Dosing Components for SCR–Systems
The future stringent emission requirements for heavy duty diesel trucks in the USA, Europe and Japan will make it necessary to use an emission control system to reduce fuel consumption, NOx, CO and particulate matter.

For many years Hydraulik-Ring develops dosing systems and components for exhaust aftertreatment systems functioning according to the SCR-principle.

The components made by Hydraulik-Ring have been used successfully in series production for many years.

The requirements dosing systems must meet as to installation size, precise dosing and cost are constantly increasing.

With Hilite / Hydraulik-Ring you have a partner who offers optimal solutions for your application requirements.
Road traffic has a substantial part in global climate change. Especially heavy duty vehicles cause over 50% of the particulate and NOx emission. Particularly Diesel engines emit eight to ten times more NOx than gasoline engines although in the average they are 10-25% less thirsty and thus emit less CO₂ (-11%). This positive effect is annulled by the emission of particulate matter (soot) and NOx.

In past years legislation has reacted with increasingly stricter emission standards especially for diesel powered vehicles.

Abbreviations in this brochure:

- **SCR** = Selective catalytic reduction
- **g/bhp-hr** = Grams per brake horsepower-hour
- **g/kWh** = Grams per kilowatt hour
- **HC** = Hydrocarbon
- **NOx** = Oxides of nitrogen
- **PM** = Particulate matter
- **AdBlue®** = 32,5% aqueous urea water solution
- **EGR** = Exhaust gas recirculation
- **DPF** = Diesel particulate filter
Measures which can be taken within the engine had to reduce fuel consumption and particulate matter, but at the same time the amount of NOx increases. Starting with Euro 5 we can only get Diesel engines clean by exhaust aftertreatment. During the aftertreatment particulate matter and NOx are reduced.

If in the opposite case NOx emission is reduced by measures inside the engine, e.g. EGR (exhaust gas recirculation) which lowers the combustion temperature the amount of particulate matter and fuel consumption increase.

The SCR-system solves this trade-off by reducing fuel consumption inspite of reduction of PM and NOx.

Chemical Processes in the SCR-System

In the SCR-process (Selective catalytic reduction) ammonia reacts, in a special catalyst at a certain temperature with the NOx in the exhaust fumes.

Since pure ammonia is a dangerous substance, we inject in the SCR-process a 32.5 % aqueous solution (AdBlue®) into the exhaust tract before it enters the SCR-catalyst. Ammonia is released by means of a hydrolytic reaction and can react with the NOx in the SCR-catalyst. Hydrolysis is the splitting of a chemical compound by reaction with water. In this split one hydrogen atom goes to one “split-off piece” and the remaining hydroxyl group goes to the other piece.

The quantity of the injected urea depends on the NOx emission of the engine and thus on the current engine speed and torque. Therefor it is indispensable to control the injection process exactly.
The innovative, global development partner and series supplier for the Automotive Industry

In the dosing system of the first generation a pump transfers AdBlue® to the dosing unit. There depending of temperature and pressure the AdBlue® is dosed by an injection valve into a tube in which it is transported by an accelerated air stream as an aerosol to the injection nozzle in the exhaust gas.

The system is abt for controlled concepts, above all for vehicles with compressed air equipment.

Since 2005 more than 1000 times produced in series
Dosing systems of the second generation work without compressed air. Their special feature is the exact dosing into the exhaust stream by means of a predefined spray behaviour. This allows the system to work still more precisely in closed loop systems.

Legal requirements increase, package sizes cannot grow any bigger (Tank, AdBlue® tank, aggregates, catalysts, particle filters etc.). This means, that construction space is getting smaller, the distance for the hydrolytic process is getting shorter and its form is changing etc. Hilite is in the position to consider all these factors and to adopt the system to individual conditions and requirements.

Exact spray (Drop sizes < 27 µm) is decisive for the hydrolysis (further evaporation and splitting into ammonia and CO₂), so that the ammonia can react in the catalyst.

Finest spray allows excellent conversion rates (amount of the NOx reduction), but also the exact quantity is important since otherwise the conversion rates deteriorate and the ammonia slip becomes too big.
Simulation tools help to optimize systems and to apply them virtually. Thus we can e.g. determine both the optimal point of injection and the optimal injection angle.

**Test Potentials**

Hydraulik-Ring equipped with state of the art test equipment:

- Climatic chambers for any heat and frost tests
- Test stands for endurance testing of pumps, valves and actuators
- Shaking test stands which allow to expose the test specimen to maximum g-powers in all directions
- Hot gas test stand to measure the exact behaviour of the components at the exhaust pipe
- Component test stands
- Malvern Spray Analyzer for measuring the exact drop size.

**Features SCR-System**

- Very small drop size
- Ideally adapted distribution
- Most precise dosing quantity
- Highly dynamic adaption to engine operating condition
- Robust system
- Series experience due to 1000 times series application day in and day out.