Developing Electric Powertrains

IAV – Your Partner for the Electric Vehicles of Tomorrow

**Tomorrow’s Powertrain**
Electric motors provide a high level of efficiency and torque: the ideal prerequisites for a strong and efficient powertrain. But taking this power to the road in the most effective way possible demands a powertrain that is cut out for the job. Transmission, battery, power electronics and many other components need optimizing to meet the requirements that face them.

Regardless of whether a powertrain is developed entirely to satisfy the demands of an electric vehicle or whether the electric powertrain is integrated in an existing platform – the vehicle concept is undergoing extensive change from known concepts based on a combustion engine.

Despite the electric powertrain consisting of altogether familiar components, it has still not been fully adapted to the needs of the automotive industry. We are already working on the concepts of tomorrow.

**20 Years of Expertise**
IAV can meanwhile build on 20 years of experience in electric vehicles. Do you need specialists with expertise in the entire vehicle, specialists who are passionate about developing electric vehicles? We can assist you from the concept and approved prototype phase right through to the start of production. Beyond this, we are also your partner for quality assurance and support in the field.
Components
Although the components of the electric powertrain are generally well-known, they often need configuring for use in vehicles. Making them suitable for this purpose, they are redesigned to meet OEM specifications. With the volume of electric cars increasing, more and more importance is being attached to efficiency and service life. A greater focus is also being placed on costs and modularization.

When developing new components, like electric motors, they are designed to meet the specific requirements right from the outset. This means they can also be designed to accommodate the specific driving profile. Voltage and current needs must, of course, be balanced with the other drive components, such as power electronics or traction battery. Increasingly, the targets set are being extended to include efficiency, service life and cost. Integration is a further focus in development. Components need to be compact, with cabling kept as short as possible. This simplifies installation and minimizes line voltage drops. One example here is the DrivePacEV80. Developed in-house at IAV, it combines all the main drive components in a module. Cabling is reduced to the high-voltage supply and connections for external components, such as the air-conditioning compressor or PTC heater.

System
The components of the electric drive system interact with each other. The power required by each and every component must be harmonized with that of the others. Behavior is reproduced in models and simulated both at component and system level. Beside system functionality, particular attention focuses on ensuring high-voltage safety. The charging concept is also part of the drive system. Although charging by cable is state-of-the-art practice, IAV has also integrated inductive charging concepts.

Vehicle
Alongside actual operation, integrating the electric powertrain also encompasses the mechanical and electric interfaces, including communication. This demands an operating strategy that defines the various operating modes. In addition, attention is given to ensuring electromagnetic compatibility within the vehicle. Control units must be free from interference and limit values must not be exceeded. IAV constructs electric and hybrid vehicles as well as power conditioning units and range extenders in prototype form and provides assistance in developing them for small-volume to mass production.

We can give you support in the following domains
• Simulating powertrains
• Selecting and ensuring the suitability of components
• Selecting suppliers and providing them with the necessary qualifications
• Integrating the powertrain or individual components
• Designing and laying out powertrain components
• Developing functions and algorithms
• Charge management
• Heat management in the vehicle
• Constructing prototypes (component and vehicle)
• Development to the point of manufacturing readiness
• Quality assurance
• Field trials, testing and validation