

A. The Inspection methods and procedures are applicable to test the smoke emission (Pollution Degree %) of diesel vehicles.

#### B: Smoke Emission Test in Off-load Rapid Acceleration

1. Application: Smoke Emission Test in Off-load Rapid Acceleration for Diesel Vehicles

2. Definition:

(1) Smoke Value: Pollution Degree % is per the rules of CNS 9845 [Reflective Smoke Meter for Diesel Vehicle Smoke Value Emission]

(2) Rapid Acceleration: step and push the accelerator pedal to the end

(3) Maximum rated horsepower speed: The rotation speed generated by engine brake horsepower when the manufacturer obtained the diesel vehicle specification qualification.

3. Inspection Equipment:

(1) Reflective Smoke Meter: per CNS 9845

(2) Filter Paper: per CNS 5038 [Filter Paper used for Chemical Analysis], Type II, for Quantitative Analysis, Class E

(3) Timer: Resolution under 0.1 sec.

(4) Engine Speed Meter: for measuring engine speed, with accuracy  $\pm 50$  rpm

4. Vehicle Condition:

(1) The test vehicle's engine condition shall conform to manufacturer's specification. Engine brake shall be shut off if installed. All the equipment, which may change the engine's normal speed character and has emission resistant ability or affect the completion of inspection, shall be shut off.

(2) The test vehicle shall be parked at well-ventilated place. Put the gear in neutral and start parking brake. Shut of air conditioner.

(3) Slowly step the accelerator pedal, accelerate the engine from idling. If no abnormal situation or sound happens, keep increase the speed until the end of accelerator. If the engine, equipment or personnel might be damaged, the accelerator shall be released immediately and test shall be abandoned.

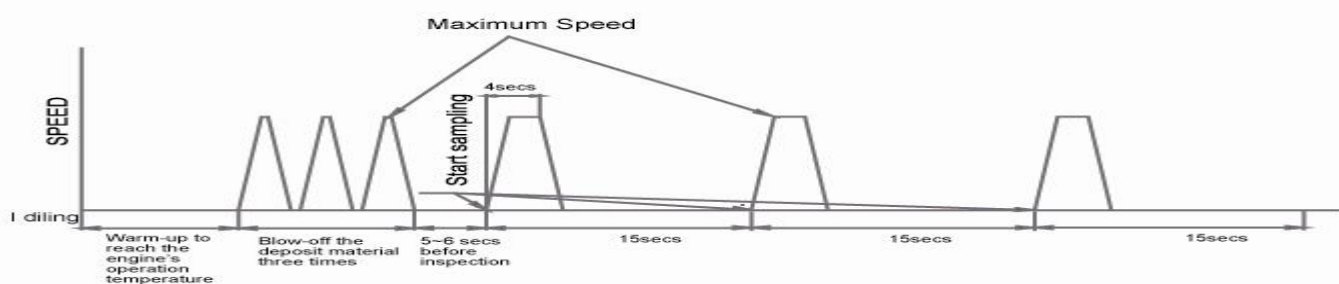
(4) No abnormal leakage in exhaust system

(5) During inspection, the engine shall operate normally. Temperatures of cooling water and lubricant shall be kept in the normal working temperature range of manufacturer's specification.

(6) Shall use market legal vehicular diesel or the diesel specified by the manufacturer. No fuel additive shall be used.

5. Inspection Method: The inspection procedures include warming-up, blowing-off deposit and sampling, as shown in Figure 1.

Figure 1 Smoke Emission Test Procedure



- (1) Warm-up: Vehicles shall be properly warmed-up to the engine working temperature given by its manufacturer.
- (2) Blow off deposit: Before the inspection, place the gear in neutral, accelerate rapidly and immediately release the accelerator for three times, to clean off the deposit in exhaust system. Record the maximum engine speed in the three times; it shall be larger than maximum rated horsepower speed.
- (3) Sampling: start within 5~6 sec after blowing off deposit
  - (a) In the beginning of inspection, accelerate rapidly and stay for 4 seconds then release the pedal immediately, return to idling and stay for 11 seconds (totally 15 seconds); that complete a test cycle. In every test cycle, take a measure when accelerator pedal starts to move.
  - (b) Repeat Step (a) until three successive smoke value measurements are not 3% different from each other (Pollution Degree)

6. The inspection report shall include the following information:

- (1) Brand name
- (2) Vehicle (engine) model
- (3) Type of Vehicle
- (4) Vehicle or engine number
- (5) Total weight of vehicle
- (6) Maximum rated horsepower speed
- (7) Total displacement
- (8) Maximum engine speed in each time

9. Inspection Result: the result is the average of the three smoke value measurements in Step 5. 2. (2).

### C. Smoke Emission Test in Full-load Constant Speed

1. Application: Smoke Emission Test in Full-load Constant Speed for Diesel Vehicles

2. Definition:

- (1) Smoke Value: Pollution Degree% is per the rules of CNS 9845 [Reflective Smoke Meter for Diesel Vehicle Smoke Value Emission]
- (2) Full Load: under set speed, the engine operation when step and push the accelerator pedal to the end.
- (3) Maximum rated horsepower: The engine brake horsepower when the manufacturer obtained the diesel vehicle specification qualification.
- (4) Maximum rated horsepower speed: The rotation speed generated by engine brake horsepower when the manufacturer obtained the diesel vehicle specification qualification.
- (5) Dynamometer Absorbed Horsepower: The vehicle output horsepower measured by dynamometer

3. Inspection Equipment:

- (1) Reflective Smoke Meter: per CNS 9845
- (2) Filter Paper: per CNS 5038 [Filter Paper used for Chemical Analysis], Type II, for Quantitative Analysis, Class E
- (3) Dynamometer: It can keep the vehicle in constant speed and constant load. When the vehicle is tested on the dynamometer, an assistant cooling fan shall be provided to keep the temperatures of engine, cool water and wheel in normal range.
- (4) Engine Speed Meter: for measuring engine speed, with accuracy $\pm 50$  rpm.
- (5) Thermometer: to measure temperature in the environment, with resolution in 1°C
- (6) Atmospheric pressure gauge: to measure atmospheric pressure in the environment, with resolution in 0.1kPa.

#### 4. Vehicle Condition:

- (1) The test vehicle's engine condition shall conform to manufacturer's specification. Engine brake shall be shut off if installed. All the equipment, which may change the engine's normal speed character and has emission resistant ability or affect the completion of inspection, shall be shut off.
- (2) The test vehicle shall be parked on the roller of the dynamometer. The vehicle shall be positioned with padding and chain. Set up assistant cooling fan. Release parking brake. Shut of air conditioner.
- (3) Slowly step the accelerator pedal, and gradually accelerate the engine from idling. If no abnormal situation or sound happens, keep increase the speed until the end of accelerator. If the engine, equipment or personnel might be damaged, the accelerator shall be released immediately and test shall be abandoned.
- (4) No abnormal leakage in exhaust system
- (5) During inspection, the engine shall operate normally. Temperatures of cooling water and lubricant shall be kept in the normal working temperature range of manufacturer's specification.
- (6) Shall use market legal vehicular diesel or the diesel specified by the manufacturer. No fuel additive shall be used.

#### 5. Inspection Method:

- (1) The inspected vehicle shall be warmed-up to the engine working temperature by its manufacturer's method (if not specified, use constant speed 50km/h) on dynamometer.
- (2) Step accelerator pedal to the end. Select a proper gear position and speed per maximum engine rated horsepower speed, set three test points as the following:
  - 100%±50rpm of maximum speed
  - 60%±50rpm of maximum speed
  - 40%±50rpm of maximum speed
- (3) Adjust load of dynamometer to set speed. At each test point, measure until two successive smoke value measurements are not 3% different from each other (Pollution Degree). Record Dynamometer Absorbed Horsepower at each test point. If the speed is lower than 1000rpm, use 1000±50rpm as the test speed
- (4) When medium diesel vehicle is inspected, at 100% of maximum rated horsepower speed on the dynamometer, the actual measured horsepower shall not be lower than 35% of maximum rated horsepower. Vehicles would be rejected if it cannot reach 35%.
- (5) Rejected vehicle shall be re-inspected after more than 4 hours.

#### 6. The inspection report shall include the following information:

- (1) Brand name
- (2) Vehicle (engine) model
- (3) Type of Vehicle
- (4) Vehicle or engine number
- (5) Total weight of vehicle
- (6) Maximum rated horsepower and speed
- (7) Total displacement
- (8) Environmental temperature and atmospheric pressure
- (9) Engine speed at each test point and Dynamometer Absorbed Horsepower
- (10) Test Result: calculate the average of two exhaust smoke value measurements, then modify with the following equation for standard temperature (293K) and pressure (101.3kPa).

$$\text{Modified Smoke Value} = \text{Test Smoke Value} - 0.24 (t-293) + 1.20 (p-101.3)$$

t: atmospheric temperature (K) p: atmospheric pressure (kPa)

Diesel Vehicle Management Strategy:

Raised Standard:

1. In-Service Diesel Vehicle Particle Pollutant Emission Standard

Manufacturing Date	Pollution Degree
Before 06/30/1993	under 50 %
07/01/1993 ~ 06/30/1999	under 40 %
After 07/01/1999	under 35 %
After 10/01/2006	under 30 %

2. Diesel Component Standard

Enforcement Time	Sulfur Content ppmw
01/01/2000	500
01/01/2002	350
01/01/2005	50

Establish the inspection system:

Visual auditing was substituted by instrument inspection.

Diesel Vehicle Smoke Emission Inspection with Dynamometer (per Article 42, Air Pollution Control Act):

1. We ask the diesel vehicle that is suspected as a pollution source and reported by people's visual witness to come to diesel vehicle emission inspection station in Taipei City.
2. Inspection Method: Diesel Motor Vehicles Exhaust Emissions Testing Methods and Procedures
3. Penalty standard:

	Particle Pollutant Exceeds Emission Standard		
	≤ 1.5 times	> 1.5 times ≤ 2 times	> 2 times
Small Vehicle	NTD 3,000	NTD 6,000	NTD 12,000
Large vehicle	NTD 5,000	NTD 10,000	NTD 20,000

Stop Diesel Vehicle Randomly at Roadside for Inspection (per Article 41, Air Pollution Control Act):

1. Proceed Off-load Rapid Acceleration Smoke Emission Test on major roads in Taipei City without warning.
2. The penalty standard is the same as above.

Diesel Quality Audit (per Article 36, Air Pollution Control Act):

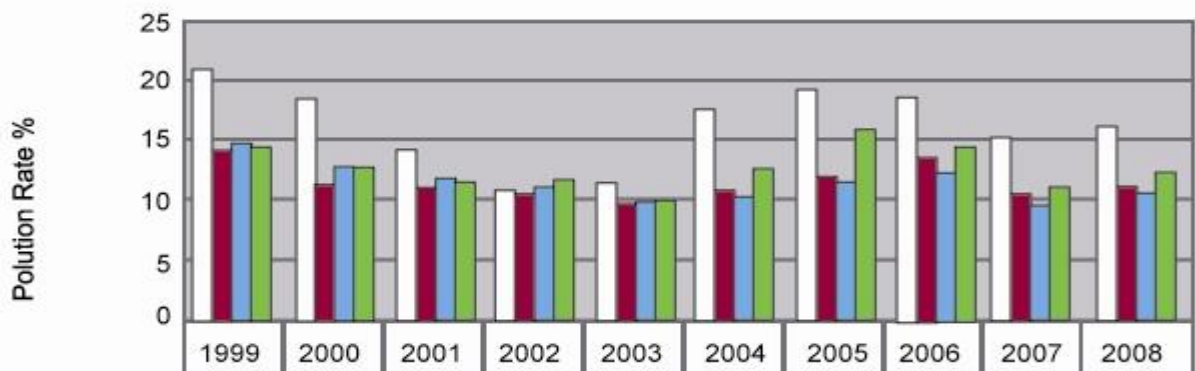
1. Ultra low sulfur diesel standard is enforced since Jan. 1, 2005
2. Penalty standard

	Sulfur Content in Diesel exceeds the Component Standard 50ppmw			
	51~100(ppmw)	101~500(ppmw)	501~1000(ppmw)	>1000(ppmw)
Small Vehicle	NTD 5,000	NTD 10,000	NTD 20,000	NTD 30,000
Large vehicle	NTD 10,000	NTD 25,000	NTD 50,000	NTD 75,000

Achievement over the Years:

Achievement over the Years									
		2001	2002	2003	2004	2005	2006	2007	2008
Visual Inspection	Report Number		3698	3425	4684	3108	1832	1144	2106
Stop Randomly for Inspection at Roadside	Inspection Number		395	11138	707	930	1930	1646	1988
	Inconformity Number		72	154	10	12	193	128	199
	Inconformity Rate		18.2%	13.5%	1.4%	1.3%	10.0%	7.8%	10%
Smoke Emission Test with Dynamometer	Inspection Number	5600	8347	5368	6973	7229	5045	5403	7187
	Test Number	370	363	108	182	413	237	157	422
	Inconformity Rate	6.6%	4.3%	2%	2.6%	5.7%	4.7%	2.9%	5.9%
Diesel Quality Audit	Sampling Number	313	377	435	6757	6980	5532	6021	7549
	Inspection Number	313	377	435	757	569	733	594	534
	Inconformity Number	19	43	48	58	30	49	18	13
	Inconformity Rate	6.1%	11.4%	11%	0.9%	0.4%	0.9%	0.3%	2.4%

**Annual Analysis for Pollution Rate**



Off-load Pollution Rate	20.7	18.1	14.3	11.1	11.7	17.3	19.2	18.0	15.0	16.7
100% Full-load Pollution Rate	14	11.5	11.8	10.7	9.2	11.0	12.6	13.0	10.1	11.7
60% Full-load Pollution Rate	14.8	13.2	12.7	11.4	9.3	10.5	12.2	12.3	9.5	11.2
40% Full-load Pollution Rate	14.3	13.1	12.2	12.6	9.9	13.2	15.2	14.8	11.6	12.6

Currently, diesel vehicle inspection is not periodical. We ask the diesel vehicle that is suspected as a pollution source to come for inspection. When the inspection result fails, a ticket is issued immediately. Because dynamometer inspection is not available in non-governmental site, the inspection often induces people's complain. Taipei City has established BeiTou diesel vehicle emission inspection station in 2004. Presently, three inspection lines are in service simultaneously. If it would not affect the work of notifying pollution suspected vehicle to come for inspection, we are planning to open the inspection station to vehicle owners to understand their vehicle's smoke emission condition. We encourage vehicle owners to voluntarily improve their vehicle's smoke emission condition, in order to reach the purpose of air pollutant reduction.

## Execution of Voluntary Inspection

### 1. Inspection Station: BeiTou diesel vehicle emission inspection station

Because BeiTou station is independent and separate from the two inspection lines in NeiHu station it is easier to be managed. The notified vehicles would not mix with the voluntary ones, preventing confusion in the inspection work.

### 2. Applicable Vehicle:

#### (1) Stage 1

We would focus on Taipei City official vehicles and military vehicles which have not been asked for inspection. Because the major purpose of the inspection is to check the usual vehicle maintenance condition and to make administrative units as examples, the open object would be mainly the vehicles which have not been asked for inspection.

For military vehicles and Taipei Governmental units that have a lot of vehicles, we encourage them to set up a vehicle maintenance system through official document exchange in administrative system. By arranging periodical vehicle inspection, self-management can be achieved, and smoky cars can be prevented.

#### (2) Stage 2

Since April, 2005, the application scope has been enlarged to all large vehicle groups registered in Taipei City. We encourage the vehicle owners to set up a vehicle maintenance system

#### (3) Stage 3

Since Dec. 2005, we have focused on the tow-truck operators and the police tow trucks in Taipei City. We require them to be inspected voluntarily through official letter in administrative system. In May, 2006, we focused on private operators to promote voluntary inspection.

#### (4) Stage 4

Because the former programs have achieved satisfied outcome, from now on, all private vehicles and all vehicle groups can come to inspection voluntarily.

### 3. Execution Method

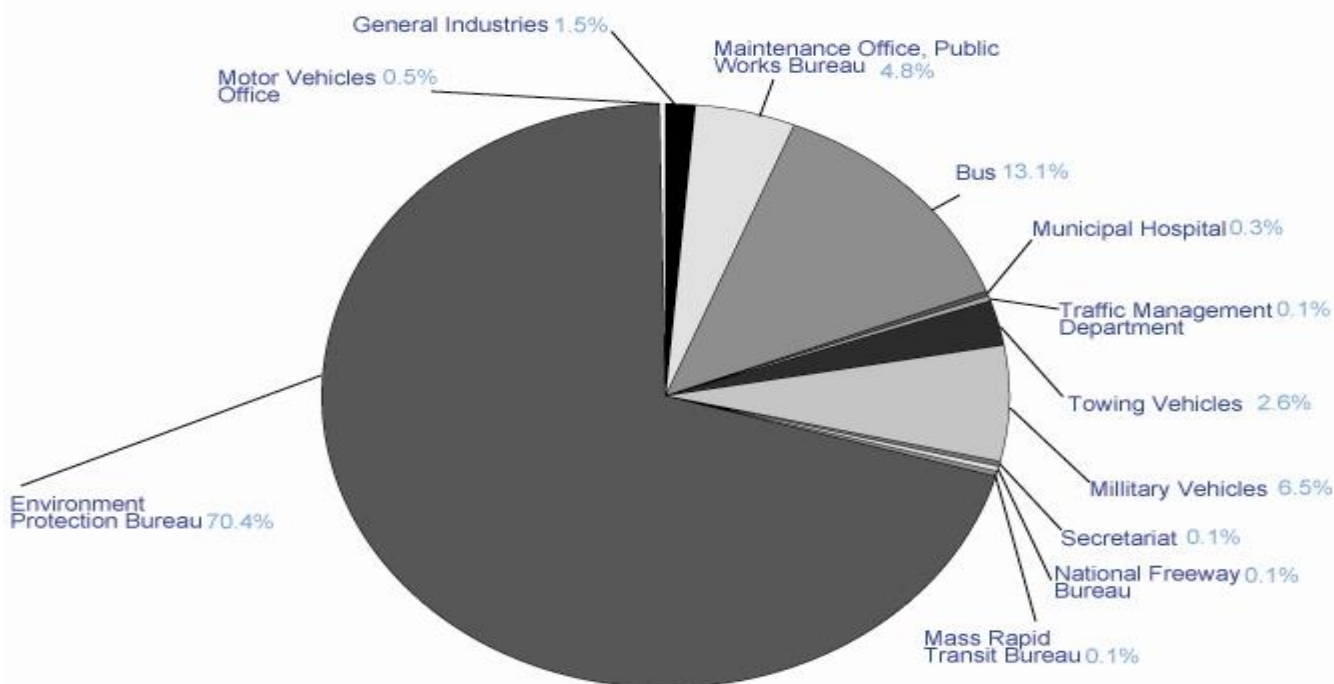
(1) Make an appointment: If vehicle owners came at the same time, the inspection site would be too crowded and retention time would be too long. We advise you to make an appointment to avoid long time waiting.

(2) Inspection Execution: For vehicles come to inspection voluntarily, the inspection would be done in the same way as normal regulations. An inspection report, which is as effective as normal inspection report, with the same format would also be given. Vehicles that pass the inspection would not be asked for inspection within three months. Vehicles that fail the inspection would not be reported immediately, in stead, a notice would be given to require for an official inspection. We offer vehicles come to inspection voluntarily a chance to be improved and manage pollution source vehicles.

### Execution Results

2005 (Statistical Period: 01/01/2005~12/31/2005)

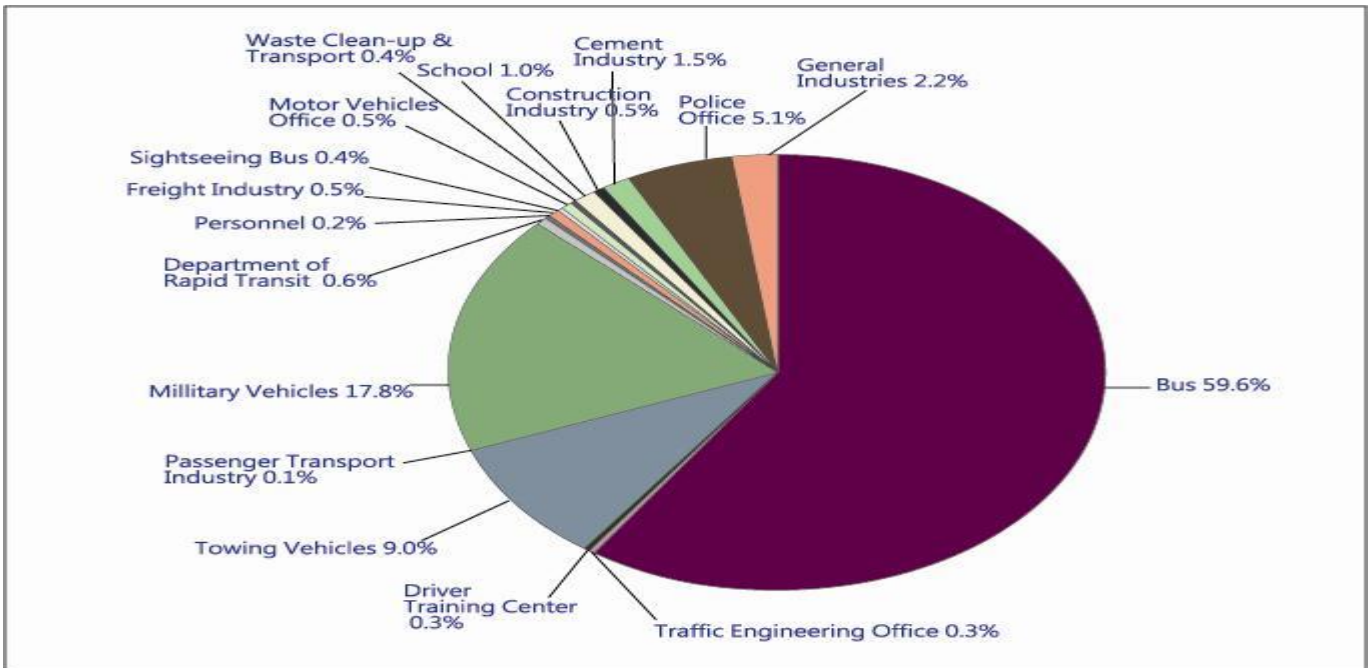
In 2005, 1522 vehicles came to inspection voluntarily. 215 of them failed. The inconformity rate was 14.1%. The vehicles are mainly come from governmental units, military vehicles, freight transport operator and passenger transportation operator.



2006 (Statistical Period: 01/01/2006~12/31/2006)

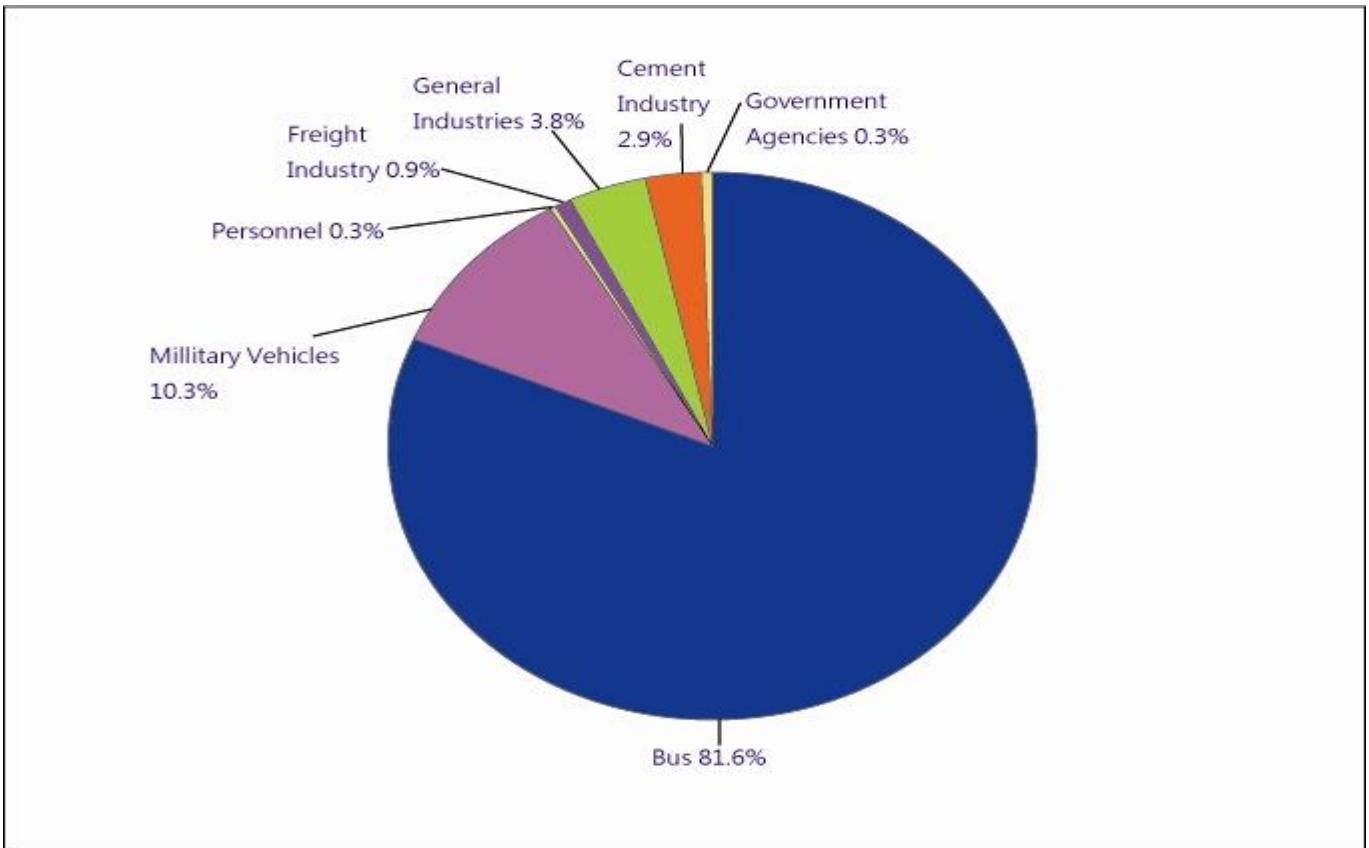
In 2006, 997 vehicles came to inspection voluntarily. 45 of them failed. The inconformity rate was 4.5%. The vehicles are mainly come from governmental units, military vehicles, freight transport operator, passenger transportation operator and private enterprises.





2007 (Statistical Period: 01/01/2007~12/31/2007)

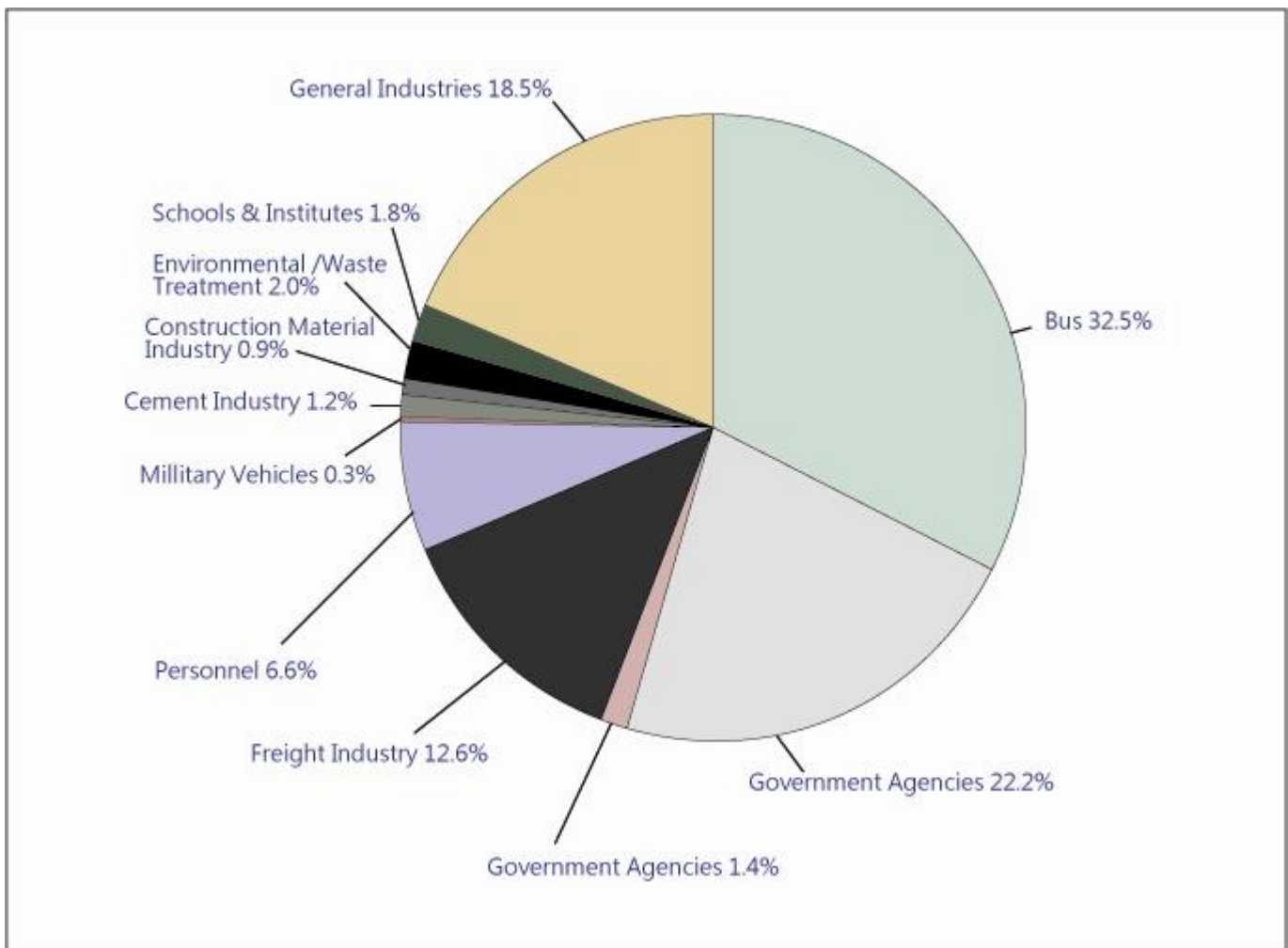
In 2007, 1520 vehicles came to inspection voluntarily. 39 of them failed. The inconformity rate was 2.6%. The vehicles are mainly come from governmental units, military vehicles, freight transport operator and passenger transportation operator.



2008 (Statistical Period: 01/01/2008~12/31/2008)

In 2008, 2840 vehicles came to inspection voluntarily. 254 of them failed. The inconformity rate was 8.9%. The vehicles are mainly come from buses, governmental units, general businesses and freight transport operator.

Vehicles from Buses were the most, 32.5%; general businesses were the second, 18.5%, as shown in Figure 1.



Make an Appointment

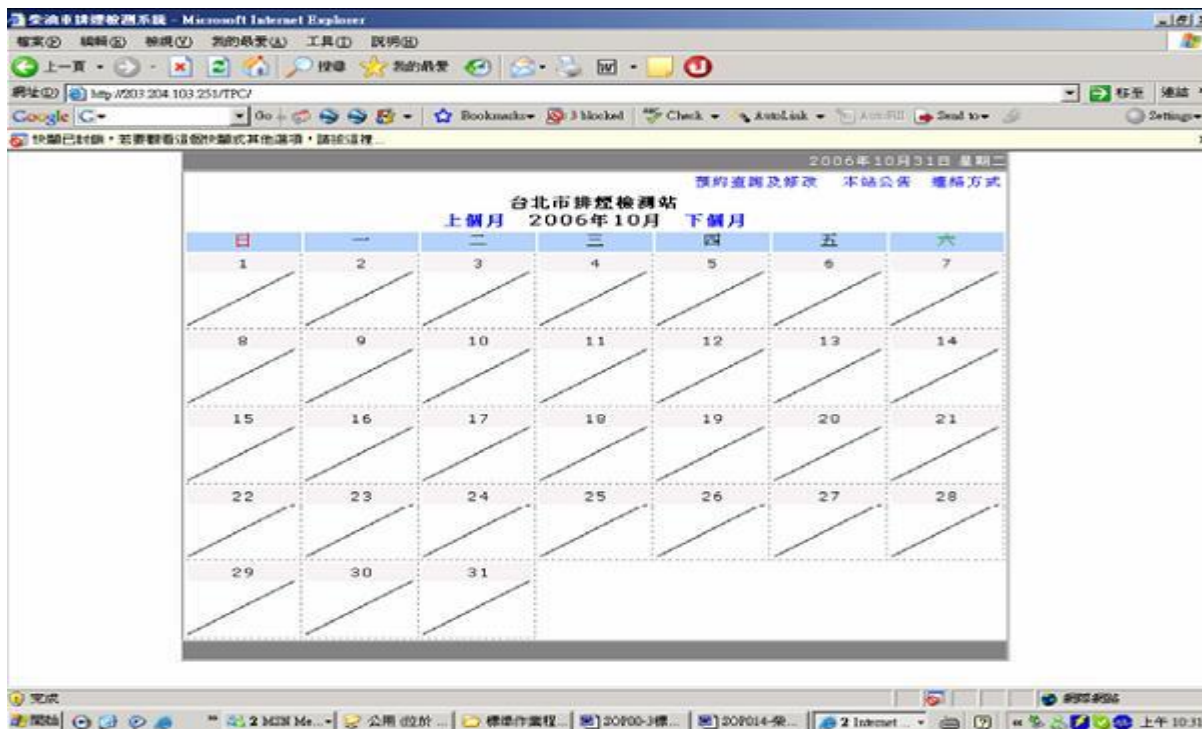
1. Taipei City Diesel Vehicle Smoke Emission Audit Management Website



## 2. Select "Appointment"

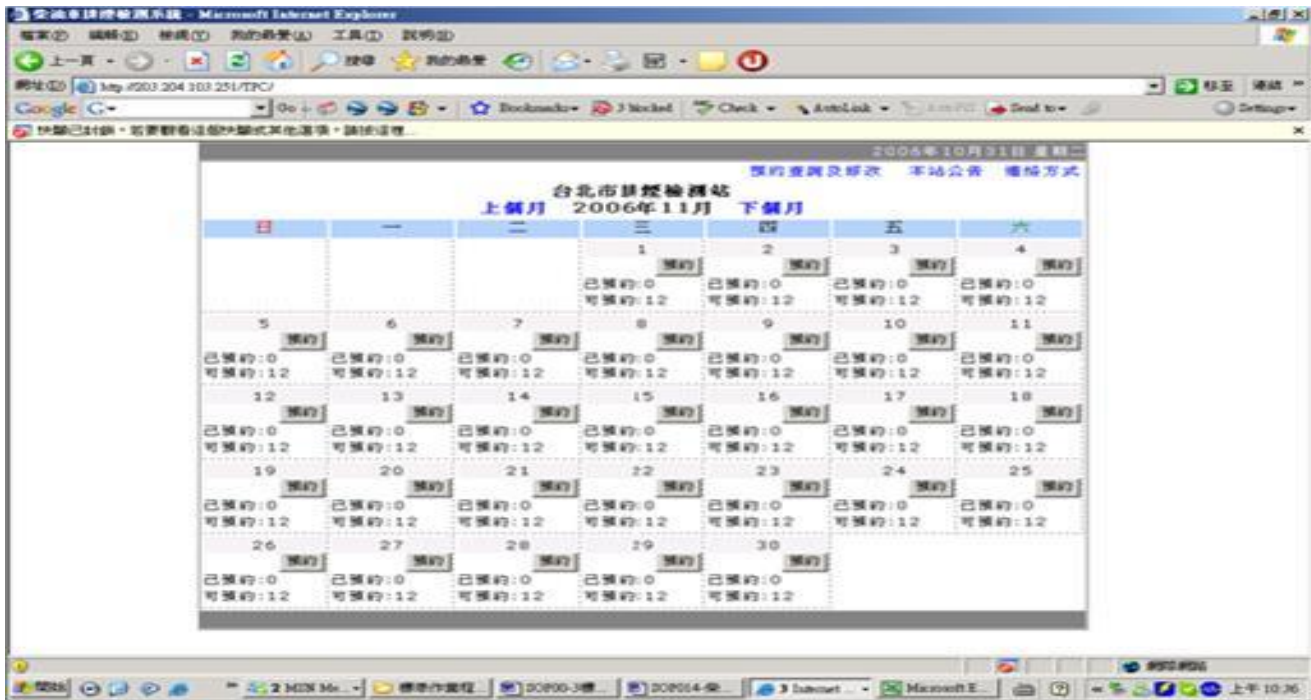


## 3. Select "Taipei City"



## 4. Choose a date to book in inspection





5. Choose appointment time; enter your vehicle license plate number, notice number and an accessible phone number for contact convenience. Thus, the book-in process is completed.

#### How to Report a Smoky Vehicle?

1. Report Time: When you find a smoky vehicle, please report through the following access as soon as possible.  
 2. Report Access: We provide the following access for reporting. You are welcome to use them.

1. Report on website
2. Report via phone
3. Report by fax; please download the report form first, fill in it and then fax to EPA or local Environmental Protection Department (County(City) Environmental Protection Department where the smoky vehicle registered is preferred)
4. Report by letter; please download the report form first, fill in it and then send to EPA or local Environmental Protection Department (County(City) Environmental Protection Department where the smoky vehicle registered is preferred)

3. Report Items: The following information is required to make the report effective.

1. Real name of reporter
2. Contact phone number and address
3. Type of the smoky vehicle

Large Bus

Small Truck

Large Truck

4. Its license plate number

5. Where it discovered.

Section:

K of National Highway

Section, Road, Dist, Town(Village), County(City)