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“CO₂ emissions are becoming an issue in the non-road sector”

The construction machine industry is subject to strong changes due to cost pressure and legal requirements. ATZoffhighway spoke to Dr. Marko Dekena, Executive Vice President at AVL, at the company site in Graz about trends and challenges in the field of construction machines.

Dr.-Ing. Marko Dekena was born in 1969 and studied Mechanical Engineering at TU Munich. After graduating, he completed a trainee programme at Kubota in Japan. He completed his doctorate in 1998 at RWTH Aachen University. He began his professional career as a Product Manager at Audi in Ingolstadt. In 2000, he joined MAN in Augsburg as Assistant to the Board of Management.

In 2005, he became Head of Sales for the Vehicle and Industrial Engines divisions at MAN Nutzfahrzeuge in Nuremberg. Since 2010, he has been Executive Vice President at AVL List GmbH in Graz, where he is responsible for Global Business Development, Sales and International Operations, Commercial Powertrain Systems and Large Engines.

ATZoffhighway _ AVL is one of the world's biggest engineering service providers for the automotive and off-road industry and is well known as an engine specialist. What role does the construction machine sector play at AVL?

DEKENA _ AVL has significantly expanded its range of activities in recent years. Alongside our traditional engine business, we are working very intensively on the entire powertrains of vehicles and machines. Of all the types of vehicles that we work with, construction machine industry is the most complex sector. In addition to the variety of very different machines, another major challenge is above all the extremely different applications and operating conditions. Added to that is the fact that the production volumes of the different machines are relatively small and common parts concepts can hardly be implemented. In this case, simulation, a particular speciality of AVL, can help to minimise the time and cost required for development. What is also needed, of course, is a very good understanding of the machines and the types of application and operating modes. What we can offer is the development of all components of a construction machine powertrain and the optimisation of the overall system. There is very great but partly unused or insufficiently used potential available to improve the efficiency of these machines, which we are able to exploit with our expertise and with a range of efficient self developed tools.

Which construction machines and in which areas of the different construction machines does AVL deal with?

At the moment, we are focusing above all on earthmoving machines, in other words wheel loaders, excavators and mini excavators, skid-steer loaders, backhoe loaders and dumpers, although we do not rule out other applications. Our range of services is very broad: from the new development of components, further development and improvement of existing powertrain components right through to complete system optimisation, in the widest sense of increasing the overall cost-effectiveness of the different machines. That also includes, of course, reducing fuel consumption and CO₂ emissions. Reducing engine emissions is practically one of our standard services.

You therefore develop all the main components of the drivetrain of construction machines. Where do you see the focus of development over the next few years?

The further reduction of emissions, including CO₂ emissions, is of course one aspect. We are expecting CO₂ emissions to become an issue in the non-road sector. Diesel engines and future exhaust aftertreatment systems must be simplified and made cheaper. As I mentioned before, complete system optimisation is a particularly impor-

“The electric hybrid technology is in its infancy”

tant area. That will require, at least to some extent, the electric and hydraulic hybridisation of construction machines, the use of new and innovative transmissions, such as highly efficient CVTs, and the use of working hydraulics systems with higher efficiencies. As far as working hydraulics systems are concerned, there seems to be a relatively high potential available, for example through a significant increase in system pressure to 400 bar and more. What will certainly happen in the longer term will be an extensive automation of working processes and the optimisation of man-machine-interface.

You mentioned the hybridisation of construction machines. Will this really play a role?

Yes, of course. Many construction machines are already hybrids today, namely diesel-hydraulic hybrids. That will also continue to be an important technology, although in an improved form in the future. But electric hybrids can also make a lot of sense. Above all in those machines in which the working processes have high proportions of acceleration and deceleration. For example, when the superstructure is swivelled by an electric motor, the acceleration can be increased practically free of charge by energy stored during the braking process. And wheel loaders that have a very intermittent mode of operation can also benefit from hybridisation. In future, more and more companies will become involved with hybrid technology. At the moment, however, electric hybrid technology is still in its infancy.

Today, CO₂ emissions and fuel consumption are a key topic for on-road vehicles. How important are they for construction machines? What, in your view, needs to be done in order to achieve significant progress?

The great opportunity lies in the optimisation of the complete system. Small steps in the engine area are certainly also possible in order to achieve improvements of around 3 to 5 %, but the greatest potential for saving fuel is contained in the overall powertrain concept. That is also extremely important for construction machines, although



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Dekena believes that complete system optimisation will offer considerable potential for improving efficiency

from a somewhat different perspective. It is not the specific, hourly or distance-based fuel consumption that is important but, for example, the fuel consumption per tonne of earth moved. Good complete system optimisation can save significantly more fuel than the optimisation of the engine and/or transmission. The topic of the Connected Vehicle should also be mentioned here.

In the passenger car sector, and also in the commercial vehicle sector, electronics is playing a decisive role today. What is the current state and the development trend in construction machines with regard to electronics?

Electronics has since long become an essential part of construction machinery, although to a very different extent depending on the type and size of the machine. But at the latest since the introduction of electronically controlled diesel engines as well as powershift transmissions and/or CVTs in larger machines, electronics has become an established component. Machines can now be conveniently controlled by a joystick. And in some cases, remote control is also available, allowing the machine to be controlled by the driver from outside the machine if it is necessary for safety reasons. One could say: the bigger the machine, the more electronic systems there are. The trend is very clearly going towards even more electronic systems – especially in order to achieve the complete system optimisation that I already mentioned, or even process automation.

You mentioned Connected Vehicle. What does the future hold in this respect?

Some of the big manufacturers are indeed already in series production in some cases. The aim is above all to interconnect several machines on a construction site and to connect them with a control centre in such a way that machine use is optimised. That involves loading and unloading cycles, route guidance, coordinated speeds, the control of repair and maintenance times and even the planning of preventive maintenance in order to reduce machine downtime. Some manufacturers are also working intensively on autonomous vehicles and machine operation, not only on individual vehicles but also whole fleets. It is an extremely demanding and exciting field, and fits well to the expertise of AVL, as



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Dekena fears that Tier 5 will be the end of the road for some machines

we develop software and functions in-house for an extremely wide variety of sectors and applications. This is a rapidly growing field, although I think it will be another ten years before these technologies are in widespread use.

There is an increasing use of gas, in particular CNG, in vehicles. Do you expect to see a similar trend in construction machines and, if so, in which form?

There is a lot of discussion on this topic. At the last Bauma fair in Shanghai, sev-

“The trend is going towards more electronic systems”

eral Chinese manufacturers presented CNG engines, although none of them is yet in series production. The problem is not so much the engine technology but logistics. You can provide diesel at every construction site, but providing gas is almost impossible. Furthermore, construction machines often have to change their operation site at short notice, and the risk that the wrong machine is at the wrong place at the wrong time is very high. No, I can't imagine CNG construction machines being used on a wide scale.

Tier 5 is to come into force from 2019. What challenges do you see here?

For many manufacturers, it will be very difficult above all to meet the deadline.

Although there is a new proposal to delay the date of introduction for some power classes, it will nevertheless be very tight. The technology for Tier 5 is known, but the application and calibration of the exhaust aftertreatment systems is in some cases difficult and time-consuming. If manufacturers have not allocated sufficient space for installing these systems in the machine at an early stage in the development process, they may have to make design modifications to the machine – and that will take time. What is more, the problem of small production volumes and the wide variety of different machines, which are typical characteristics of construction machines, will also come into play once again. Hence, for some machines Tier 5 may well mean the end of the road for economic reasons.

Dr. Dekena, thank you very much for this interesting interview.

INTERVIEW: Andreas Fuchs

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