

QUALITY TESTING OF THE DIESEL EXHAUST FLUID FOR REDUCING NITROGEN OXIDE EMISSION

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SCOPE

INA R&D Central testing laboratory) is equipped with state of modern analytical instruments and our analytical services are backed by qualified and experienced staff members. It requires important for developing new products and quality control of motor fuel oils at all levels of the chain: from production to logistics and end usage. Road transport remains the main source of toxic NO_x (nitrogen oxide) emissions because new European standards require a further reduction in hazardous air pollutants and emissions for diesel vehicles: passenger vehicles, trucks, construction, agricultural equipment and rail and marine engines.

EU's Green Deal, Sustainable and Smart Mobility Strategy

In 2022 the new regulation is an integral part of the EU's Green Deal, Sustainable and Smart Mobility Strategy and Zero Pollution Action Plan. The diesel exhaust fluid, AdBlue is an inexpensive and efficient option for lowering NO_x emissions. The solution is added to a separate storage tank in diesel-powered vehicles equipped with a selective catalytic reduction (SCR) technology system (Table 1 and Figure 1). This system aims to significantly reduce emissions of nitrogen oxide (NO_x) which are harmful to the environment and thus meet the stringent emission limits set by European standards which are standard for the control of toxic air emissions.



Table 1 Reactions involved in the NO_x reduction in diesel vehicles

Exhaust	Containing NO _x (NO and NO ₂)
AdBlue	Containing urea ((NH ₂) ₂ CO)
Thermolysis	(NH ₂) ₂ CO → NH ₃ + HNCO
Hydrolysis	HNCO + H ₂ O → NH ₃ + CO ₂
SCR	$4 \text{ NO} + 4 \text{ NH}_3 + \text{O}_2 \rightarrow 4 \text{ N}_2 + 6 \text{ H}_2\text{O}$ $\text{NO} + \text{NO}_2 + 2 \text{ NH}_3 \rightarrow 2 \text{ N}_2 + 3 \text{ H}_2\text{O}$ $6 \text{ NO}_2 + 8 \text{ NH}_3 \rightarrow 7 \text{ N}_2 + 12 \text{ H}_2\text{O}$
Output	N ₂ + H ₂ O

Table 2 Description standard ISO 22241-2 – Testing methods

Annex	Characteristic	Unit	Limit Value
A	Sampling test samples	-	-
B	Urea content by total nitrogen	% mas	31,8 – 33,2
C	Refractive index	nD20	1,3817-1,3850
D	Alkalinity as NH ₃	% mas max	0,2
E, F, H	Aldehyde*, ** biuret and ***phosphate	ppm max % mas max	* 5; ** 0,5 *** 0,3
G	Insolubles metter	ppm max	20
I	Trace metals	ppm max	0,5: Ca, Fe, Al, Mg, Na, K 0,2: Cu, Cr, Zn, Ni
J	FTIR spectrometry identification		FTIR spectrum

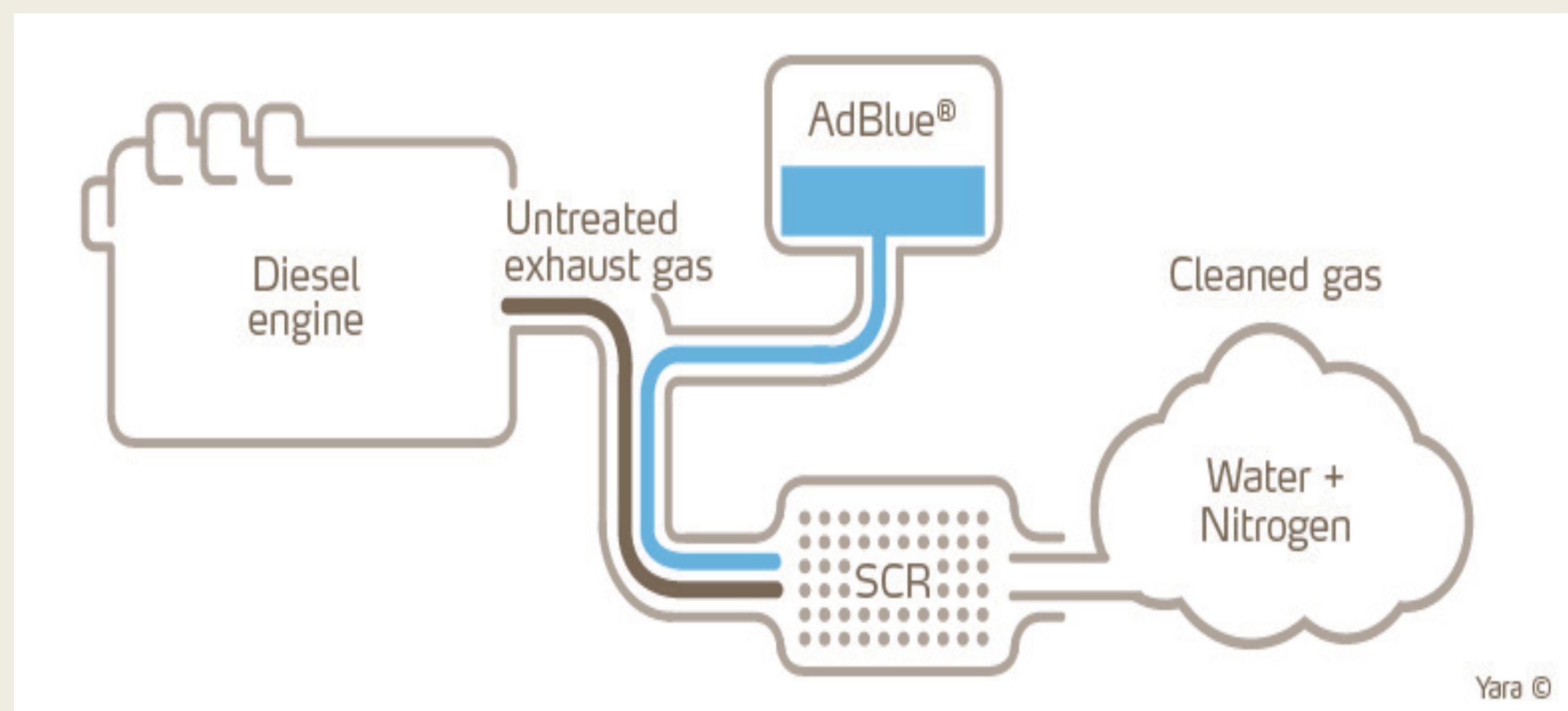


Figure 1 Scheme of NO_x reduction in diesel vehicles

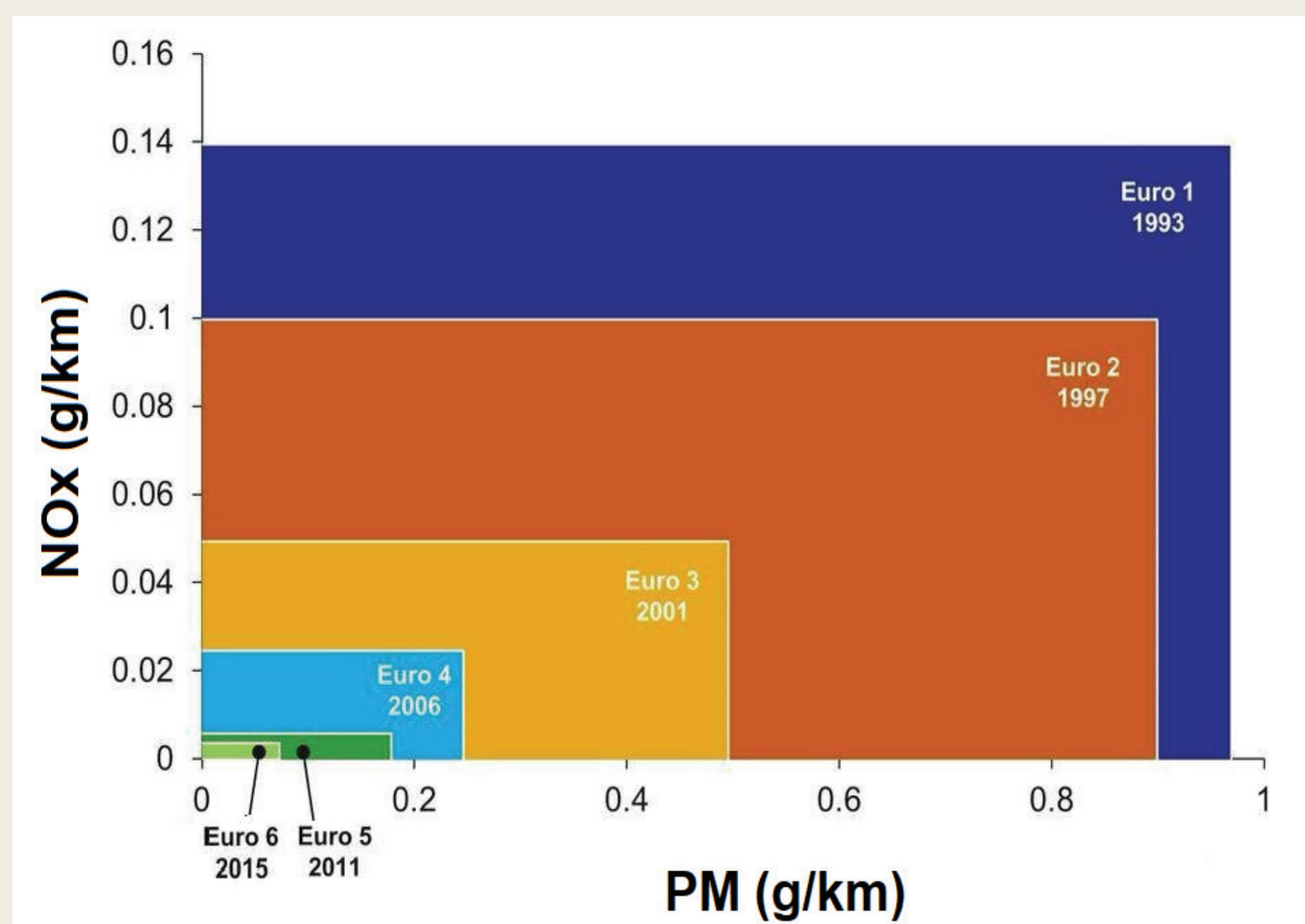


Figure 2 Scheme of EU standards (Euro 1 to Euro 6)

In future RD CTL work

- The procedure validation of test methods has been confirmed by an interlaboratory study between INA RD CTL and external laboratories.
- The introduction of these test methods will certainly affect the further improvement of the quality of processes and services for external and internal customers and the efficiency of the business performance in our laboratory.
- This will allow for increased competitiveness and better market positioning, ultimately affecting the entire company's profitability.

Normative references

- [1] ISO 22241-1, Diesel engines — NO_x reduction agent AUS 32 — Part 1: Quality requirements, 2019
- [2] ISO 22241-2, Diesel engines — NO_x reduction agent AUS 32 — Part 2: Test methods, 2019
- [3] ISO 22241-2, Diesel engines — NO_x reduction agent AUS 32 — Part 3: Handling, transportation and storage

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