

RDE-ready thanks  
to technical  
plastic parts

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## Authors

- » Heinz Bühl, Vice President Intake Manifold Systems
- » Dr. Heinz Fuchs, Vice President Technical Plastic Parts

With innovative technologies, MANN+HUMMEL is helping the international automobile industry to reach its CO<sub>2</sub> targets. From resonance charging through integrated charge air cooling and thermal management to integration of electrical supercharging – the system supplier provides the corresponding focus through the functions of the product group coordinators for intake manifolds and for technical plastic parts.

## Holistic approach

The role of the product group coordinators primarily comprises acting in an interdisciplinary manner in the company, because they are responsible for everything from strategy through to manufacturing – you could say they are the entrepreneurs within the company. This is a huge challenge that simultaneously offers great potential for change and fun. The particular thing about this for both experts is the comprehensive technical responsibility. In order to meet this challenge, they maintain continuous exchange

with the development departments of customers, and future engine generations and requirements are coordinated with the pre-development departments. As a result, the experts from MANN+HUMMEL can elaborate strategies and fields of action which are fundamental for the future. Comprehensive system know-how regarding customers' needs, the demand for enhanced functionality and the integration of new product ideas make possible improvements in current products and innovations. The results of these processes are not "moon landings", but market-ready products that will not disappear into drawers but will end up on the street.

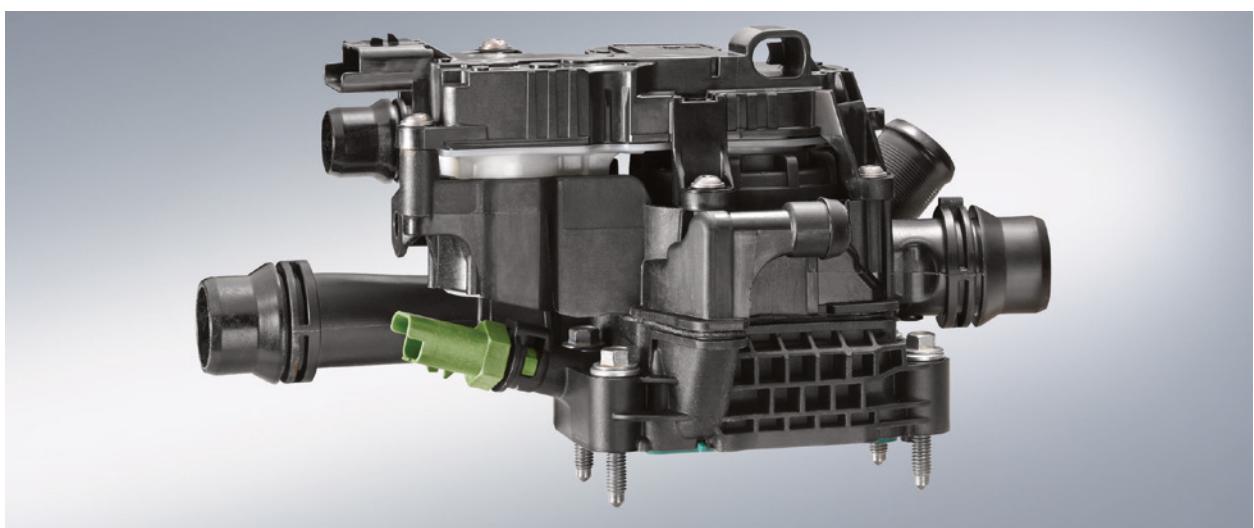


FIGURE 1: Electronically actuated ACT valve (Active Cooling Thermal Management valve)(© MANN+HUMMEL)



FIGURE 2: Active intake module with integrated charge air cooling and electrical booster compressor  
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The advantage for customers lies precisely in this holistic approach. When an innovation is taken from product idea through to manufacturing by one group, that group bears complete responsibility for the implementation of the idea. The prerequisite for this is always the ability to bring it to commercial manufacturing and full functionality.

### Air and liquid management

In response to the demand to reduce CO<sub>2</sub> emissions, MANN+HUMMEL has elaborated numerous solution approaches. To this end, the fuel consumption of vehicles must first be lowered further. The specialists in product innovation are therefore relying on air and liquid management. Some innovations, such as the ACT valve (Active Cooling Thermal Management), FIGURE 1, for high-precision switching of cooling circuits, or weight-reduced components lower CO<sub>2</sub> emissions directly. But other

products also make possible the use of modern engine concepts to minimize consumption.

For the product group coordinators of MANN+HUMMEL these include, for example, efficient oil separators for crankcase ventilation and switching valves in the low pressure exhaust gas recirculation. The company is focused on supporting consumption-optimized engine technology, and therefore uses lighter structural components with lower friction, or reduced pressure losses at higher compression and more variability in the intake line.

One very interesting solution that MANN+HUMMEL is currently offering is the charge air cooling of intake manifolds, which can help to further enhance the efficiency of turbocharging, FIGURE 2. According to our own information, that can save up to 3 g CO<sub>2</sub>/km. With this integrated concept, MANN+HUMMEL has already succeeded in winning several series production orders. In downspeeding too, new processes have been successfully established. This involves a high torque at low speeds,



FIGURE 3: The active charge air line switches, depending on the charging status of the engine, between torque mode and power mode (© MANN+HUMMEL)

termed low-end torque. For this, an active charge air line was developed, whereby the line length can be switched and thus the pulsation in the intake area can be used, FIGURE 3. The integration of the electric booster in the suction line has similar aims. This electrically driven supercharger uses a leverage effect: ten times the electrical power introduced can be used at the crankshaft due to there being more air in the combustion chamber and more fuel injected. Plastics technology also offers further potential: today at MANN+HUMMEL, it is not just oil filter elements and air filter systems that are developed and manufactured successfully in plastic, but intake manifolds, charge air ducts, oil sumps, FIGURE 4, cylinder head covers and other peripheral products too. These products therefore offer customers a weight reduction through the substitution of the new material and also new functions

and integration options. Nowadays, the further development of materials, high-temperature-resistant materials and hot gas welding make possible wall thicknesses of only around 2 mm. With this lower wall thickness and greater structural strength, weight savings in the order of 20 to 25 % can generally be achieved. For a modern intake manifold that is, for example, 1.2 kg.

### Ideas for the future

In order to achieve even more in the future, a new system approach is to be selected and the question asked as to how the systems interact with one another and how, for example the charge air ducts and the intake manifolds can contribute to the optimum filling of the combustion chamber, which can be seen with resonance charging. As the real

drive emissions regulation has been adopted, the developers need such new solutions to meet the requirements, to maintain driving enjoyment and to do all this at an affordable price. For the OEMs, it is interesting to invest in these products as this further improves the efficiency of their engines. These products also often work as enabling technologies, making it possible to use engine technologies that lead to reduced emissions.

“Enabling” in the context of oil separation in crankcase ventilation, for example, refers to the fact that for rising turbo pressures and heavy oil vapors, one needs very high oil separation rates, which in and of itself does not save on CO<sub>2</sub>, but does permit even higher turbo pressures, more viscous oil and a more finely honed combustion process. Another option is thermal management, with which MANN+HUMMEL aims to optimize the thermal characteristics of the engine. This is because heat can lower consumption by 1 to 2 %, when it is possible to bring it from where it is created to where it is needed.

## Hybridization

There is potential too in the area of electromobility; particularly in the hybridization of the drivetrain. In this area, MANN+HUMMEL offers a whole range of products for the climate control of batteries: battery frames, degassing units as well as drying and deionization components. This all enables the use of hybrid vehicles for the first time, which in turn reduces CO<sub>2</sub> emissions.

MANN+HUMMEL has already provided for the future: the company has a range of solutions in the areas of air management and liquid management that will directly reduce consumption and CO<sub>2</sub> emissions. Other products work as enabling technologies and make it possible for customers to introduce new technologies themselves. This applies to combustion engines and electrical drives. And as many innovations will only come onto the market in the next few years or in some cases are still in predevelopment, an exciting future is already guaranteed.



FIGURE 4: Plastic oil sump with high level of integration (© MANN+HUMMEL)