

Diesel Vehicle Emission Control and its Benefits in Hong Kong

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HA Kong, Matthew Tsang
Environment, Transport and Works Bureau
Hong Kong Special Administrative Region Government

Major Sources of Air Pollution

Vehicle emissions

Stationary sources


- Power plants
- Fuel combustion sources
- Industries

Causes of Air Pollution Problems

⊗ **Street level air pollution**

- High RSP and NO₂ levels caused by :

- ✓ High intensity of vehicle usage
 - 271 vehicles per km of road in HK
 - 33 vehicles per km of road in USA
- ✓ Heavy reliance on diesel vehicles
 - 30% of vehicle population in HK
 - 17% in Singapore
 - 4% in USA
- ✓ Poor dispersion at street level
 - dense urban setting and tall buildings



Controlling Vehicle Emissions

- ❖ Comprehensive programme introduced in 1999
- ❖ Target – By end-2005 :
 - ✓ reduce particulates by 80%
 - ✓ reduce nitrogen oxides by 30%

Control Measures for Vehicle Emissions (1)

Cleaner Fuels:
Unleaded Petrol
Ultra-Low Sulphur Diesel
LPG

EURO III

Advanced Engine

Strategies:

- ✓ Clean alternatives to diesel vehicles
- ✓ Stringent new vehicle emission standards and fuel specification

Control Measures for Vehicle Emissions (2)

Cleaner Fuels:
Unleaded Petrol
Ultra-Low Sulphur Diesel
LPG

Police Spotter

EURO III

Advanced Engine

Dynamometer Testing

Strategies:

- ✓ Strengthened in-use diesel/petrol vehicle emission inspection
- ✓ Strengthened enforcement against smoky vehicles

Control Measures for Vehicle Emissions (3)

Cleaner Fuels:
Unleaded Petrol
Ultra-Low Sulphur Diesel
LPG

Police Spotter

Trap/DOC

EURO III

Petrol Catalytic Converter

Advanced Engine

Mechanic

Dynamometer Testing

Strategies:

- ✓ Retrofitting pre-Euro diesel vehicles with catalysts / traps
- ✓ Promote environmentally friendly driving and awareness of proper vehicle maintenance

Controlling Vehicle Emissions Major Progress

- ❖ **Replace diesel taxis with LPG ones**
- ✓ Nearly all diesel taxis (about 99.8%) switched to LPG ones
- ❖ **Replace diesel light buses with LPG or electric ones**
- ✓ About 80% of newly registered public light buses are LPG ones
- ❖ **More stringent motor fuel**
- ✓ Since April 2002, Ultra low sulphur diesel (ULSD) became the statutory motor diesel standard in Hong Kong
- ❖ **More stringent motor vehicle emission standard**
- ✓ Euro III vehicle emission standards introduced in 2001

Controlling Vehicle Emissions Major Progress (Continue)

- ❖ **Retrofit in-use vehicles with emission reduction devices**
 - ✓ About 80% of the eligible pre-Euro light diesel vehicles installed with particulate traps or catalysts
 - ✓ Nearly 60% of the pre-Euro heavy diesel vehicles installed with catalysts
- ❖ **Enforcement against smoky vehicles**
 - ✓ Penalty for smoky vehicles raised from \$450 to \$1000 since Dec 2000
 - ✓ All commercial vehicles to undergo a smoke test in the annual roadworthiness inspection
 - ✓ Dynamometer smoke test covers all diesel vehicles

Inspection and Maintenance Programme for Diesel Vehicles

❖ Annual Roadworthiness Inspection

- ✓ Transport Department Program
- ✓ Smoke check by
- ✓ Free Acceleration Smoke Test (FAS)
- ✓ Random testing using dyno (10%)

Smoky Vehicle Control Programme

- ❖ **Implement by Environmental Protection Department to Control Vehicle Emissions**
 - ✓ Started at 1988
 - ✓ Require gross polluters to undergo smoke compliance test
 - ✓ Accredited spotters to report smoky vehicles
 - ✓ Summons vehicles concerned to undergo smoke compliance check
 - ✓ Designated Vehicle Emission Testing Centres conduct smoke test
 - ✓ Failure to comply may face license cancellation

Road Side Enforcement by the Police on Diesel Smoke

- ✓ Not to exceed 60 HSU measured by smoke meter using free acceleration smoke test method
- ✓ Issue fixed penalty tickets to excessive smoky vehicles
- ✓ Report these smoky vehicles to EPD for follow-up action

Enforcement against Smoky Vehicles

- ❖ These enforcements have alleviated the smoky vehicle problem but the improvement was not sufficient.
- ❖ Many spotted smoky vehicles are repeaters.
The Reasons :
 - ✓ Tampering with the engine fuel pump can easily cheat the free acceleration smoke test.
 - ✓ Even checking engine speed as part of the free acceleration smoke test cannot stamp out this malpractice.

Enforcement against Smoky Vehicles

- ❖ The Solution:
 - ✓ A smoke test that is more effective in screening out vehicles with tampered engines should replace with the free acceleration smoke test.

Test Methods for Checking Compliance

A. Dynamometer Smoke Test

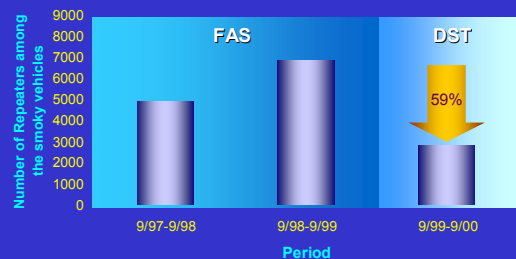
- ✓ Check rated rpm \pm 5% manufacturer spec
- ✓ Check road power to at least 50% of manufacturer spec
- ✓ Smoke limit 50 HSU

B. Free Acceleration Smoke Test

- ✓ Check rated rpm \pm 5% manufacturer spec
- ✓ Can not check road power
- ✓ Smoke limit:-

Pre- 90	60 HSU
Post 90	50 HSU

Effectiveness of Advanced Smoke Test on Smoky Light Duty Diesel Vehicles



Roadside Air Quality Improving

- ✓ RSP & NO_x emissions from motor vehicles reduced by 63% & 28% respectively
- ✓ Compared with 1999, in 2003 concentrations of RSP and NO_x at roadside dropped by 13% and 23% respectively
- ✓ The number of API recorded at roadside monitoring stations exceeding 100 has dropped by 35%
- ✓ Smoky vehicles spotted on road reduced by 70%

