



# Highly integrated metering units for cleaner air

Highly integrated metering units form an integral part of today's state-of-the-art exhaust aftertreatment technology for combustion engines. In fact, they are essential in reducing CO<sub>2</sub> emissions.

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Engineers have long been focusing on the technical solutions required to purify exhaust gases – well before the recent emissions scandal. Whether powered by diesel or petrol, all combustion engines produce exhaust gases. Indeed, they are unavoidable given the physical and chemical processes involved. One of the key objectives within the automotive market is to ensure that exhaust gases are free from hazardous pollutants to the largest extent possible. At the same time, statutory provisions governing this industry are such that car makers must find ways to reduce fuel consumption. This goes hand in hand with lower CO<sub>2</sub> emissions.



In parallel, however, consumers are looking for performance and a unique driving experience. What is more, they are unwilling to make any compromises when it comes to vehicle size, which explains the growing trend towards SUVs. Similar principles apply to the transport industry and mobile machinery sector, where diesel-powered units tend to be the norm. Among the harmful pollutants generally associated with diesel engines are nitrogen oxides (NO<sub>x</sub>) and particles of soot. So-called particulate filters are responsible for filtering soot particles from the exhaust gases produced by the engine. These filters have to be regenerated on

a regular basis, i.e., cleaned with the help of chemical processes. The reduction of nitrogen oxides is performed by SCR systems. SCR stands for Selective Catalytic Reduction, i.e., nitrogen oxides are converted to non-harmful nitrogen and water. The ammonia required for this reaction to take place within the system is supplied by an aqueous urea solution, referred to as AdBlue® or DEF (Diesel Exhaust Fluid). This aqueous solution is injected directly into the exhaust tract. In order to reduce the nitrogen oxides to the fullest extent possible, it is essential that AdBlue® is supplied in the correct ratio to match the engine's nitrogen oxide emissions at the

various points of operation. If the "dose" is too low, nitrogen oxide reduction will ultimately be less effective. If, however, the urea solution injected into the system is too highly dosed, there is a risk of so-called ammonia slip occurring within the unit. In this case, ammonia passes through the SCR un-reacted.

A high-precision metering unit is essential when it comes to measuring and supplying the required volume of AdBlue®. German engineering specialist Thomas develops and produces a range of state-of-the-art metering units and pumps used in this field of application. Drawing on more than fifty years' experience in the area of electromagnets and more than thirty years' expertise in metering pumps, the family-run company from Herdorf in the northern part of Germany's Rhineland-Palatinate region has now developed a new generation of metering systems. They are capable of measuring and delivering the required quantity of AdBlue® with pinpoint accuracy. Metering pumps such as the P1300 developed by Thomas can achieve repeat accuracy of < 2%. What is more, these pumps can operate in sub-zero conditions while fully loaded with fluid – without the risk of damage. This is particularly important given the fact that AdBlue® freezes at approx. -11°C and expands substantially. The overall design of the metering pump has to take account of this expansion in volume. The new generation of



Metering Pump P1300 from Thomas.

metering pumps has been thoroughly tested to ensure full functionality in these conditions. What is more, it has undergone endurance tests to fulfill the requirements of long service lives associated with trucks - achieving a consistently high quality as regards metering accuracy.

The P1300 pump is available in various designs with a range of hydraulic and electrical connections, which makes it the perfect choice for a host of applications. Alongside AdBlue®, P1300 series metering pumps are capable of supplying fuel. Therefore, they are particularly suited to systems used in the regeneration of diesel particulate filters. These systems also call for precision metering,

the prime objective being to use just as much fuel as needed. The regeneration of particulate filters is aimed at maintaining flow rates and functionality, thereby preventing any additional increase in pressure within the exhaust tract. Regeneration refers to the burn-off of soot particles collected within the filter itself by increasing the exhaust gas temperature. To be effective, the unit has to raise the temperature to over 500° C. This is achieved by adding diesel fuel to the exhaust tract. Particulate filters can also be regenerated by means of post-injection, which can be achieved largely without the involvement of engine management and irrespective of the state of operation. In this case, diesel fuel is injected directly into the exhaust gas via a nozzle or a thermal regenerator to achieve the required soot burn-out temperature. This method provides greater flexibility when it comes to selecting a suitable location to install the unit within the overall system. Thomas offers a highly integrated solution within this area, with the metering unit not only delivering the fuel but also generating the required operating pressure. Furthermore, the metering unit is extremely reliable, as it is designed to prevent uncontrolled fuel flow.

In contrast to systems that separate the tasks of metering and delivery, this highly integrated unit can be operated without the need for additional components such as sensors, valves, and injectors. As a result, the number of electrical and hydraulic interfaces can be greatly reduced, which helps to scale back the overall costs of the system. ■



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