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PRESSRELEASE

Active fuel prefilter module for diesel engines used around the world

Frankfurt, September 2013 – The strategies of part replication and modular design offer great potential for serving global markets efficiently in high quantities. On the powertrain side, the pinnacle of this approach is the so-called world engine, an engine platform for use in every region. This concept presents substantial technical challenges. On the one hand, the engine must meet the partly strict exhaust gas legislation, which leads to a high level of technological advancement. On the other hand, it is this sophisticated level of technology that is confronted with different biofuel shares and fuel quality levels. MAHLE has thus developed an active fuel prefilter for diesel engines that allows the engine to be used around the world based on its reliable separation of water and contaminants.

In order to comply with demanding emissions limits, modern diesel engines typically employ common rail injection systems. These are extremely sensitive to solid particles and diesel fuel containing unsolved water. Since world engines are also used in countries with poor fuel quality and varying shares of biofuel, it is necessary to enable optimal separation of contaminants and water even under these conditions. Biodiesel is critical because it has a hygroscopic effect and consequently binds additional moisture from its environment. If fuel does not contain any special additives to prevent corrosion along with its increased water content, the risk of damage to the injection system increases.

As a high degree of water separation is required in order to protect the fuel system components, regardless of service life, dirt content, or fuel quality, MAHLE has developed a solution with the active prefilter module that achieves a separation level of up to 98 percent in normal operation. The separation of water

from fuel is fundamentally dependent on the volume flow rate; separation levels drop particularly at high volume flow rates. Previously, separation systems were integrated in the fuel filter module near the engine on the high-pressure side. This meant that separation was dependent on the transient volume flow as a function of the load state of the engine. The active prefilter is now located in a separate circuit, which due to the integration of a so-called hopper tank that acts as an intermediate tank can be charged with a largely constant volume flow rate. This rate is optimized for the filter medium. In addition, this so-called suction-side arrangement can prevent fine diesel-water emulsions that are difficult to separate and are generally caused by the primary pump.

The fuel is fed into the prefilter from the main tank and cleaned of large contaminants and water in sequential steps. This process is based on the proven principle of two- or three-stage water separation from the latest series of heavy-duty fuel modules. It utilizes a filter medium for coarse separation, a hydrophilic nonwoven fabric, and a hydrophobic final separator medium if needed. The cleaned fuel then flows into the hopper tank, from where it is extracted toward the engine through the primary pump. The unused fuel returns from the engine via a return line to the hopper tank, which in turn is connected to the fuel tank through another return line. By means of this line, the excess diesel fuel can be discharged and otherwise serves to provide pressure compensation.

The separated water is collected. A sensor detects the water level and sends a signal to the vehicle via the integrated electronic controller. The separated water is discharged manually or automatically using the patented BlueDrain® system.

The amount of fuel held in the hopper tank can be specified depending on the control strategy. It is possible to actuate the transfer pump as needed, for example, to maintain the volume flow within defined limits depending on the load cycle of the

engine. In the future, this can be further optimized by networking with topographical data and the navigation system. The expected fuel consumption would then be predictable and could be held available as a buffer.

By shifting the active prefilter to a low-pressure system, MAHLE has been able to produce a highly efficient water separation system that achieves a very high degree of performance throughout the service life of the filter medium. The module thus allows a diesel engine to be used throughout the world, regardless of fuel quality and biofuel share. At the same time, the design of the components that are subject to loading can be simplified by shifting them out of the high-pressure region, which nearly compensates for the additional effort of providing a separate circuit. The active prefilter was constructed as a functional prototype at MAHLE and tested extensively on the test bench and engine test rig. The application is currently being prepared for predevelopment together with a manufacturer.

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 as well as 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. The Industry business unit bundles the MAHLE Group's industrial activities. 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 2012, the MAHLE Group achieved sales of nearly EUR 6.2 billion (USD 7.9 billion); approximately 48,000 employees work at over 100 production plants and 7 research and development centers.

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