



# VEHICLE EMISSION STANDARDS VERSUS EURO TECHNOLOGIES IN SRI LANKAN CONTEXT

## 1. S.M.D.J.T. Jayatilake, S.M.A. Samanmali

Vehicle Emission Testing Programme, Department of Motor Traffic, Colombo 05, Sri Lanka

## 2. A.G.T. Sugathapala

Department of Mechanical Engineering, Faculty of Engineering, University of Moratuwa, Sri Lanka



# Introduction

- **Transport sector is a major contributor in outdoor air pollution**

## Regulatory instruments

Legal, enforceable, “command and control” type instruments

Air Quality Management

Vehicle Emission Standards



## Emission standards for New Vehicles

- Vehicle Importation Standards
- With Type approval
- Eg: Euro 4

## Emission standards for in use vehicles

- Inspection and maintenance (I/M) programs
- Eg: Vehicle Emission Testing Programme

## Fuel Quality standards

- Phased out leaded gasoline and controlled lead content in unleaded gasoline
- Introduced fuel quality standards to limit sulfur content

# European emission standards / EURO standards



- The European emission standards or Euro standards define the emission classes for **new automobiles**.

## • Pollutants

- Nitrogen oxides (NO<sub>x</sub>)
- Total hydrocarbon (THC)
- Hydrocarbons (HC)
- Carbon monoxide (CO)
- Particulate matter (PM)

Over time, EU has adopted tougher standard for all vehicular pollutants

### Euro 1 (1992)

- passenger cars
- light trucks

### Euro 2 (1996)

- passenger cars

### Euro 3 (2000)

- any vehicle
- For motorcycle

### Euro 4 (2005)

- any vehicle

### Euro 5 (2009)

- light passenger
- commercial vehicles

### Euro 6 (2014)

- light passenger
- commercial vehicles

# Emission standards in Asia

- Emission standards have been widely implemented in Asia.
- Lower standards, strict enforcement is a major challenge in Asia.

Country	Vehicle type	Fuel	Effective date	Equivalent Emission Limits
Bangladesh	Light & Heavy duty	Gasoline	2006	Euro II
	Light & Heavy duty	Diesel	2006	Euro I
China <sup>(1)</sup>	Light Duty (<3.5t) <sup>(2)</sup> – National	Gasoline & Diesel	1993	ECE 15.03 with higher limits
	Passenger Cars & Light Duty (Beijing & Shanghai)		July, 1999	Euro I
Hong Kong	Light Duty(3)		01/01/2006	Euro IV
India	Light Duty- National		2000	91/441/EEC(4)
	Light Duty-Delhi region		04/00	Euro II
Indonesia	Gasoline Engines		2005	Euro II
	Diesel Engines		2005	Euro II
Malaysia	Light Duty	Gasoline	01/2001	Euro II
		Diesel	10/2006	Euro IV
Nepal	Light Duty- Imported		01/02	Euro I
Philippines	Light Duty		01/01/97	ECE E 15-04(5)
	Medium & heavy duty		01/01/97	ECE R 49-01
Singapore	Light Duty	Gasoline	01/2001	Euro II
		Diesel	10/2006	Euro IV
South Korea	Gasoline			US procedures
	Diesel			ECE R 49
Sri Lanka	Gasoline		01/01/2004	In use vehicles equivalent to Euro II
	Diesel		12/07/2018	New vehicles equivalent to Euro IV
Taiwan	Passenger Cars(6)	Gasoline	07/90	US 1984 Limit
	Light duty(6)	Diesel		US 1984 LDT
Thailand	Light Duty	All(7)	25/08/2001	96/69/EC
Saudi Arabia				ECE R 15.03 equivalent

# Air Emission, Fuel and Vehicle Importation Standards in Sri Lanka

## Section 32 of the National Environment Act No. 47 of 1980 30/07/2003 (GE/1295/11)

Diesel Vehicles 30/07/2003 (GE/1295/11)	
Type of Vehicle	Emission Standards
	Smoke Opacity on Snap Acceleration - k factor(m <sup>-1</sup> )
	With effect from 01/01/2004
Diesel Vehicles	4.0

- 12/07/2018 (GE/2079/42) Amended – Similar to Euro 4 standard
  - Part III - Vehicular Exhaust Emission Standards For Importation, Manufacturing or Assembling Of Vehicles
  - Coverage based on gross vehicle weight (GVW)
    - Petrol and Diesel Vehicles having GVW < 3500 kg
    - Petrol Two Wheelers
    - Petrol and Diesel Three Wheelers
    - Heavy vehicles and Heavy Engines
    - Construction Equipment Vehicles

Petrol Vehicle Standard 30/07/2003 (GE/1295/11)			
Type of vehicle	Emission Standards		Remarks
	With effect from 01/01/2004		
	CO (%vol.)	HC (ppm v/v)	
Petrol vehicles other than motor cycles & motor tricycles	3	1200	Both Idling and 2500 RPM/ no load
Petrol motor cycles/tricycles	4	3000	Both Idling and 2500 RPM/ no load

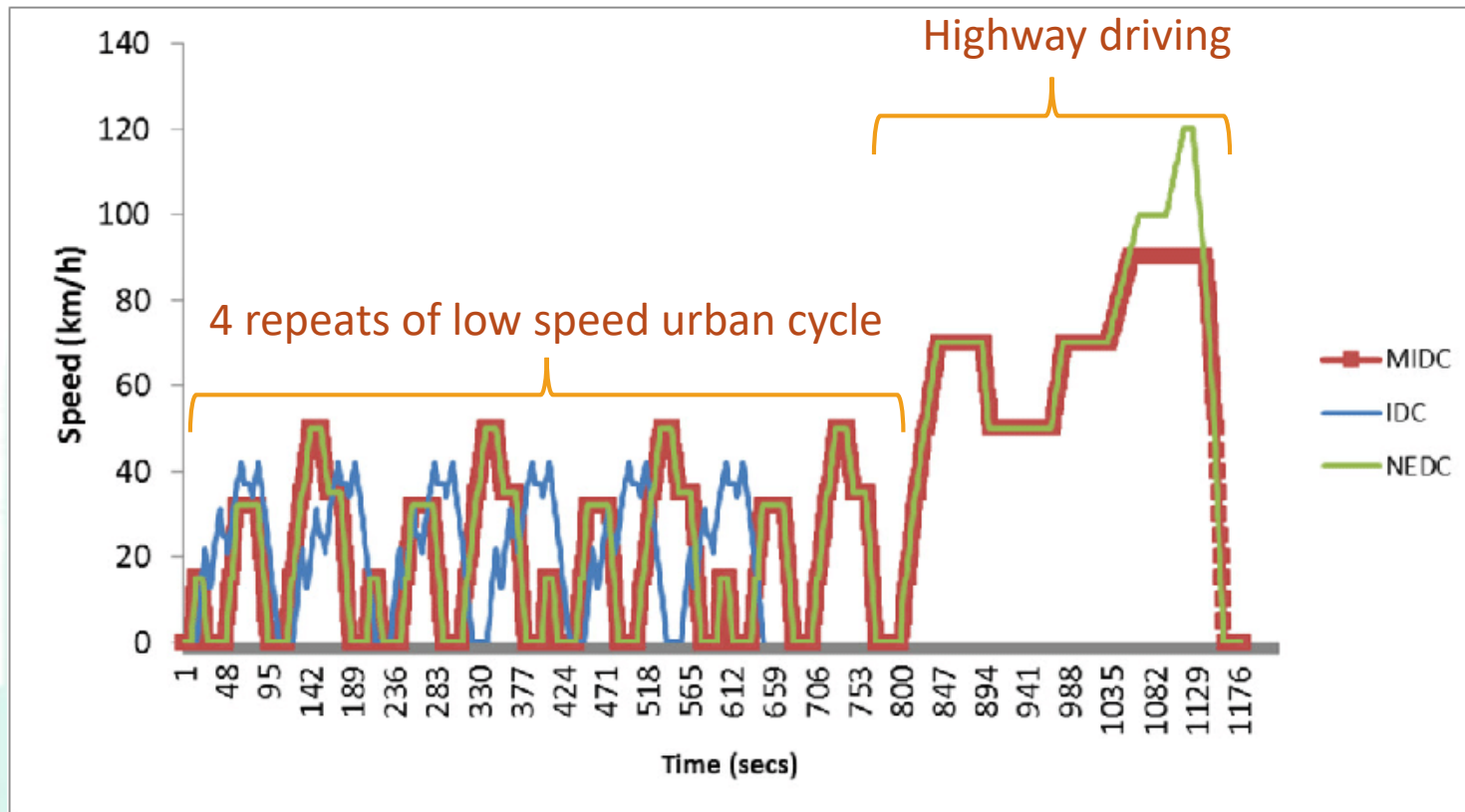
**No load test**



**Mass Emission Standards**

# Driving cycle

- Similar driving cycle for passenger cars and light duty vehicles
  - **NEDC - New European Driving Cycle**
  - **MIDC - Modified Indian Driving Cycle**
  - WMTC – World-Harmonized Motorcycle Test Cycle – for Motor Cycles
  - IDC - Indian Drive Cycle or WMTC – for Three wheelers



**World-Harmonized Light-Duty Vehicle Test Procedure (WLTP) in Euro – for light duty vehicles**

# Comparison of standards

	Sri Lankan Standards	EURO Standards
Fuel quality	<ul style="list-style-type: none"><li>• Sulphur Content for petrol: <b>95 Oct – 50ppm (01/07/2018)</b> 92 Oct – 300ppm</li><li>• Sulphur Content for diesel: <b>Super diesel - 10ppm(01/07/2018)</b> Normal (Auto Diesel) – 3000 ppm</li></ul>	<ul style="list-style-type: none"><li>• Gasoline &amp; diesel: 50 ppm sulfur max (2005)</li><li>• Gasoline &amp; diesel: 10 ppm sulfur max (2009)</li></ul>
Design	<ul style="list-style-type: none"><li>• Values stay stable until for multiple years, until new standards are introduced or revised/ amended</li><li>• Different maximum limit values set for diesel and gasoline</li></ul>	

# Conclusions and Recommendations



- **Adoption of the EURO standard would contribute significantly to reduction of emissions transport in Sri Lankan Context**
  - Good initiative to harmonize the Sri Lankan Standards with the world wide standards.
  - However, Euro standards are applicable only for new vehicles imported, and therefore it is important introduce the same for in-use vehicles to achieve the required benefits
- **Regulatory measures alone might not be sufficient to reduce vehicular emissions to the desired level.**
  - Effective pricing or fiscal policies, sound land use planning and the provision of environmentally sound public transportation systems.
- **Challenges**
  - **Availability of testing facilities for specified Driving cycles**
    - It is a requirement to provide a certificate of conformity of type approval
  - **Two methods for importation of vehicles and in use vehicles**
    - Moving from No load test to mass emission test would require significant resources and expertise
  - **Implementing fuel quality standards along with the emission standards**