



AVL'S NEW APPROACH FOR ELECTRIFIED UTILITY VEHICLES

Solution Portfolio

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Abstract



The rising popularity of electrified vehicles has also reached the off-road commercial vehicle industry.

Local air pollution, new legislations, diesel (driving) bans and public pressure drive the need for electric driving solutions. Various major European cities have introduced bans for diesel-powered internal combustion engine vehicles, which affect municipal vehicles in the same way as passenger cars and delivery trucks.

Municipal power classes offer enormous potential to electrify vehicles with state-of-the-art technology. In addition, these performance classes are commonly used in the cultivation of special crops and at farms for small-scale operations, giving the organic agriculture label a new dimension. This can be realized by replacing the conventional ICE with an electric drive train without affecting the vehicle structure, which is the most applied concept.

Development challenges are mainly related to the reduction of component costs and the management of application diversity and low volumes.

AVL helps tackle these major challenges with an innovative, cost-efficient and technically sophisticated solution for small-volume and small-size utility vehicles, which results in maximum performance and reliability.

The Challenge



One of the reasons for the electrification trend, even in the off-road commercial vehicle industry, is an increasing number of driving bans for diesel vehicles in urban cities, which even affect municipal vehicles. Besides stricter emission legislations (EU Stage IIIB → V), which will be relevant for mobile machinery in 2022, German farmers do not receive any public compensation for their self-produced energy due to the Renewable Energy Act (EEG), which is starting in 2020. Additionally, farmers have to reduce their green house gas emissions by 30 % compared to 1990 (German Climate Protection Plan).

Electrification approaches for commercial vehicles are an excellent solution for these challenges. Most applied concepts emphasize replacing the conventional combustion engine by an electric drive train while the vehicle structure remains the same.

However, all configurations that integrate an all-electric drive into an existing vehicle structure have the disadvantage that the wheel loads and the components are not ideally matched with each other. In addition, costs occur because of the corresponding system structure.

AVL offers a new approach for electrified utility vehicles that takes all these challenges into account.

The AVL Solution



Apart from the conventional small tractor structure, AVL developed a flexible, cost-efficient and high-performing solution for small volumes and small-size tractors. The concept is not limited to one type of machine. It combines the cost-driving components, such as the electric drives, batteries or power electronics in a base chassis, which can be used for a tractor or a harvesting or maintenance machine on the same power level.

In addition to the electric power, the chassis also provides the required hydraulic and pneumatic power. By expanding this basic component through system implements for each application, the ideal matching vehicle configuration can be created. Therefore - especially in seasonal work - the economic efficiency of the system is not clouded by insufficient capacity utilization. Instead, the cost-intensive components are used across various applications.

Besides being emission-free, which supports an environmentally friendly value chain, this innovative approach ensures that system costs are at an economic and reasonable level.

The AVL Solution in Detail

POWER CHASSIS

Integration of cost-driving components into a power chassis

Modular chassis for different applications

Chassis as power distribution for drive and implements

Electric power unit: Batteries, power electronics

Hydraulic power unit: Pump, tank, cooler, filter

Pneumatic power unit: Compressor, tank

SYSTEM IMPLEMENTS

Implements mounted on top of chassis

Implements are supplied by hydraulic power and DC power from the chassis and have separate control units

Automatic identification of implements

VARIABLE AXLE

Modular drive train with variable traction power, wheel track, ground clearance and steering

Exchange of all functional components by non-functional placeholders



EXTERNAL IMPLEMENTS

Various mounting options for implements on chassis

Downgrade possibility to use conventional implements for better product placement

The Added Value

There are numerous benefits of partnering with AVL, such as:

- Highly sophisticated technical solutions regarding performance and costs
- Reduction of system costs by using a modular approach
- Short time-to-market and low development costs due to AVL's long-standing engineering experiences
- Good cost benefit ratio of the overall product (selection of the most suitable components & suppliers)
- Optimized system thanks to AVL's advanced development methods and simulation tools
- Extensive cross-industry and long-standing experience from worldwide electrification projects
- Deep knowledge of e-components due to AVL's global network
- Proven competencies in agricultural machinery

Summary



- Market requires the development of electric powertrains
- New laws in Germany (Renewable Energy Act (EEG), Climate Protection Plan) & increasing bans for diesel-powered vehicles in urban areas
- Electric vehicle development still leads to trade-offs between range, cost, weight, vehicle packaging and durability
- High development costs for small volumes
- AVL's new approach:
 - Benefits regarding costs and efficiency due to the modularity of chassis
 - Response to future challenges for farmers and municipal authorities
- Technically sophisticated and cost-effective electrification solutions
- Innovative approach based on long-standing experience and expertise from cross-industry projects
- Supported by AVL's unique tools and methodology

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Thank You



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