

Vehicle emissions standards

The European Union (EU) adopted catalyst-forcing standards for new gasoline-fuelled cars in the early 1990s (so called Euro 1 standards) and have gradually tightened them in several steps: Euro 2 in 1996, Euro 3 in 2000 and Euro 4 in 2005. Similar requirements were adopted for diesel cars and light and heavy commercial vehicles.

In conjunction with the tightening of vehicle standards, fuel quality improvements were also mandated. In some cases, the fuels modifications are necessary to allow the introduction of vehicle technologies that are required to meet the new vehicle emissions standards. For example, the adoption of Euro 1 standards for gasoline vehicles requires the use of unleaded gasoline. The adoption of Euro 2 standards for diesel vehicles will require the use of diesel with sulfur levels lower than 500 parts per million (ppm). Further reductions in sulfur levels in both gasoline or petrol and diesel fuel are linked with Euro 3, 4 and, for diesel trucks, Euro 5 standards (see Table 1). In setting new vehicle standards, policymakers must

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Standard	Gasoline		Diesel
	Lead	Sulfur (ppm)	Sulfur (ppm)
Euro 1	0	NA	NA
Euro 2	0	500	500
Euro 3	0	150	350
Euro 4	0	50 ^a	50 ^a
Euro 5 ^b	NA	NA	50 ^a

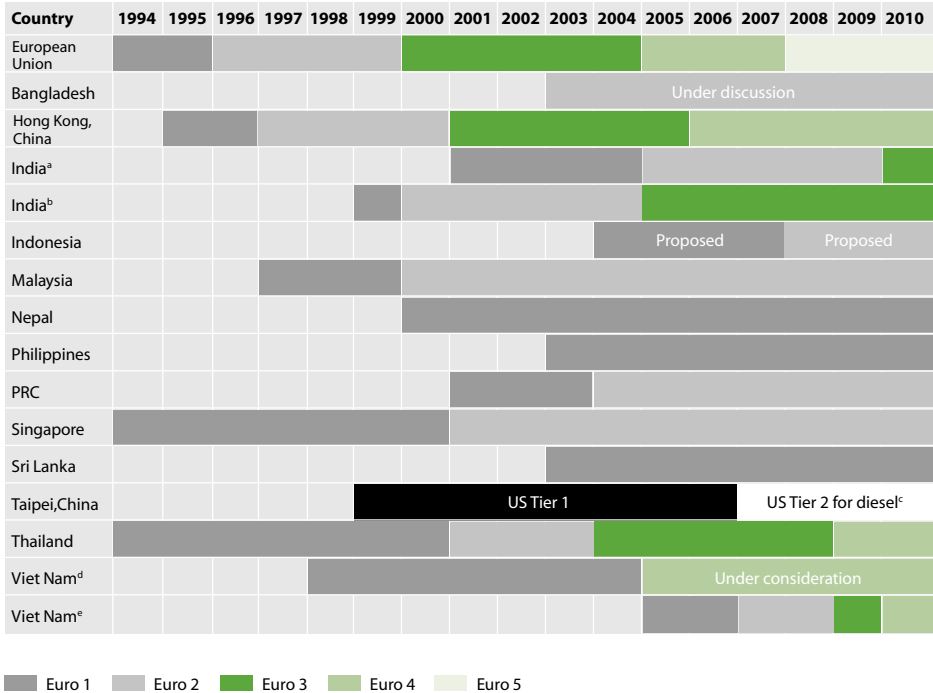
Table 1
European Standards for Gasoline and Diesel Fuel that Coincide with Gasoline- and Diesel-Fuelled Vehicle Standards

ppm = parts per million, NA = not applicable
^a 10 PPM is in the late stages of Adoption by the European Union
^b Heavy Duty Diesel Engines Only

appreciate the close linkage between vehicle standards and the resulting technologies and fuels requirements, and must assure that the appropriate fuel quality will be available when the vehicle standards are introduced.

In setting new vehicle standards, policymakers should be guided by the following principles:

- Those countries where the appropriate fuel is available can leapfrog to the Euro 2, Euro 3 or Euro 4 standards quickly. Depending upon the seriousness of the air pollution problem, policymakers should strongly consider jumping forward to the most stringent standards possible after assuring that the appropriate fuel quality would be available.
- The implementation of new vehicle emissions standards will be facilitated if governments announce the schedule for tightening requirements well in advance. While the majority of Asian countries have adopted Euro 1 standards to regulate new car and truck emissions, only a few countries have announced the time schedule for adopting subsequent Euro 2, 3 and 4 standards. Policymakers should formulate short-term and long-term plans for adopting vehicle and fuel standards so that the vehicle and fuels industries have sufficient time to adapt.
- At the present time, many countries throughout the region lag behind the European new vehicle standards and fuels requirements by approximately a decade. Table 2 shows the emissions standards for new light duty vehicles and Table 3 shows the emissions standards for new motorcycles in several countries in Asia. It is strongly recommended that each country set as a goal achieving parity with Europe, the United States (US) or Japan by 2010 at the latest.
- As a practical matter, the technology being built into cars and trucks to comply with the US, European and Japanese standards is very similar. Therefore, allowing compliance with any of these current requirements may be an efficient approach to standards setting for new vehicles for many countries, and should be considered by policymakers.



^a Entire country

^b Delhi and other cities; Euro 2 introduced in Mumbai, Kolkata and Chennai in 2001; Euro 2 in Bangalore, Hyderabad, Kanpur, Pune and Ahmedabad in 2003; Euro 3 to be introduced in Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad and Ahmedabad in 2005

^c Gasoline vehicles under consideration

^d For gasoline vehicles

^e For diesel vehicles

Table 2
Emissions Standards for New Vehicles (Light Duty)

- The development of new vehicle standards will require active dialogue between the motor and oil industries to ensure that required fuels will be available. Policymakers should encourage such a dialogue.
- As new vehicle standards are tightened, in-use vehicle standards should also be tightened and these in turn should form the basis for routine vehicle inspections.

New vehicle standards are intended both (i) to apply when the vehicle comes off the assembly line and (ii) to define the ve-

Country	Effectivity	Vehicle Type	Standards			Remarks
			CO	HC	HC + NO _x	
Bangladesh	—	—	3.5 g/km	—	2.0 g/km	Under discussion test = ECE R40
Cambodia	current	2-stroke	4.0%	3,000 ppm	—	Idle test
	current	4-stroke	4.0%	2,400 ppm	—	Idle test
Hong Kong, China	current	4-stroke	13.0 g/km	3.0 g/km	0.3 g/km (NO _x only)	As per IDC As per IDC; Deterioration factor = 1.2
	current	2-stroke	8.0 g/km	4.0 g/km	0.1 g/km (NO _x only)	
India	2000	2- and 4-stroke	2.0 g/km	—	2 g/km	As per IDC
	2005 proposed	2- and 4-stroke	1.5 g/km	—	1.5 g/km	As per IDC; Deterioration factor = 1.2
	2005	3-wheel gas	2.25 g/km	—	2.0 g/km	
Indonesia	2005	3-wheel diesel	1.0 g/km	—	0.85 g/km	
	2001	2- and 4-stroke	12.0 g/km	—	10.0 g/km	ECE R47
	2004	2- and 4-stroke	8.0 g/km	—	5.0 g/km	ECE R47
Japan	2007 proposed	2- and 4-stroke	5.0 g/km	—	3.0 g/km	ECE R47
	current	2-stroke	14.4 g/km	5.26 g/km	—	
Malaysia	current	4-stroke	20.0 g/km	2.93 g/km	—	
	2003 proposed	2-stroke	8.0 g/km	4.0 g/km	0.1 g/km (NO _x only)	97/24/EC
	2003 proposed	4-stroke	13.0 g/km	3.0 g/km	0.3 g/km (NO _x only)	97/24/EC
Philippines	current	2- and 4-stroke	6.0%	—	—	Idle test
	2003	2- and 4-stroke	4.5%	—	—	Idle test
PRC	2003	2-stroke	4.0%	4,000 ppm	—	Idle test
	2003	4-stroke	4.0%	1,000 ppm	—	Idle test
	2001	2-stroke	1.50%	3,000 ppm	—	Idle test
Beijing	2001	4-stroke	1.50%	300 ppm	—	Idle test
	2001	4-stroke	1.50%	300 ppm	—	Idle test
Singapore	current	2- and 4-stroke	12.0 g/km	—	5.0 g/km	must comply with US 40 CFR 86.410-80
Sri Lanka	current	2- and 4-stroke	6.0 g/km	—	—	Low-idling
Taipei, China	current	2- and 4-stroke	4.0%	6,000 ppm	—	Idle warm test
Thailand	2004, January	2- and 4-stroke	3.0%	2,000 ppm	—	Idle cold test
	current	2- and 4-stroke	4.5 g/km	3.0 g/km	—	Free acceleration; 30% white smoke
	2003, July	2- and 4-stroke	3.5 g/km	—	2.0 g/km	Evaporative emission 2g test; 15% white smoke
	2004, July	2- and 4-stroke	3.5 g/km	—	1.8 g/km	Without evaporative emission standard; 15% white smoke
	2004 proposed	2- and 4-stroke	4.5 g/km	—	3.0 g/km	
Viet Nam	2007 proposed	2- and 4-stroke	3.5 g/km	—	2.0 g/km	
	2004 proposed	Moped	6.0 g/km	—	3.0 g/km	For 3 and 4 wheelers multiply by 2
	2007 proposed	2-wheel Moped	1.0 g/km	—	1.2 g/km	
	2007 proposed	3- and 4-wheel Moped	3.5 g/km	—	2.4 g/km	
	2007 proposed	Moped	6.0 g/km	—	3.0 g/km	

Table 3
Emissions Standards for New Motorcycles in Asia

97/24/EC = Directive 97/24/EC of the European Parliament and of the Council of 17 June 1997 on certain components and characteristics of two or three-wheel motor vehicles, CO = carbon monoxide, ECE R40 = Economic Commission for Europe Regulation 40 - Emission of gaseous pollutants of motorcycles, ECE R47 = Economic Commission for Europe Regulation 47 - Emission of gaseous pollutants of mopeds, g/km = gram per kilometer, HC = hydrocarbons, IDC = Indian Drive Cycle, NO_x = nitrogen oxides, ppm = parts per million, US 40 CFR 86.410-80 = United States Code of Federal Regulations (US 40 CFR 86.410-80) emissions standard

hicle manufacturer's responsibilities over a reasonable period of actual in-use driving. For example, the current EU requirements stipulate that vehicle manufacturers are responsible for assuring that vehicles meet the in-use standards for 80,000 kilometers. In the US, they apply for 160,000 kilometers. If substantial numbers of vehicles, which are properly cared for and driven, fail to meet their new vehicle standards in use over the defined period, they can be subject to a recall program whereby defective vehicles will be repaired at the manufacturer's costs. Further, defective parts for individual vehicles are covered by a warranty.

To trigger these recall or Conformity of Production programs, individual member states in the EU and the US Environmental Protection Agency (US EPA) carry out in-use testing programs using the same test procedures as the Type Approval or certification programs.

The United States has required the introduction of onboard diagnostic (OBD) systems since 1996, and OBD systems are required in Europe with the introduction of vehicles meeting Euro 3 requirements. As new vehicle standards in Asia are tightened to these levels, OBD systems can identify failures to both vehicle owners and in-use vehicle inspectors. In the meantime, in order to assure that in-use vehicles are properly cared for, many countries adopt in-use standards based on short tests that are much less expensive to operate than typical Type Approval tests. These in-use programs are discussed in the next section.




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