulics. Hydraulic cylinders provide high forces, greatest compactness, reliability for heavy-duty conditions, easy overload protection, shock resistance and simple design. Today applied hydraulics have poor efficiency due to their system layout. Hydraulics could be efficient if the system were changed and highly efficient components applied. Hybrid and electric machines with expensive energy storage must save energy through efficiency improvements. Otherwise expensive battery power is converted into heat and wasted. This presentation shows how new hydraulics could meet the requirements of hybrid and electric machines in an optimal way.



### An electrified drives and control platform for multifunctional vehicles

Hartmut Riegert, executive director, Refu Elektronik GmbH, Germany

Multifunctional vehicles are operated by towns for mowing, cleaning or winter maintenance. Within the MUFFELPlus research project, an electrified platform has been developed to help to reduce emissions. The hybrid vehicle concept is based on a Holder C70 with combustion engine and battery system. The basic cell of the powertrain is an 8kW synchronous reluctance motor combined with a planetary gearbox for each wheel. Two motors controlled by a dual inverter are integrated in a front and rear axle of the 'Knicklenker', allowing load splitting and torque vectoring in each condition. The complete system is scalable.



### Panel Discussion

Bringing together the 'Electric & Hybrid' and 'Powertrain' audience to discuss 'Engineering challenges transitioning from traditional IC powertrains to electrification and hybridization'.



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DAY 2 THURSDAY FEBRUARY 14

**Hybridization trends in the global off-highway vehicle market**

Pietro Boggia, principal consultant, mobility, Frost & Sullivan, UK

Demand for hybridization in the global OHV market is expected to grow at a CAGR of 10.6% for the period of 2017 to 2025. Asia is expected to dominate the hybridization market in terms of volume through the forecast period. Excavators, bulldozers and loaders will experience the highest penetration of hybrid powertrains, given their widespread application and acceptance in the construction and mining segment. Among these, loaders are expected gain the maximum market adoption for hybridization. Equipment manufacturers have realized the growth potential of the hybrid market and hence focus is now shifted toward hybridization to tackle stringent emission norms and enhance fuel efficiency. The competitive landscape is expected to witness more joint ventures, mergers, acquisitions and technology transfers, which will further intensify the market competition; however, traditional players will drive the segment's development.



**The E-DEUTZ approach for non-highway applications**

Ralf Plieninger, head of electrification, Deutz AG, Germany

This presentation will focus on the next steps in the E-DEUTZ approach, which involves the development of fully functional electrified drivetrains for real-world mobile machinery. The investigated approaches cover the range from a mild hybrid powertrain that combines a combustion engine < 56kW with a 20kW electrical machine, across full-scale hybrid-electric vehicles (HEV) to fully electrified battery-electric vehicles (BEV). The review will also address the conceptual layout, the mechanical and electrical design of powertrains in demonstrator vehicles, and the impact on real-world fuel economy and emission reduction.



**Electric and hybrid powertrain solutions for the access industry**

Ignacy Puzskiewicz, senior director, advanced technology and industrial design, JLG Industries Inc, USA

The presentation will focus on the current state of the art and trends in the development of electric and hybrid powertrain solutions for access machines (aerial work platforms). Mobile elevated work platforms are an ideal application for hybrid power systems due to the duty cycles and requirements to work in partially and sometimes fully closed building envelopes. Over the last 20 years, hybrid power machines have become prevalent in the construction industry. However, very few companies offer both series and parallel hybrid designs. These products reduce emissions and noise while minimizing fuel consumption without sacrificing power or performance, and providing flexibility in machine usage.



**Generation 2 MHEV systems for off-highway machinery**

Ryan Maughan, founder, Avid Technology Group, UK

Generation 1 MHEV systems are rapidly coming to market in the passenger vehicle field with a range of technologies, the most common being focused on BISG machines to recover energy under braking and provide torque assistance under acceleration. Second-generation MHEVs are now under development, featuring more highly integrated electrical machines and the elimination of the engine front-end belt drive. This technology is very applicable due to its utilization of higher power- and torque-capable integrated electrical machines, opportunities for improved engine thermal management and emissions control through systems electrification and the shift to 48V for other high-power consumers.



**Challenges and opportunities in thermal management of electric and hybrid machines**

Josef Graubmann, managing director, Ymer Technology GmbH, Germany

With the implementation of electric drivetrains, thermal management will become even more important and will be one of the challenges for off-highway OEMs. In addition to the battery, the cab and other (driveline and hydraulic) components need to be cooled or heated. Ymer Technology's complete thermal management system (TMS) focuses on all cooling and heating demands in machines and puts an end to separately developed cooling and heating systems. The system is modular and scalable, and focuses on highest energy efficiency by reusing waste heat and passive cooling wherever possible.



### **Changing supply chain – new players emerging in industrial vehicles**

Steve Sokolsky, program manager, Calstart, USA

Based on research into market economics, technology readiness and component transferability, there is a clear emerging pathway for electrified on- and off-road commercial vehicles and equipment. With the advent of a new Global Commercial Vehicle Drive to Zero program targeting major urban regions, what is the impact to and benefit for industrial vehicle electrification and where will it be targeted? This presentation will review these emerging market segments, identify the top geographies driving this change and provide insights into what industrial segments will benefit from these markets and also may be required to electrify rapidly.



### **Automated, efficient and robust charging of off-road vehicles**

Mathias Wechlin, director product management, IPT Technology GmbH, Germany

Electrification of off-road vehicles in demanding and harsh applications seems to be an unsolvable challenge. How to get the power on board efficiently and reliably? Cables and plugs face wear and tear. Handling them is a hassle. Plugs get soiled. Not so with wireless charging solutions, which operate without physical contacts and cable connections to the vehicle. Fully automated charging is possible, which is especially interesting for autonomous vehicles. Opportunity charging during operation drastically increases the range. The presentation will show how this has been working with buses for many years and how it can be implemented successfully in off-road vehicles.



### **Battery charging challenges and solutions for construction equipment/ agricultural machinery fleets**

Sabine Pretsch, system engineer, AVL Commercial Driveline & Tractor Engineering GmbH, Austria

Due to the increasing amount of plug-in electric machinery within a fleet, the interdependencies between powertrain and grid need to be considered with a holistic system engineering approach. A detailed analysis of an application's load cycle combined with the possibility for opportunity charging within the working process of the machinery will lead to potential downsizing of the battery. If the plug-in electric vehicles are aggregated and coordinated, the increased number of vehicles can have a positive effect on the grid. The battery storage can act as a load (charging) or can inject power into the grid like a generator.



### **Wireless charging**

Ulrich Richter, team lead wireless charging, Delta Energy Systems, Germany

Wireless charging opens the way to increase the operating productivity of a vehicle. Growing automation demands, intelligent systems, labor shortages, decreased maintenance, variety of battery chemistries and simple ease of use are all strong reasons to implement wireless charging. AGVs and manned vehicles can benefit from fast charging access points from multiple chargers dispersed throughout a warehouse. Delta's wireless charging system incorporates a fixed charging station with emitting pad and very high-density vehicle-mounted receiving pad, all with a total (wall to battery) system electrical efficiency of 94%. No cables, no connectors, no hassle.



### **Modular battery systems for off-highway vehicles**

Dr David Sandells, chief technical officer, Hyperdrive Innovation, UK

The presentation will discuss taking Nissan cell technology into new markets and applications; dealing with conflicting requirements across on- and off-highway vehicle and machine types using a modular battery pack approach; minimizing development costs and reducing time to market, especially for OEMs without in-house electrification expertise.



\*This program may be subject to change

# ivT EXPO

INDUSTRIAL VEHICLE TECHNOLOGY

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## Discover the next generation of industrial vehicle components, materials, concepts and manufacturing technologies

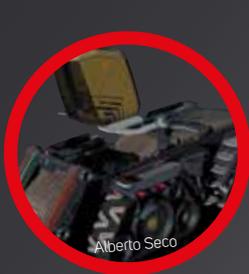
REDUCE EMISSIONS | INCREASE ELECTRIFICATION | IMPROVE OPERATOR SAFETY & COMFORT | BOOST VEHICLE AUTONOMY & EFFICIENCY

While you are in Cologne: From February 2019, the industrial vehicle industry will have an international exhibition that showcases nothing but the latest and next-generation components and technologies. The free-to-attend exhibition, which is closed to the public, will feature around 100 exhibitors, providing a compact, hassle-free environment tailor-made for serious discussion and business, without any of the logistics issues that go with very big events.

No full vehicles will be on show: **ivT Expo** will only showcase the components, services and technologies from Europe and all over the world that go into making the next generation of industrial vehicles, plus a range of manufacturing and assembly technologies.

**ivT Expo** will bring to life the pages of the market-leading Industrial Vehicle Technology International magazine. Visitors will discover new materials; new engine technologies, including electric motors and hybrid applications; new control systems that question the need for hydraulics; sensors; testing and validation services and technologies, from durability rigs to EMC and NDT technologies; cabin equipment; the technologies required for operatorless/driverless vehicles; and innovative ideas that will help manufacturers of industrial vehicles ultimately improve product design, efficiency and thus sales. The expo will also feature companies displaying the latest and next-generation manufacturing and assembly technologies for industrial vehicles.

Vehicle categories covered by **ivT Expo** are anything from off-road loaders, mining equipment and diggers, to tractors, cranes and lift-trucks. In short, technologies and services for every class of industrial vehicle will be on display.



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A brand-new conference for 2019 entirely dedicated to next-generation cabin design and future technologies for industrial, commercial and off-highway vehicles.



A new conference dedicated to exploring the latest and next-generation designs and technology for reducing CO<sub>2</sub>, meeting future industry emission targets, improving performance, and increasing reliability and productivity.



Autonomous Industrial Vehicle Technology Conference is exclusively dedicated to the design and development of highly automated and unmanned construction, mining, agricultural, industrial and off-highway vehicles.

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