

Past experience in improved fuel quality in Japan

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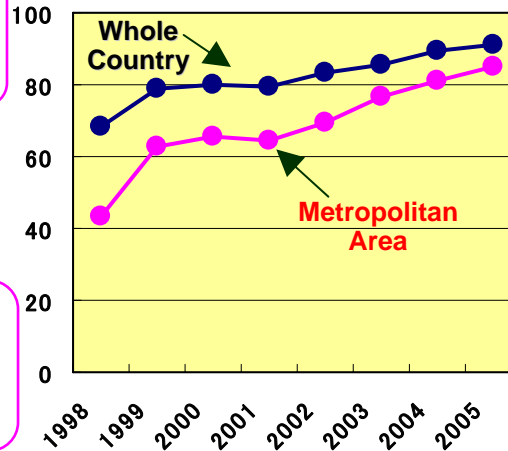
Air Pollution at Present

Air pollution is severe especially in metropolitan area

Attainment Rate in FY 2005
... NOx:85 % , PM:93%

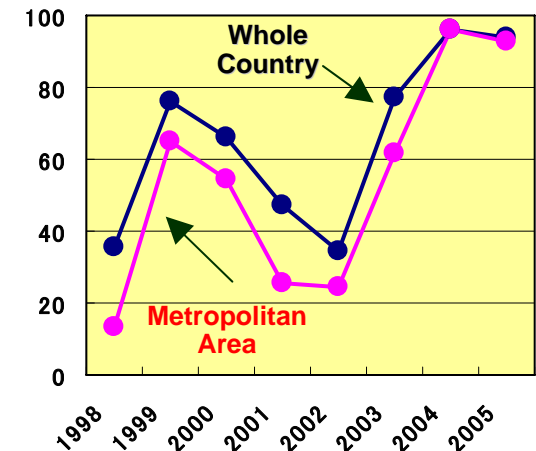
Diesel Vehicles are primary factor of air pollution
(NOx:42% , PM:43%)

Attainment Rate (%)



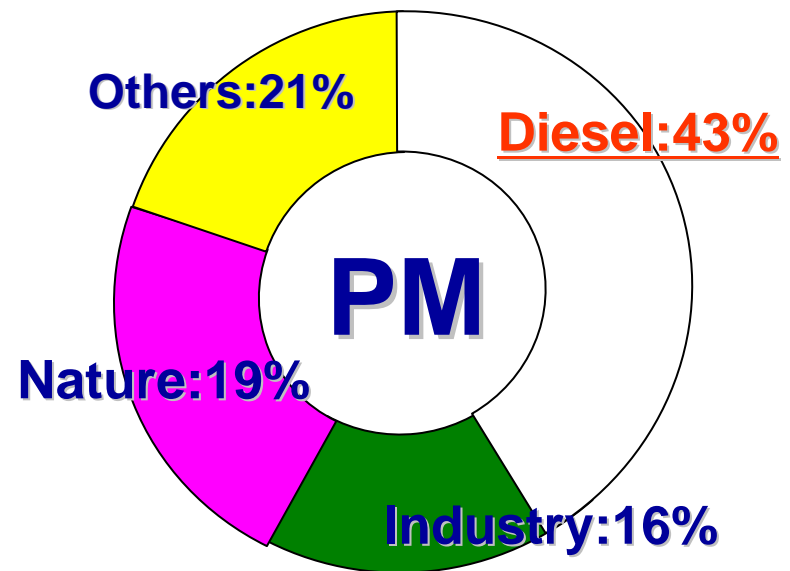
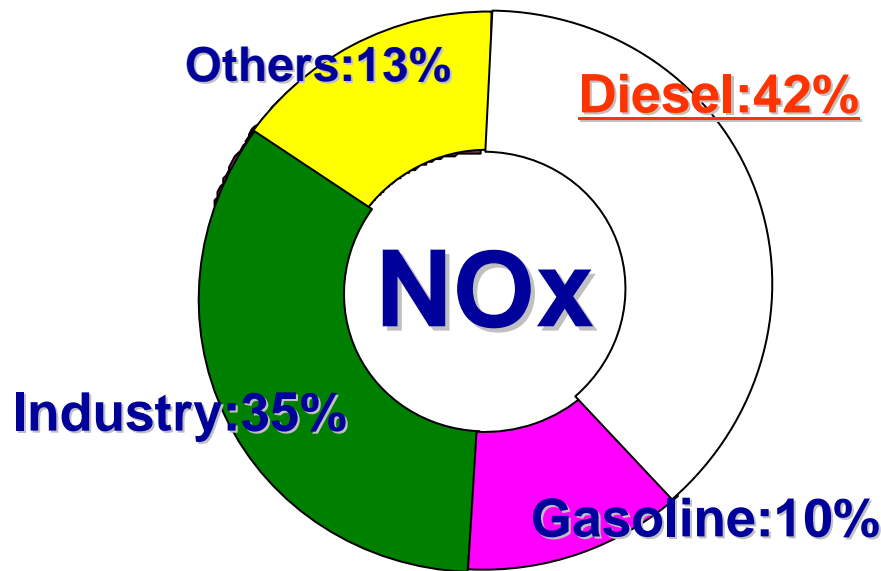
NO2

Attainment Rate (%)



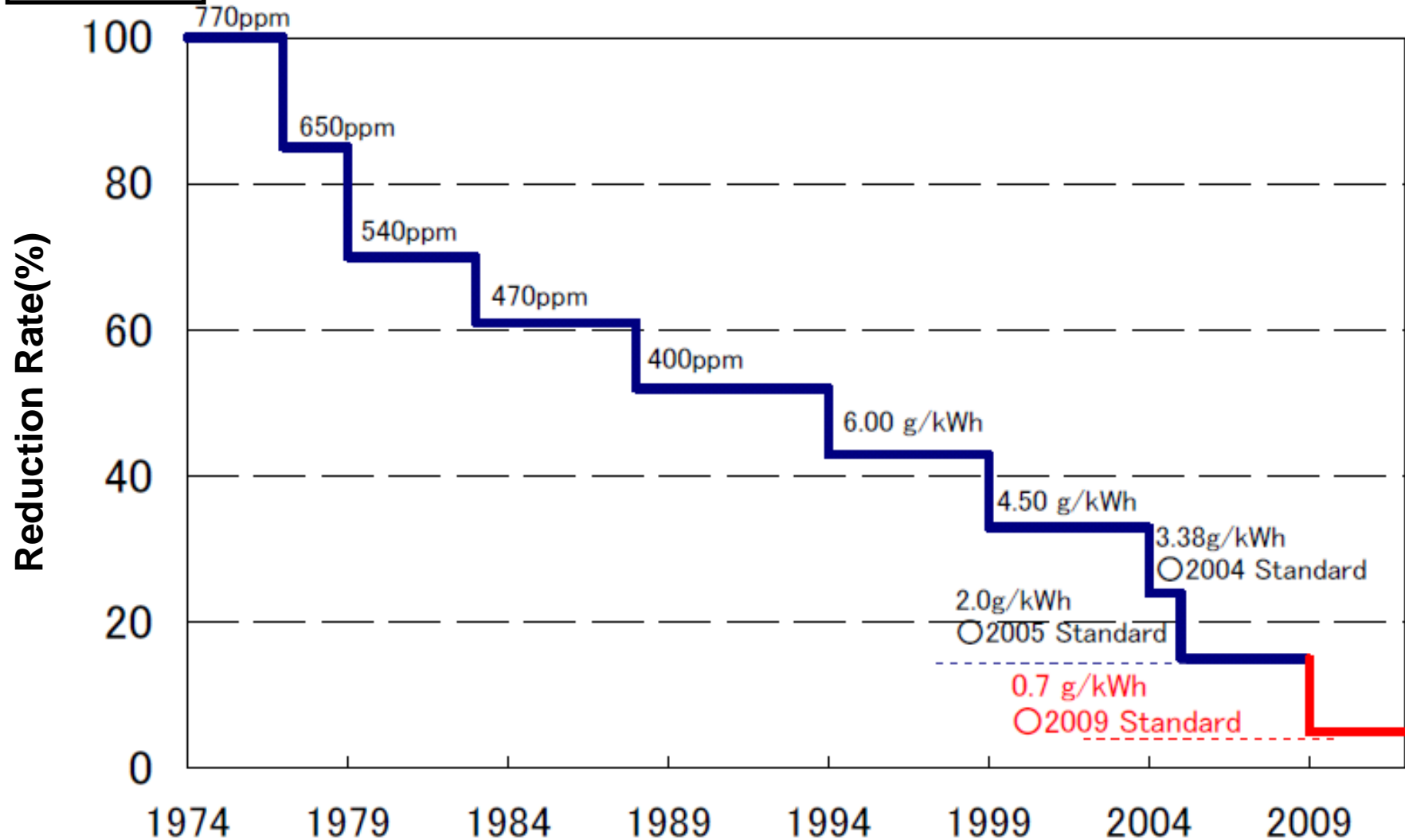
SPM

Ratio of Exhaust Emissions in Metropolitan Area (FY 2002)

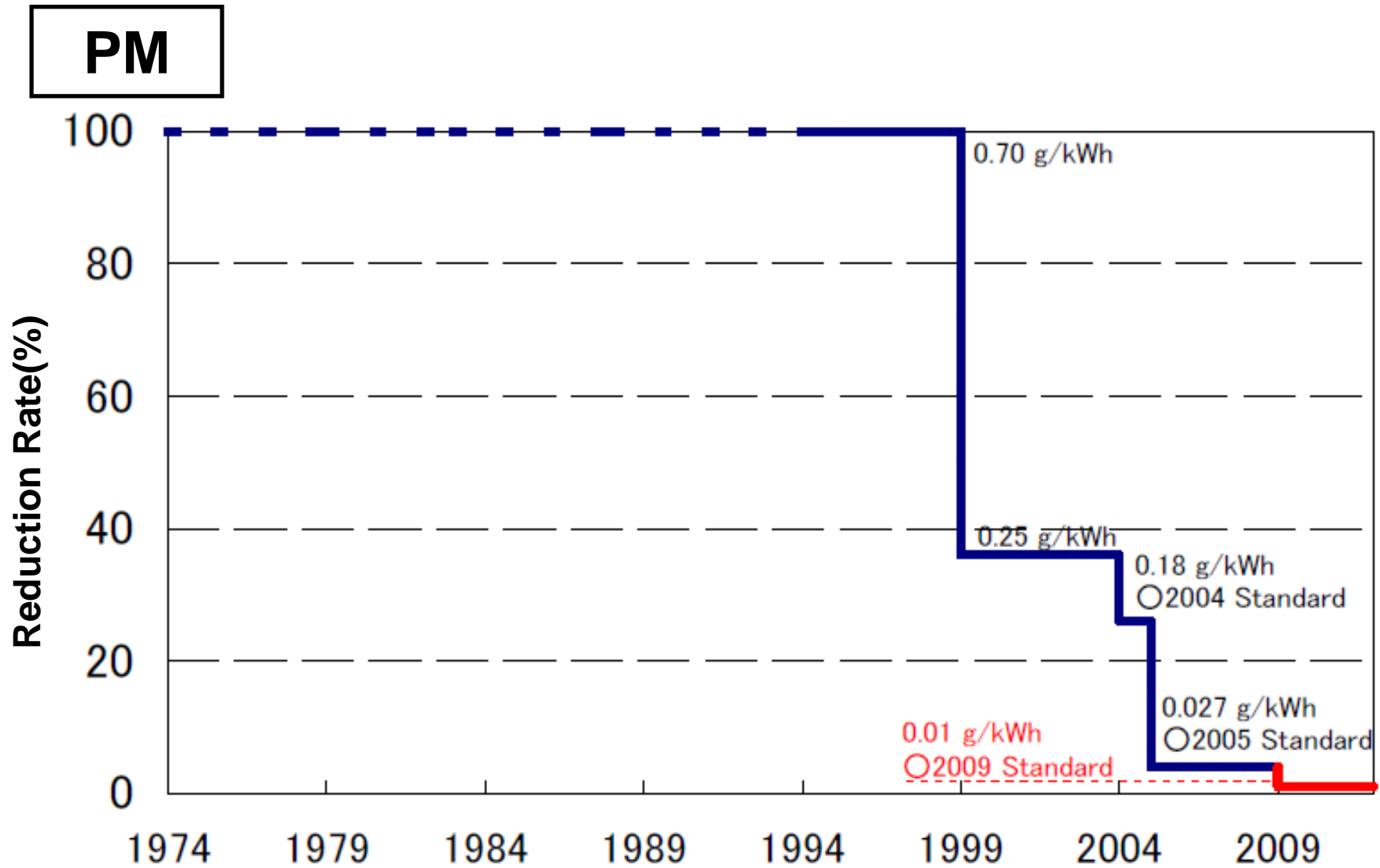


Change in Exhaust Regulation Standard (Diesel-Powered Heavy-Duty Vehicles)

NOx



Change in Exhaust Regulation Standard (Diesel-Powered Heavy-Duty Vehicles)



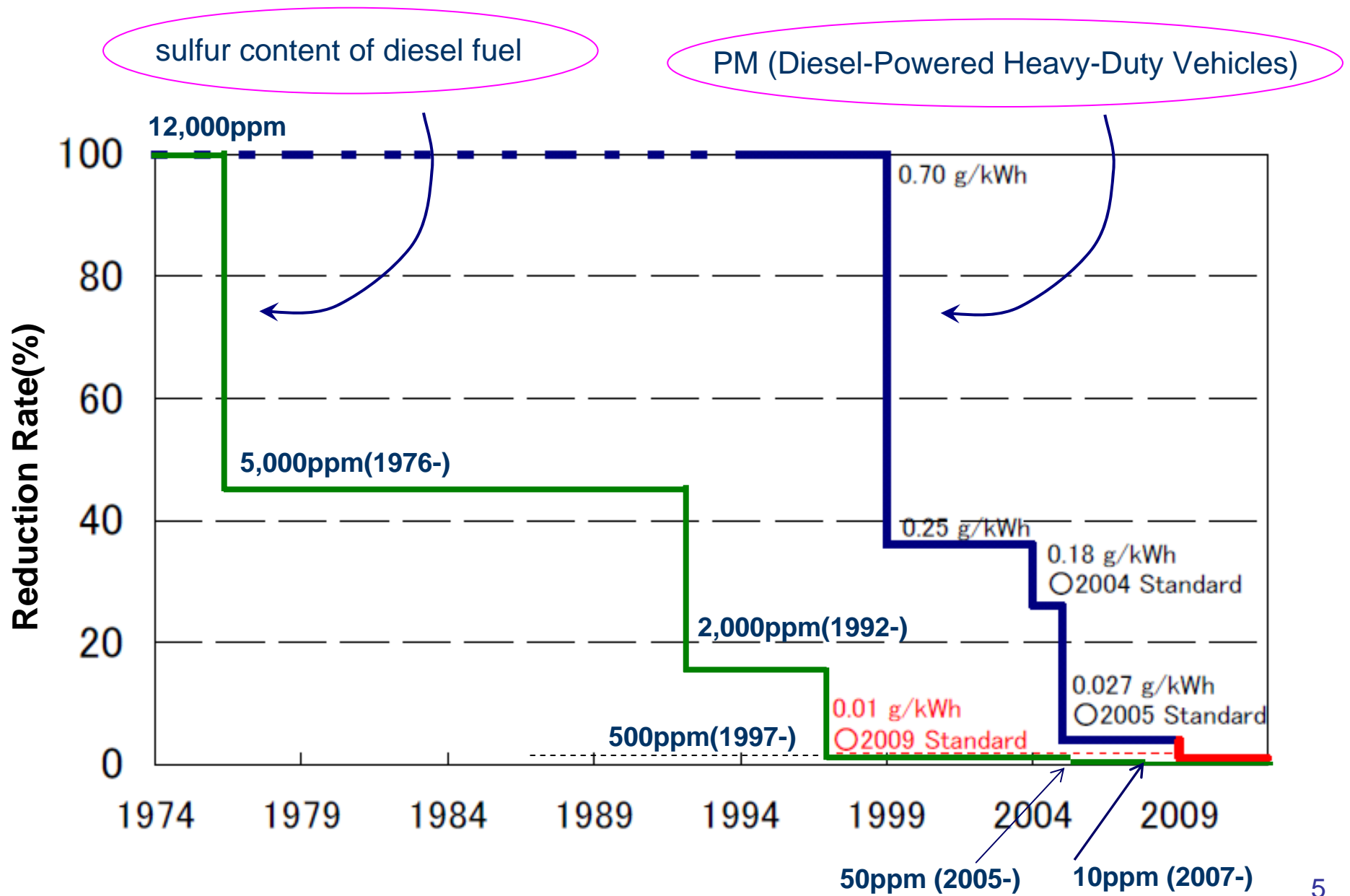
Emission Reduction Technology (Diesel Vehicles)

	2004 Standard	2005 Standard	2009- Standard
Improvement of combustion chamber and air-intake system	○	○	○
Improvement of fuel injection system	○	○	○
Cooled EGR	△	○	○
Turbo Charger	△	○	○
HCCI(Homogeneous Charge Compression Ignition)	×	×	△
NOx sensor	×	×	○
Urea sensor	×	×	△
Exhaust After-treatment Device			
Oxidation Catalyst	△	△	△
Passive type Diesel Particulate Filter(DPF)	△	○	○
Selective Catalytic Reduction (SCR)	×	△	○
NOx Storage Catalyst	×	△	○

Note) ○ : Prevailed △ : Limited use × : Not Possible

Source: Ministry of the Environment Japan 4

Change in Exhaust Regulation Standard & Fuel Quality



Promotion of the use of appropriate fuel

• Ministry of Land, Infrastructure and Transport developed the portable sulfur density analyzer and inspect diesel fuel quality(sulfer) on the street from 2005.

→ Sulfur: more than 50ppm → Notice

→ Sulfur: more than 200ppm → Ordinance

* Regulation:50ppm max



Spot inspection on the street

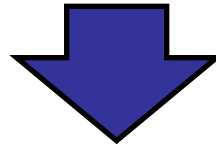


Portable sulfur density analyzer

System for Fuel Quality Control

**Air Pollution Control Law
(Ministry of the Environment)**

**Establishment of permissible limits on
the automotive fuel quality**



**In consideration of permissible
limits on the automotive fuel
quality**

**○Road Vehicle Act
(Ministry of Land,
Infrastructure and Transport)**

**Establishment of reference
fuel quality for emission test**

**○Law of the Quality Control of
Gasoline and Other Fuels
(Ministry of Economic, Trade
and Industry)**

**Establishment of commercial
fuel quality regulation.**

Commercial fuel quality regulation in Japan (Diesel Fuel)

Sulfur		10 Wt-ppm or less
Cetane number		45 or more
Distillation properties 90% distillation temperature		633K (360°C) or less
Triglyceride		0.01 vol% or less
When FAME was blended	FAME	5 vol% or less
	Methanol	0.01 vol% or less
	Total acid number	0.13mgKOH/g or less
	Total of Formic, Acetic and Propionic acids	0.003 vol% or less
	Oxi. Stability (Acid)	0.12 mgKOH/g or less Increase

Commercial fuel quality regulation in Japan (Gasoline)

Lead	Not to be detected
Sulfur	50 wt-ppm or less 10 wt-ppm or less (from 2008)
MTBE	7.0 vol% or less
Benzene	1.0 vol% or less
Kerosene	4.0 vol% or less
Methanol	Not to be detected
Existent gum	5 mg/100 mL or less
Color	orange
Oxygen concentration	1.3 wt% or less
Ethanol	3.0 vol% or less