

# "Those, who only follow paths taken by others, will never set out on new paths"

## In Magdeburg, research is underway on the automobile of the future

Particularly in the Institute for Competence in Automobility (IKAM), where research in the field of automotive industries is bundled. How can we score well with innovative drive concepts in Saxony-Anhalt? How far advanced are we on the issue of new mobility? An interview about the car of the future, the consideration of tradition and the courage to forge new paths. Prof. Dr.-Ing. Jens Hadler of the Faculty of Mechanical Engineering at the Magdeburg Otto von Guericke University, who conducts research in the field of innovative drive technologies. He is certain that Saxony-Anhalt is able to make significant contributions to new mobility concepts.

### Let's be visionary and practical at the same time! What is the car of the future going to look like?

**Prof. Dr.-Ing. Jens Hadler:** The car of the future will comprise markedly more networked, assisted or autonomous dimensions than is the case today. Notwithstanding this however, the drive will remain one – if not the most – emotional integral components of the car.

### Will hybrid drives and electrically powered cars be able to ensure individual mobility? Or do we have to expect combustion engines in the future as well?

**Prof. Dr.-Ing. Jens Hadler:** Fortunately, we will also be able to rely on combustion engines in the future. Their outstanding features will enable them to handle the major part of freight and passenger transport tasks. The degree of electrification will represent the challenge for the basic design of the powertrains, which will continue to be further optimised in the future. Pure electric mobility will develop a field of application based on pedelecs, vehicles for emission-free mobility over short distances through to special sporty designed applications. At the present time, the plug-in hybrid represents the best compromise of both worlds, its basic design being a combustion engine with additional functionality.

### How do we have to imagine research progressing in the development of the engine? What processes and methods do you intend to use?

**Prof. Dr.-Ing. Jens Hadler:** In addition to the engineering, a large number of other scientific research disciplines are involved – due to the complexity of the overall task. The challenges range from fundamental issues in material research, via thermodynamics and fluid mechanics, the kinetics of chemical processes as well as the world of electronics and mechatronics through to control technology algorithms. The fundamental challenge here is to interconnect and network everything with each other. The terms of reference are becoming increasingly multi-dimensional, which results in a wide scope for action – that's the great thing about engine development.

### How is it possible within the framework of this research not only to think about the near future, but also from a sustainable perspective?

**Prof. Dr.-Ing. Jens Hadler:** It is a question of the system boundary, the general time span of development cycles and development methodology. Due to his basic training, the engineer is accustomed to think and act in an environment consisting of conservation laws – to this extent the subject of sustainability is immanent for him. A key aspect in this process is educating young people on the subject of sustainability.

### When is going to be normal to drive an electric car? What requirements still have to be created to bring it about?

**Prof. Dr.-Ing. Jens Hadler:** For some people, it's going to be normal in the next few years. To what extent the electric vehicle will be globally regarded as the normal nature of things depends on many factors, which are not possible to foresee today. The challenge with electric vehicles is their range and thus their energy storage capacity. Here the battery is the limiting factor. At the current time, it is still too difficult or too expensive to present a sufficient travelling distance. Although a lot of progress has already been achieved, significant improvements are still required for a sustainable solution.

### Resources are becoming increasingly scarce, while the challenges relating to environmental protection, exhaust limits and reducing consumption and emission are gaining in importance. How does that affect engine development?

**Prof. Dr.-Ing. Jens Hadler:** First of all, we have to agree on terminology. If by resources we mean fossil fuels, then I entirely agree. These are finite, as long as we take more than is created in the same period. The objective must be a recycling economy of sustainable resources. If we can manage to achieve a recycling system based on renewable energy sources to make available for vehicles of the future, then we've solved the task. As far as emissions are concerned, we cannot create pollutant deposits – whether on a local scale in the manufacturing and driving of vehicles or on a global scale when supplying the energy source. Engine development takes account of both challenges in the process of its further development. Many different aspects of the powertrain development are affected in this regard, exemplarily including thermodynamics, after-treatment of exhaust gases, friction reduction, electronics, the ever increasing system integration of engine and transmission as well as the increasing interconnecting of the powertrain with other components and systems in the vehicle.

### How can we score well with innovative drive concepts in Saxony-Anhalt? And what do they look like?

**Prof. Dr.-Ing. Jens Hadler:** We have to think about our strengths and advantages and focus on expanding them. We offer a challenging training to the good, motivated students that we possess. Together with policy makers, we have to continually improve the framework conditions both for basic and industry-related research. In the engineering sciences, we have to bring the prospective graduates into contact with the current issues faced by industry at an early stage, so that they can feel the pulse of the time. For this purpose, both properly networked courses and university facilities are required, which are not inferior in comparison to those of industry. We need the courage to do something different on occasion. Those, who only follow paths taken by others, will never set out on new paths.

### How do you judge the innovative power on the subject of new mobility here in Saxony-Anhalt? How well developed are we? What is happening in this state?

**Prof. Dr.-Ing. Jens Hadler:** I think that we require a large number of small steps - the to be involved. This means: the continual contact with industry – evolution. Thanks to the combination of historically based strengths in natural science and engineering research in

association with a traditional expertise-based engineering industry, Saxony-Anhalt has the opportunity to make significant contributions to new mobility concepts.

### We are on the brink of a new age of mobility. What opportunities does this create – particularly for Saxony-Anhalt? Can we make an impact with the traditional experience gained from mechanical engineering?

**Prof. Dr.-Ing. Jens Hadler:** As the saying goes: "Better is the enemy of good". Do we have to prepare ourselves for something completely new, or is it a question of complementing what already exists? Mobility has so many aspects and challenges that it's difficult to give a comprehensive answer. However, if we go forward based on our strengths and grasp the opportunity offered, then it may safely be stated that mechanical engineering is a good basis. Electrification in powertrains brings with it a new component to be integrated. It is therefore necessary to develop a special integration expertise. Although a small flower has been planted here, it still needs cultivation and promotion.

### How can we achieve the development of intelligent transport systems, which will bring new approaches for transport management?

**Prof. Dr.-Ing. Jens Hadler:** This question is strongly slanted at the modal split, i.e. the linking of the various forms of transport. Interface optimisation plays a special role in this context. The even stronger networking of the car with the internet is particularly significant here. One example: The current information on road traffic flow is reported by a single or individual car to the cloud, while the summarised cloud information is then fed back as the current traffic situation to all road users.

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