Modular and highly efficient: new valve covers with integrated oil mist separation

Hanover, September 2012 – New valve covers have been developed for the new engine platform of a large European commercial vehicle manufacturer. The focal points for the development of this cover with integrated oil separation were ultrahigh separation levels and a modular concept for use in the four-cylinder and six-cylinder models of an engine family.

Walk-on areas, in particular, and a suitable structure for reducing acoustic emissions were designed for strength. The intake line of the compressor for the air brake was also successfully integrated, which reduced the number of variants of this line to a minimum.

Development started with investigations into a suitable blow-by sampling point that would provide low raw oil emissions for oil separation at nearly any planned engine inclination. These are challenging requirements, as the engine platform is used in a large number of vehicles, from mid-range trucks to various offroad vehicles. After precleaning, the blow-by makes it way to the switched impactor/fine separator developed by MAHLE. Since the differential pressure of the MAHLE separation system is the same for a wide range of blow-by volume flow rates, identical components were able to be used for four-cylinder and six-cylinder applications. The same separation unit, consisting of impactors and pressure regulation, can be used for both engines, despite their different blow-by levels. Another highlight is the use of a specially developed pressure regulator that reuses the energy from compression to provide very fine separation of the oil mist. All passive energy sources are thus put to use to achieve ultrahigh separation levels. Despite a very fine droplet spectrum for the engine, the impactor technology separates 1 µm particles at over 90 percent.
Clean gas values of below 0.9 g/h have been achieved in the full-load range for the six-cylinder engine. The cleaned blow-by then travels in a clean gas channel within the cover and is fed into the cylinder head. Hose connections are thus eliminated.

Extensive calculations have been performed, particularly for the accessibility and acoustic performance of the cover. Since the height of the cover is very low, a support on the camshaft frame is used to provide walk-on stability. The cover bends in a defined manner until it reaches the support points. Sound emission is also an important function of the valve cover. Appropriate ribbing on the inner side of the cover ensures that no unpleasant noise is emitted during engine operation.

When looking into the engine compartment of a truck, the valve cover is the first thing that meets the eye. Appearance was therefore also considered in the design of the cover. The components were arranged as symmetrically as possible, in order to achieve an attractive appearance. Appropriate brand emblems can further improve the appearance of the valve cover.

**About MAHLE**
The MAHLE Group is one of the 30 largest companies in the automotive supply industry worldwide. With its two business units Engine Systems and Components and Filtration and Engine Peripherals, MAHLE ranks among the top three systems suppliers worldwide for piston systems, cylinder components, as well as valve train, air management, and liquid management systems. MAHLE’s industrial activities are combined in the Industry business unit. These include the areas of large engines, industrial filtration, as well as cooling and air conditioning systems. The Aftermarket business unit serves the independent spare parts market with MAHLE products in OE quality. In 2011, the MAHLE Group generated sales of approximately EUR 6 billion; around 49,000 employees work at over 100 production plants and eight research and development centers.
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