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Vehicle Emissions Reduction Programme in Hong Kong

1. Need for the Programme

The protection of Hong Kong's public health is of major concern to both citizens and political representatives. However, air quality standards, as established by the Environmental Protection Department (EPD) of the Hong Kong Government, are often exceeded. Numerous studies during the past decade have documented that vehicle exhaust is a significant contributor to health problems However, the territory remains in the dark due to faulty inspection analysis of the problem and lack of emission factors*. Excessive, unregulated exhaust from petrol vehicles is carcinogenic. Exhaust from diesel vehicles accounts for the majority of fine particulate (RSP) contribute to respiratory problems.

2. Scope of Work

The inspection system currently employed by the Hong Kong Government, Snap-acceleration, is designed to inspect heavy duty vehicles according to method of the Society of American Engineer (SAE). However, for light and medium duty vehicles, a dynamometer (track mill system -I/M 240) is more desirable. An effective inspection system / program is crucial to reduce the air pollution in Hong Kong whether for diesel or petrol vehicles. An ineffective system generates false signal and information to the general public. In September 1999, the EPD finally carried out a more effective emission inspection system (dynamometer lug-down test while the TD still employs the snap acceleration). As expected, many diesel vehicles which were able to "pass" the snap test easily failed the "lug-down test". In fact, the Government was forced to relax the standard in order to "pass" more vehicles. As we have mentioned many times to the Hong Kong Government before, identify problem vehicles is relatively easy, properly repair problem vehicles would be a challenge to the repair industry.

3. Current Situations

There are three major factors that contribute to pollution from diesel vehicles.

(I) Premature wear and tear due to lack of maintenance with ineffective inspection system carried out by the Government for more than 15 years.

(II) Low technologies for diesel vehicles and poor technicians skills.

(III) Fuel quality.

環保教育研究社 Better Environment Hong Kong
Unit 303, 3/F, Bonham Trade Centre, 50 Bonham Strand East, Sheung Wan, Hong Kong Tel: 2851 2569 Fax: 2529 7499

Each of the above factors is elaborated below:

(I) Inspection System: Snap acceleration system has been employed by TD for more than 15 years. However, this system is designed to inspect heavy duty diesel vehicles based on SAE methods. Light and medium duty vehicles can be easily to circumvent through engine tampering, such as tampering with the fuel pump during the test. It further encourages the tampering services performed by the "Quick Fix" repair garages. Even though the EPD finally implemented a more effective system in 1999. Unfortunately, many diesel vehicles may have already worn out since no preventive maintenance was never performed on many diesel vehicles. Thus, the Government must find out the worn out vehicle %, breakdown by year, cost to replace them, cost to repair them, etc.. Data evaluation is essential before any effective measure can be implemented. It is about time the Government to do some cost/benefit analysis. i.e. compare the cost to reduce pollutant per tonne with different programs.

(ii) Lack of Maintenance: Lack of maintenance and maintenance knowledge are commonly observed facts which has a long-term effect on vehicles. Some diesel owner/operators are "shoe string" operators and push their vehicles to the limit before spending any money on them. "Quick Fix" services are mostly performed by the repair garages in order to save money and time.

(II) Low Technologies and poor mechanics skill: Diesel technology, especially light-duty vehicles imported before 1995, is still based on early 80's technology. There is no turbo charging, vertical exhaust pile, electronic fuel pump, EGR nor particulate trap. etc.. The normal practice in the repair industry is "Quick Fix". Under such "Quick Fix" system, most mechanics are not required to upgrade their skill since their only objective is to "fix" the vehicles so they are driveable and be able to pass the "smoke test". To make the matter worse, since more than 90% of the workshops do not or can not afford to have a "dedicated tester" or repair manual for each car model. A centralised diagnostic testing center may be needed in Hong Kong eventually.

(III) Fue quality: Some drivers run their vehicles on low quality diesel whenever possible.

4. Proposed Actions

While dynamometer test is a more better inspection system, many side programs need to be enhanced at the same time.

(1) Diagnostic testing center for vehicles fail the test: a diagnostic test center can help to identify problem components from problem vehicles for one year. Data will be important to the repair trade and for I/M evaluation purpose.

(2) Licensing mechanics with advanced on-going education. Advanced on-going education is essential in order to keep update with more advanced technological vehicles, such as EURO III computerized vehicles.

(3) Make repair manual and diagnostic equipment available to the trade. With more than 2,300 autoshops in Hong Kong. It is impossible to require all workshops to equip with different diagnostic equipment due to size and the cost. Therefore, a centralized diagnostic testing center may be needed in Hong Kong to enable the repair trade to share such equipment at a reasonable cost.

In order to improve the air quality, it takes both clean fuel, advanced technology and proper repair/maintenance from repair industry.

EMISSION TEST FORM
廢氣測試表格

Serial No. 815
編號

Vehicle Emission Testing Centre :
車輛廢氣測試中心

Vehicle Registration Mark 車輛登記號碼	C/	Recorded Mileage 已行駛的哩數	530235 km 公里
Emission Testing Notice No. 廢氣測試通知書號碼	EP/P1/XXXXXX/99	Vehicle Manufacture Year 車輛製造年份	1996
Test Date 測試日期	06/10/1999	Time 時間	10:37

A. Vehicle Identity and Safety Inspection
車輛驗證及安全檢查

(i) VIN/Chassis No. is correct — Yes
車輛底盤號碼 正確

If incorrect, Stamped No.
如不正確，蓋印編號

(ii) Vehicle Satisfied the Pre-test Inspection — Yes
車輛通過試前檢查

B. Emission Test on Chassis Dynamometer
底盤式功率機廢氣測試

(i) Corrected Maximum Power Measured 32.45 kW
經修正並度所得的最大馬力

Minimum Required 34.20 kW
最低要求

(ii) Measured Max. Power Engine Speed 3295 RPM
在最大馬力時所量度得的引擎轉速 (轉/分鐘)

Lower Limit 3895 RPM Upper Limit 4305 RPM
下限 上限

(iii) Measured Smoke 18.78 HSU at the Engine Speed at Max. Power of 3295 RPM
在最大馬力引擎轉速情況時所量度得的煙霧水平

Legal Emission Limit 50.00 HSU
法定廢氣限額 哈特里奇單位

(iv) Measured Smoke 12.42 HSU at 90% of the Engine Speed at Max. Power of 2997 RPM
在最大馬力引擎轉速的90%情況時所量度得的煙霧水平

or 或 N/A m^{-1}
光吸收絕對單位

(v) Measured Smoke 13.65 HSU at 80% of the Engine Speed at Max. Power of 2661 RPM
在最大馬力引擎轉速的80%情況時所量度得的煙霧水平

C. Test Result
測試結果

(i) Emission Test Result FAILED (Passed / Failed / Test Aborted / Test Suspended)
廢氣測試結果 (合格 / 不合格 / 未能完成測試 / 測試中途停止)

(ii) For reason(s) of Item(s) : No. ___ as indicated in the footnotes.
由於發現如附註所述的第 項問題，

Approved Vehicle Emission Tester
認可的車輛廢氣測試員

(Tester's No. & Signature)
測試員編號及簽名

Footnotes 附註 :

1. Chassis No. Incorrect
底盤號碼不符
2. Air Filter not Equipped
沒有配備空氣濾清器
3. Exhaust Pipe Leak
廢氣喉漏氣
4. Engine Coolant Leak
引擎被漏冷卻液
5. Engine Lubricant Leak
引擎漏潤滑油
6. Transmission System Oil/Fluid Leak
傳動系統漏潤滑油/液體
7. Fuel Leak
燃料漏漏
8. Tyres and Wheels Not Suitable for Test
車胎及車輪不適宜進行測試
9. Loose Part Found in Transmission System
傳動系統有零件過鬆
10. Lubrication Oil Warning Light Not in Operation
潤油警告燈操作不正常
11. Engine Coolant Temperature Gauge Not in Operation
引擎水溫錶操作不正常
12. Mal-adjustment, Engine Speed too Low
引擎調較不當，轉數過低
13. The Test Requirements were Not Met
未能符合測試合格標準
14. The Test Cell Condition was Unsuitable for Conducting the Test
檢車間情況不適宜進行測試
15. Power/Force exceeds Dynamometer Capacity
車輛馬力超出功率機的規格
16. Others (as specified)
其他事項 (如述)

EMISSION TEST FORM 廢氣測試表格

Serial No. 588 編號

Vehicle Emission Testing Centre 車輛廢氣測試中心

Vehicle Registration Mark 車輛登記號碼	GN	Recorded Mileage 行車紀錄數	527453 km 公里
Emission Testing Notice No. 廢氣測試通知書編號	GF [illegible] XXXXXX/99	Vehicle Manufacture Year 車輛製造年份	1996
Test Date 測試日期	28/09/1999	Time 時間	13:21

A. Vehicle Identity and Safety Inspection
車輛驗證及安全檢查

(i) VIN/Chassis No. is correct 車輛底盤號碼正確 Yes

If incorrect, Stamped No. 如不正確，蓋印編號

(ii) Vehicle Satisfied the Pre-test Inspection 車輛通過測前檢查 Yes

B. Emission Test on Chassis Dynamometer
底盤式功率機廢氣測試

(i) Corrected Maximum Power Measured 33.12 kW
經修正最高所得的最大馬力

Minimum Required 34.20 kW
最低要求

(ii) Measured Max. Power Engine Speed 3295 RPM
在最大馬力時所量度得的引擎轉速 (轉/分鐘)

Lower Limit 3595 RPM 下限 Upper Limit 4305 RPM 上限

(iii) Measured Smoke 85.99 HSU at the Engine Speed at Max. Power of 3295 RPM
在最大馬力引擎轉速情況時所量度得的煙霧水平

Legal Emission Limit 50.00 HSU
法定排放限額 哈特里奇單位

(iv) Measured Smoke 85.15 HSU at 90% of the Engine Speed at Max. Power of 2982 RPM
在最大馬力引擎轉速的90%情況時所量度得的煙霧水平

or 或 N/A m^{-1}
光吸取絕對單位

(v) Measured Smoke 86.20 HSU at 80% of the Engine Speed at Max. Power of 2662 RPM
在最大馬力引擎轉速的80%情況時所量度得的煙霧水平

C. Test Result
測試結果

Approved Vehicle Emission Tester
認可的車輛廢氣測試員

(i) Emission Test Result 廢氣測試結果 FAILED (Passed / Failed / Test Aborted / Test Suspended) (合格 / 不合格 / 未能完成測試 / 測試中途停止)

(ii) For reason(s) of Item(s) : No. __ as indicated in the footnotes.
由於發現如附註所述的第 項問題。

(Tester's No. & Signature)
測試員編號及簽名

Footnotes 附註：

1. Chassis No. Incorrect 底盤號碼不符
2. Air Filter not Equipped 沒有配備空氣過濾器
3. Exhaust Pipe Leak 廢氣喉漏
4. Engine Coolant Leak 引擎渦漏冷卻液
5. Engine Lubricant Leak 引擎渦漏潤滑油
6. Transmission System Oil/Fluid Leak 傳動系統渦漏油/液體
7. Fuel Leak 燃料渦漏
8. Tyres and Wheels Not Suitable for Test 車胎及車軸不適宜進行測試
9. Loose Part Found in Transmission System 傳動系統有零件過鬆
10. Lubrication Oil Warning Light Not in Operation 潤滑油警告燈操作不正常
11. Engine Coolant Temperature Gauge Not in Operation 引擎水溫錶操作不正常
12. Mal-adjustment, Engine Speed too Low 引擎調較不當，轉數過低
13. The Test Requirements were Not Met 未能符合測試合格標準
14. The Test Cell Condition was Unsuitable for Conducting the Test 驗車間情況不適宜進行測試
15. Power/Force exceeds Dynamometer Capacity 車輛馬力超出功率機的規格
16. Others (as specified) 其他事項 (如述)