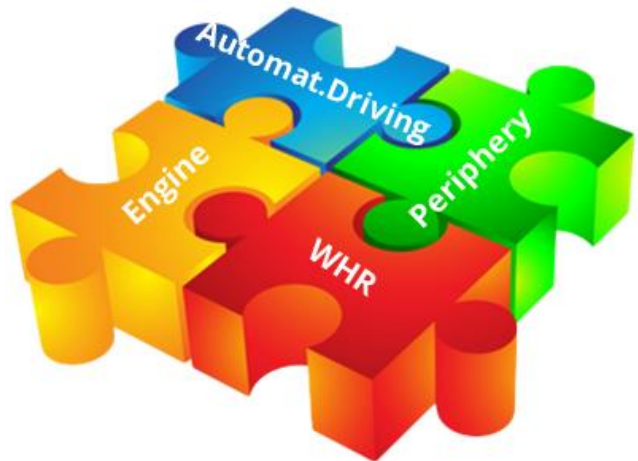


PRESS RELEASE

December 2015

Man and Machine – Automated driving: Impact on the internal combustion engine



The powertrain is at the heart of every motor vehicle. An increase in safety, efficiency and comfort is often mentioned as a benefit of autonomous driving. However, what real impact will autonomous driving have on existing architectures and components? Which products will benefit most from automation and connectivity?

Engine: Internal combustion engine or hybrid

Current internal combustion engines still offer significant potential for increasing efficiency, e.g. by minimizing abrasion losses, optimizing combustion strategies or recovering dissipated heat. All of these technologies target the optimization of transient operations. The term transient operation, also elasticity or partial load, mainly refers to inefficient operating areas, which must be made more efficient or minimized. This is the target of autonomous driving and connectivity. The engine and the entire powertrain will be connected and provided with information in order to anticipate the next driving operations. This, in turn, results in reduced transient operating conditions and fast attainment of an optimal load point in the engine map.

The internal combustion engine in hybrid powertrains is being increasingly optimized for just a few operating conditions. In the long term this will result in combustion strategies, such as a pure Miller cycle and inverted Atkinson cycle, as well as an engine layout similar to a stationary engine. The internal combustion engine has to cover fewer dynamic load conditions in the long term, because these will be covered by electrical traction or even a minimized partial load.

Auxiliary Components: From supercharger to coolant pumps

What does this development mean for auxiliary components and their suppliers? At first it might appear that there will be no noticeable effect for consumers. In the long run, however, there will certainly be important effects on complexity, actuators and control intelligence. Electrical traction can be transmitted through either a belt-driven starter generator, an electrical compressor or, e.g., a traction motor. Today single-stage or multi-stage turbochargers take care of this task. Redundancy is obviously not pursued. This

means that the integration of an electrical compressor reduces complexity and the efficiency of mechanical turbochargers. In order to optimize functions like thermal management through anticipation of the next operation conditions, it is necessary to implement a “demand-driven” function. This will logically not only result in an increasing penetration of electrified auxiliary or main coolant pumps but also lead to a higher “on-board” intelligence or even to thermal management modules. There is a distinct tendency towards increasing overall complexity.

Not only traditional suppliers can profit from this development. In particular, companies that focus on software, control algorithms and ECUs will profit from automation and connectivity. Schlegel und Partner anticipates that software and control components will account for up to 60% of the total added value resulting from autonomous driving and connectivity.

New technologies: Waste heat recovery

Not only existing components are affected by this development. There are possibilities for new technologies, e.g. Waste Heat Recovery (WHR) systems, that are benefiting from higher automation stages. Waste heat recovery aims to convert waste heat into traction or electrical energy. This can be accomplished by various systems, e.g. organic Rankine cycle systems or thermoelectric generators. In our next newsletter these technologies will be further analyzed.

Outlook

Autonomous driving and connectivity are increasing the complexity of existing components or establishing new opportunities for innovative new systems.

Complexity is mainly controlled through more flexible and complex control software and control algorithms. The increasing relevance of mechatronics is a problem for medium-sized suppliers. Schlegel und Partner can competently accompany you in dealing with this issue in order to improve the long-term prospects of your business.

Please do not hesitate to contact us for further information about our newsletter series “Connectivity and autonomous driving”.

For further information or if you have any question please contact us under the following contact information:

Mr Daniel Kennel, Phone +49 6201 9915 62,

Daniel.Kennel@SchlegelundPartner.de

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