

The next generation: an even more compact SCR module

EMITEC Gesellschaft für Emissionstechnologie mbH in Lohmar near Cologne is one of the leading manufacturers of catalytic converters and particulate filters. Following the takeover of the Danish company NoNO_x Emitec is able to deliver the right SCR technology for any motor vehicle (cars, trucks and non-road), stationary machinery, power stations, locomotives and ships that operate in the megawatt range. The company also supplies dosing modules with flow rates of up to 1,000 litres per hour. Both airless and air-assisted SCR modules are available for series production.

As part of ongoing developments the size of the SCR module for passenger cars was further reduced. At only 0.7 litres the new generation IIIb is much smaller than standard commercial systems with a volume of well over 1 litre. The innovative and compact dosing module with built-in control unit and sensors can be easily integrated in any AdBlue tank. All components are protected against freezing and the module includes all the necessary hydraulic and electrical connections. The module is designed to last for the lifetime of the vehicle. The injectors for the aqueous urea solution AdBlue are in-house developments or can be sourced from other suppliers, if necessary. Every parameter, such as spray angle, spray width, droplet size, etc., can be adapted to the specific application.

Since only a few millilitres of AdBlue have to be injected according to driving conditions it is important to pay particular attention to optimum and accurate dosing. Tests revealed that the droplet size distribution of the injected AdBlue peaks at a droplet diameter of around 40 µm. It is a well-known fact that even very small droplets exhibit a certain degree of mass inertia with regard to potential changes in direction. Therefore the injected AdBlue solution should be evaporated rather than merely atomised, if possible. The quality of evaporation depends largely on the temperature and the substrate structures as shown in the results of a research project of TU München. Emitec is the only supplier worldwide of structured – that is, turbulent – catalyst substrates whose urea decomposition and hydrolysis efficiency is far superior to that of conventional products.

In compact SCR systems the AdBlue is injected onto the back end of the oxidation catalyst, that is, the hydrolysis component, to ensure optimum evaporation and prevent the heated nozzle from cooling (the urea operating temperature is 165 °C). The nozzle is flush-fitted into the catalyst jacket. Depending on the operating cycle of the engine close-coupled systems may require air-cooled or water-cooled injectors. The addition of an electrically heated catalyst, the Emicat, further optimises evaporation and so increases the efficiency of the SCR catalyst. The power requirement of heated metal catalysts ranges between 1 and 3 kW depending on type. The resulting increase in the operating temperature in passenger cars of up to 100 °C (and a crucial 20 to 30 °C in commercial

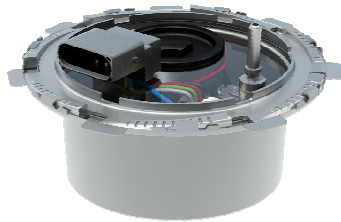
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vehicles) is particularly important to low-temperature diesel engines with SCR. Due to improved onboard electrical systems and new vehicle designs (e.g. braking energy recovery) the heated catalyst usually has no effect on fuel consumption, thus minimising its operating costs.

The newly developed dosing system consists of the following main components: tank with suction pipe, dosing unit, injection nozzle, sensors and control unit. The configuration and control of the system allow it to be installed as a stand-alone version (with its own sensors), as a retrofit module or as original equipment that can be integrated in the vehicle's electronic system. The individual components can be used in passenger cars with a 12-volt system and commercial vehicles with a 24-volt system and are easily adapted. Depending on the type of vehicle and the available installation space the tank geometry and size (volume) can be customised to meet specific requirements. The aqueous urea solution is extracted via the suction pipe whose length can be adjusted to the tank geometry.



SCR dosing module



Tank with integrated SCR dosing module

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