AVT ET-073 **14.-18. May 2007 Florence**

The Impact of F-34 (SFP) and high Sulphur Diesel on Ground Equipment using Advanced Reduction Emission Technologies

The SCR-System in Military Application

Bienenda Wolfgang OPEA 53

Content

- Introduction
- Development of the exhaust threshold values standard from 1990 to 2008 in europe
- Present Technologies to reduce diesel exhaust emission for EURO 4/5
- What is the SCR-System?
- Effect of the SCR-System
- How works the SCR-System ?
- The SCR-System realised in Trucks
- The SCR-System realised in passenger vehicles
- Dieselquality (Sulphur Content) worldwide
- Influece of Dieselquality for the SCR-System
- Next stepps for the Industry and military User

Introduction

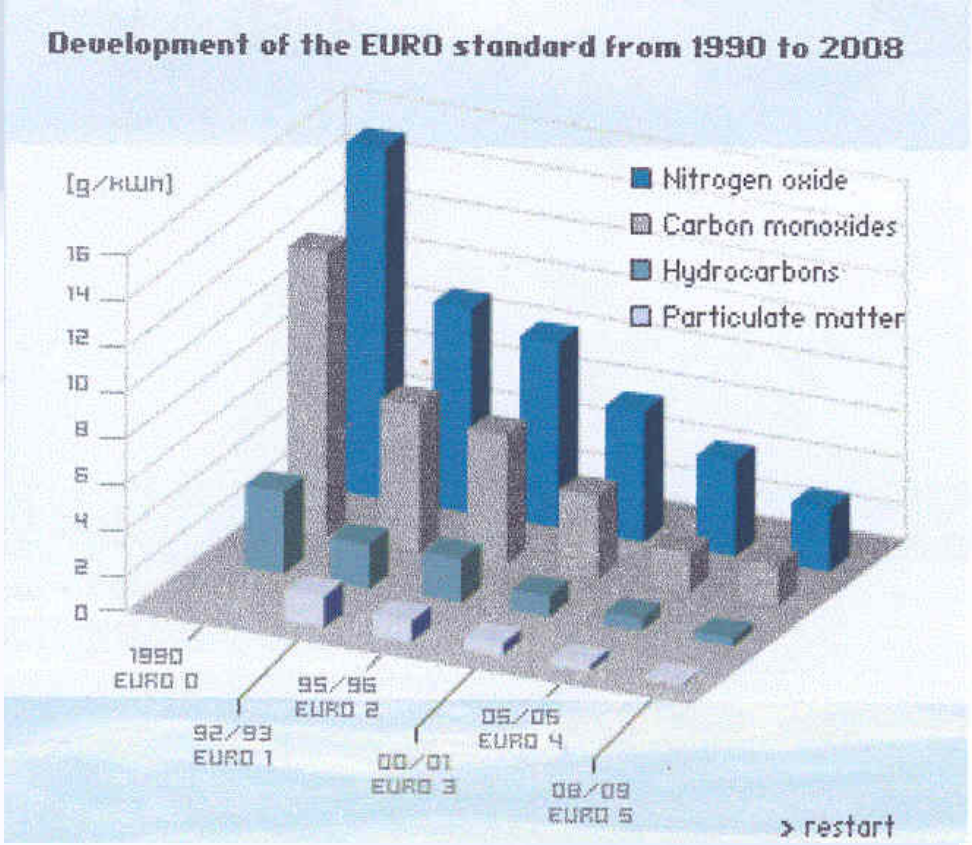
The development of new technologies for the exhaust threshold values EURO4/5 in europe has the consequence that we will have higher requirements for dieselquality for this systems.

So it will be necessary to investigate the effects of diesel with high sulphur or F-34 for military application.

Development of the exhaust threshold values standard from 1990 to 2008 in europe

The reduction percentage in the periode 1990-2008:

- Nitrogen oxide (NOx): 86%
- Carbon monoxide (CO): 87%
- Hydrocarbon (HC): 81%
- Particle emission (PM): 94%



Present Technologies to reduce diesel exhaust emission for EURO 4/5

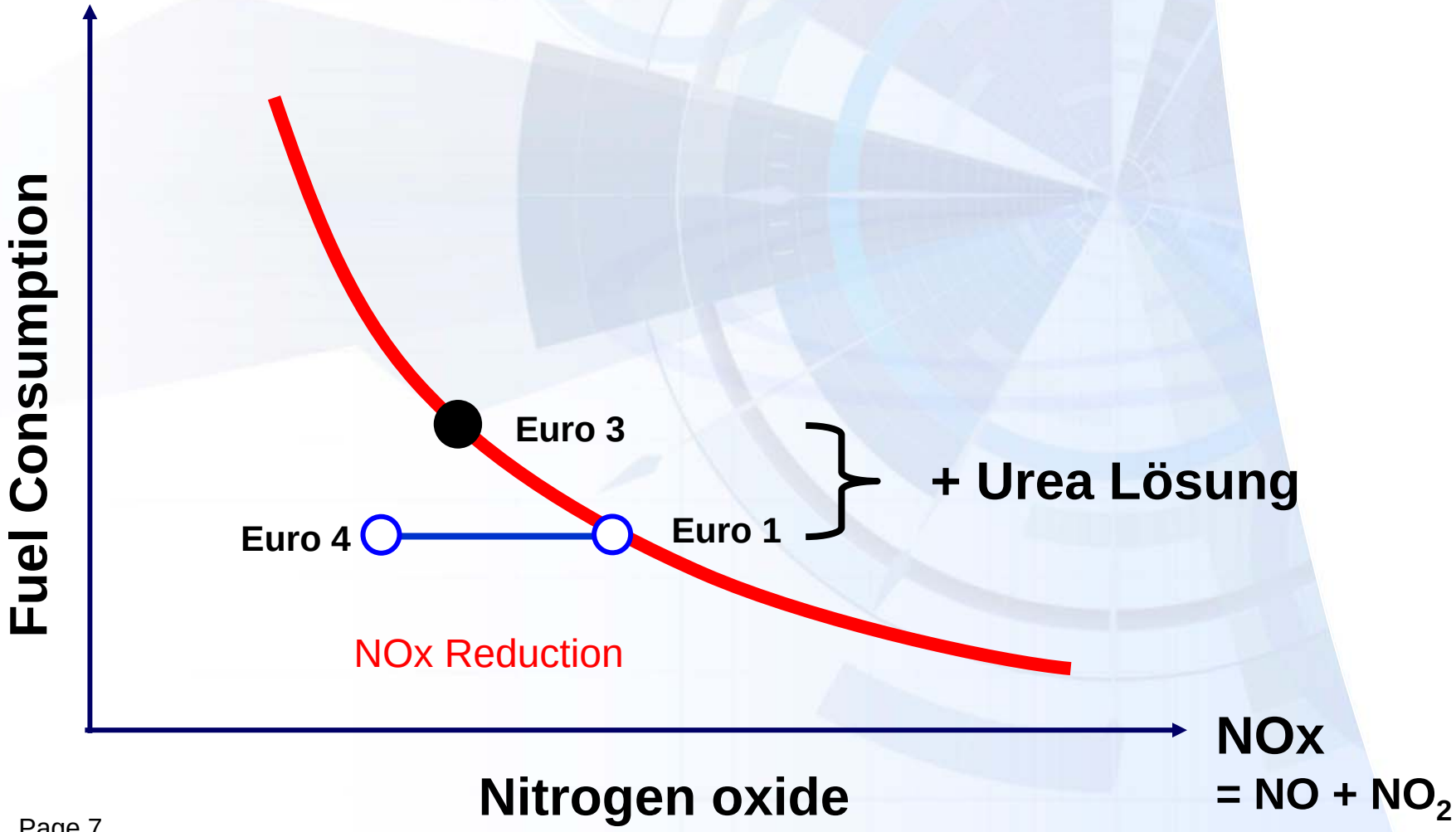
- SCR (**S**elective **C**atalytic **R**eduction)
- HCCI (**H**omogeneous **C**harge **C**ompression **I**gnition)
  Detailed explained by Mr. Bader
- EGR (**E**xhaust **G**as **R**ecirculation)
  Detailed Explained by Mr. Bader

EADS DEFENCE & SECURITY

What is the SCR-System ?

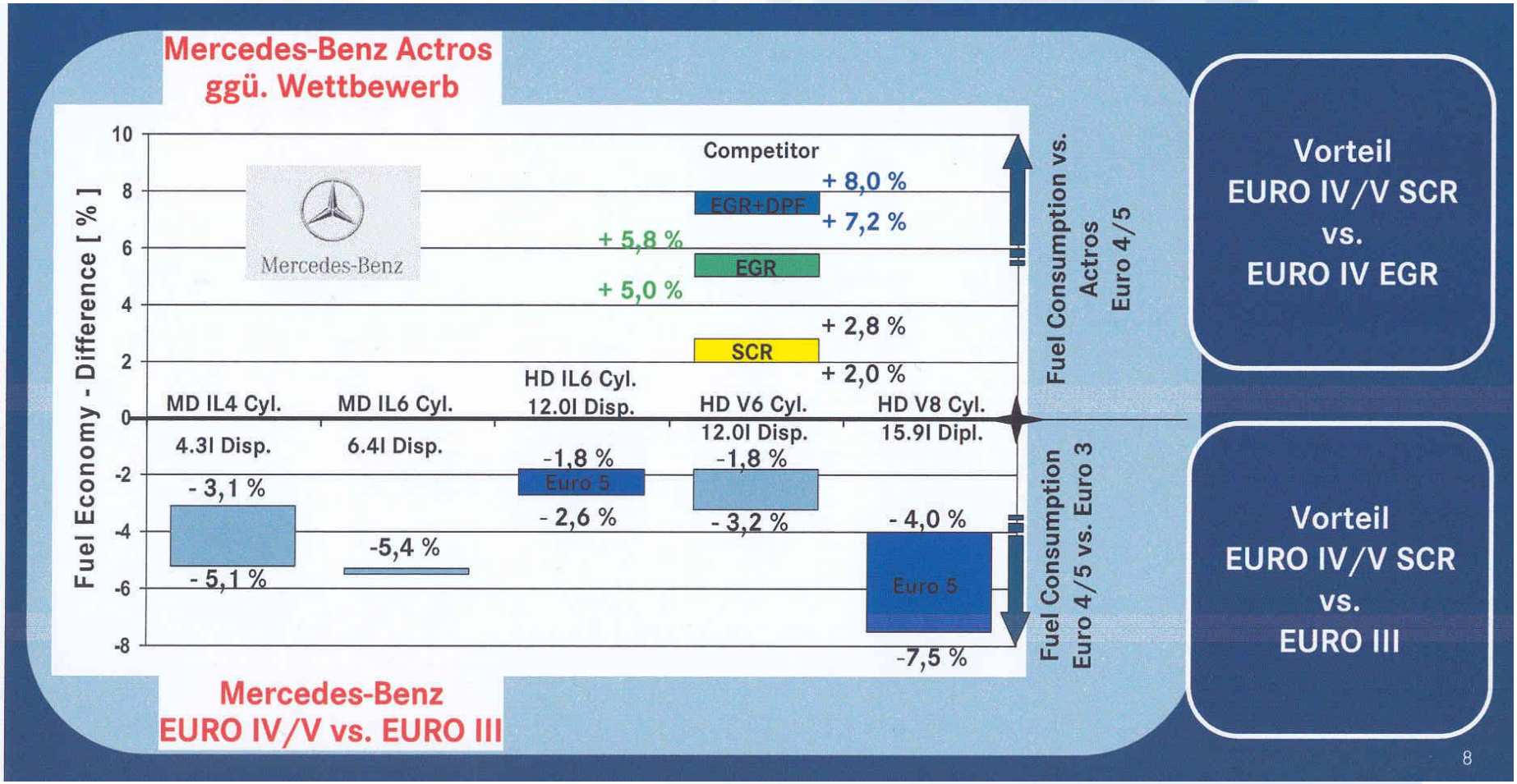
- The SCR-System (**S**elective **C**atalytic **R**eduction-System) is the specific elemination of Nitrogen-Oxides from the exhaust gas for diesel engines by using “AdBlue“ (Urea dissolved in water) and a catalytic converter realised in trucks and passenger cars.

Effect of the SCR-System

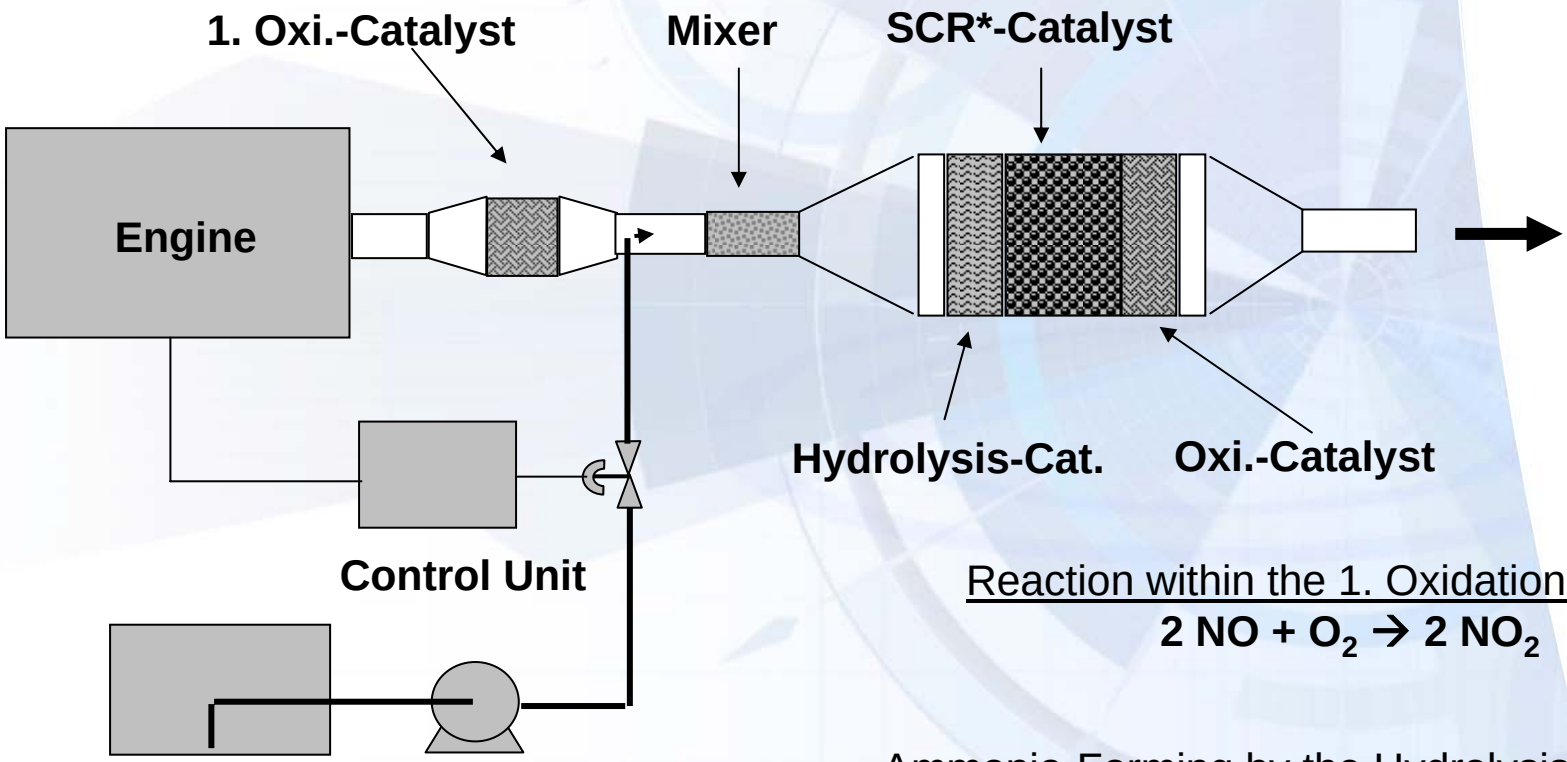


Effect of the SCR-System

An Main Effect of the SCR-System is the lower fuel Konsumtion



How works the SCR-System ?



Tank and Pump for AdBlue*
(* urea dissolved in water)

Reaction within the 1. Oxidation-Catalyst

$$2\ NO + O_2 \rightarrow 2\ NO_2$$

Ammonia-Forming by the Hydrolysis-Catalyst

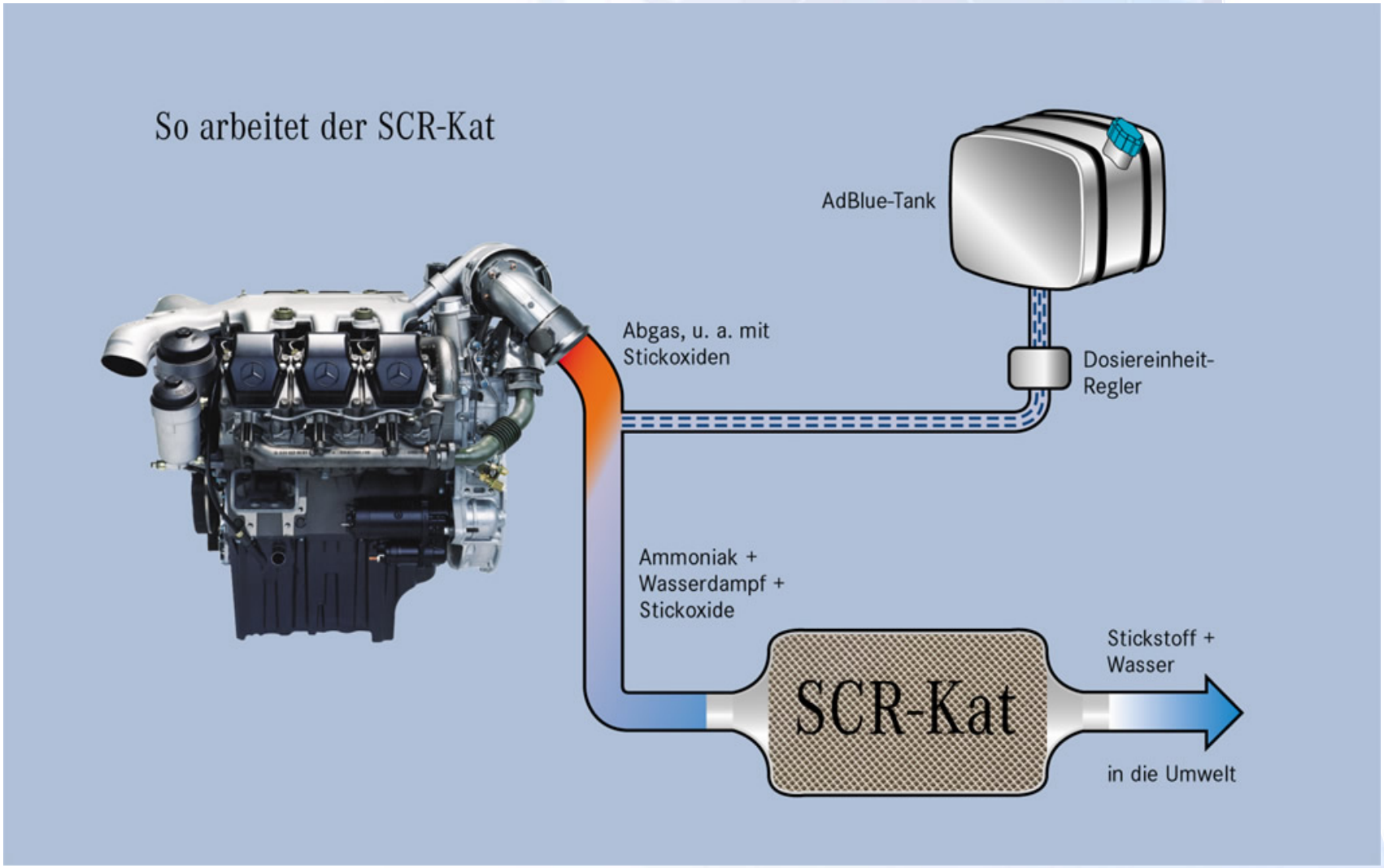
$$(NH_2)_2CO + H_2O \rightarrow CO_2 + 2\ NH_3$$

Reduction of the Nitrogen Oxide by the SCR-Catalyst

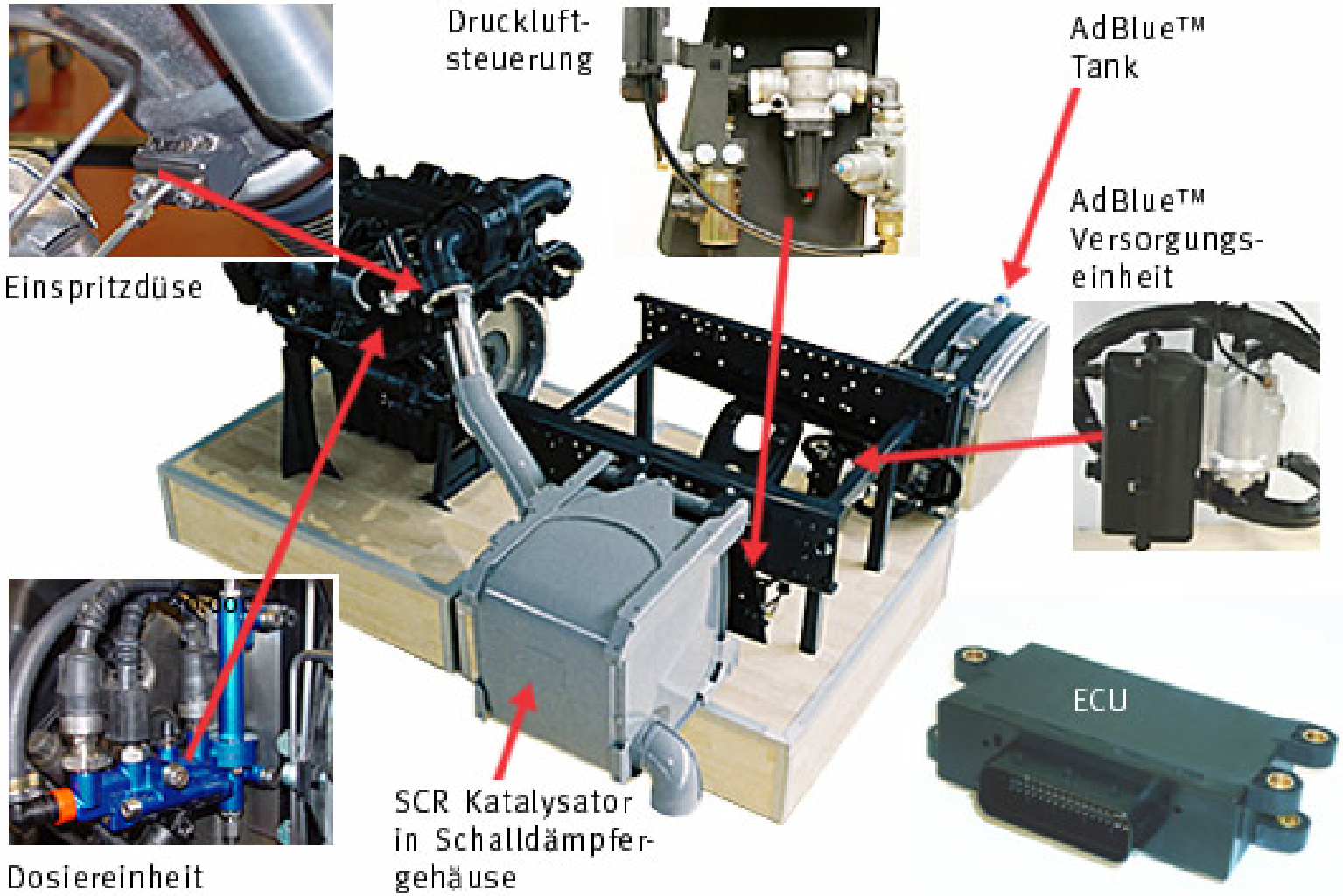
$$6\ NO_2 + 8\ NH_3 \rightarrow 7\ N_2 + 12\ H_2O$$

$$NO + NO_2 + 2\ NH_3 \rightarrow 2N_2 + 3\ H_2O$$

The SCR-System realised in Trucks

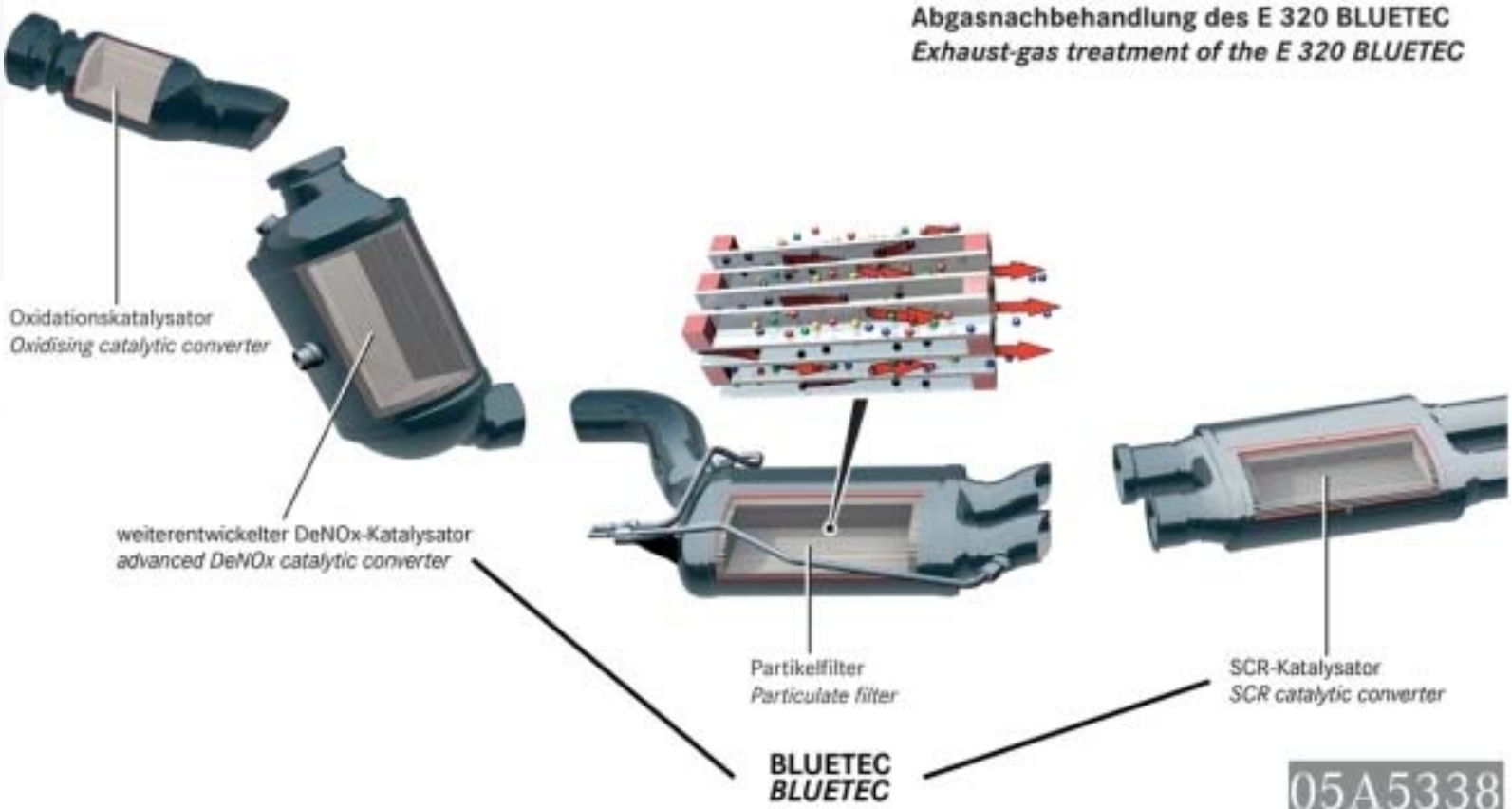


The SCR-System realised in Trucks

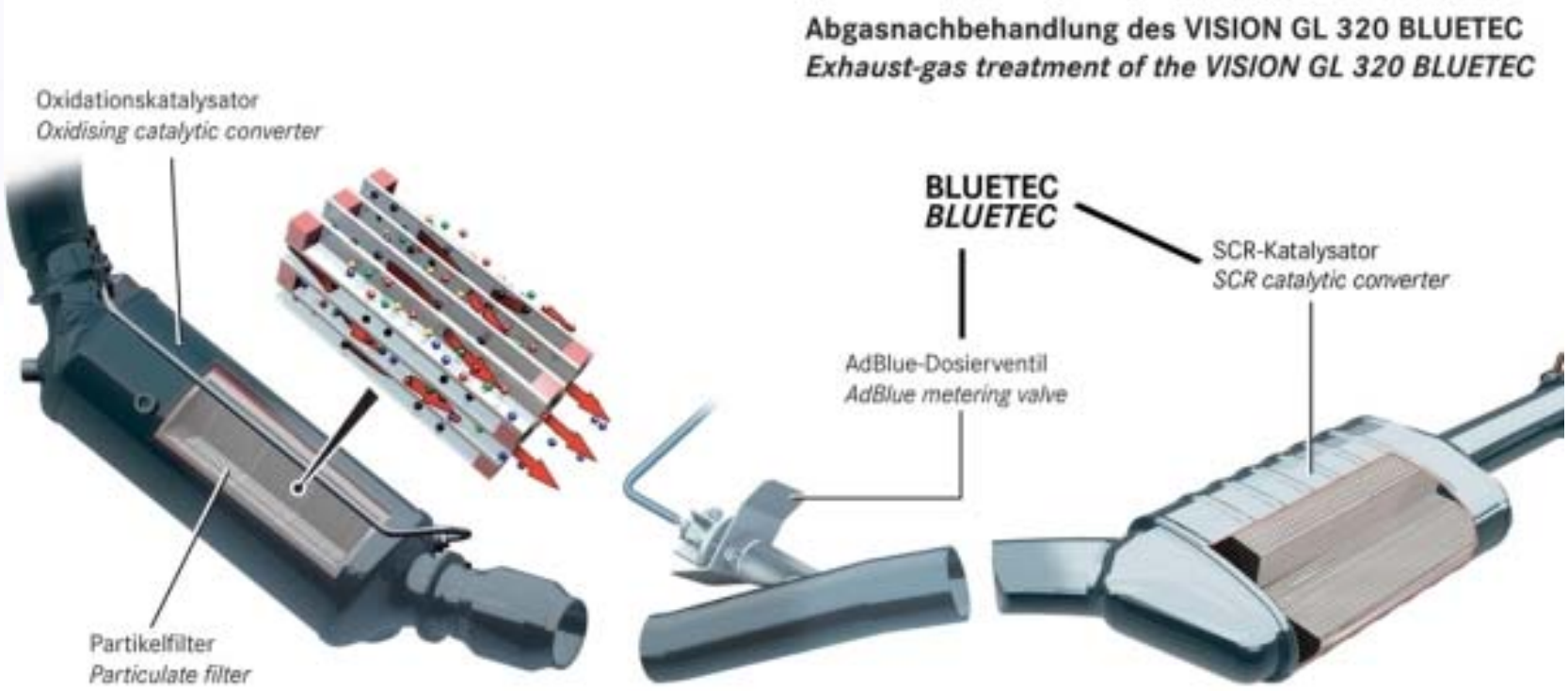


The SCR-System realised in passenger vehicles

Exhaust gas treatment in the E 320 BLUETEC. Self-sufficient operation thanks to an improved nitrogen oxide storage catalytic converter



Exhaust gas treatment in the Vision GL 320 BLUETEC



Dieselquality (Suphur Content) worldwide

- The sulphur content in diesel fuel depends on the local deposite of crude oil and refining technology.
- Sulphur in diesel fuels can range from 10 – 10.000 ppm
- Sometimes national diesel fuel with more sulphur than F-34

Influence of Dieselquality for the SCR-System

- The SCR-System is in principle a system which has only influence of the exhaustsystem. No Modification of the Engine is necessary.
- In case of use bad fuel or F-34 the function of the ECU has to be modified because the NOx-Sensor after the Catalytsystem will send the uneccaptable exhaust gas datas and the ECU will reduce the torque about 40% by heavy trucks and about 25% by light trucks. This will be also the case if the engine is running without “AdBlue“.

This will be for military application not acceptable

Next stepps for the Industry and military User

- Tests with an DC-Engine with SCR-System under military conditions by WIWEB (with F-34 / high sulphur fuel / no AdBlue).
- Solve the problem with the ECU

  for ex.: special military ECU

  Softwaremodification

  swith version: Military-Civil

Emission**C**ontrol**U**nit

Thank You for Your Attention !