Report No. 44 of the Director of Audit — Chapter 2

DIESEL VEHICLE EMISSION CONTROLS

Summary

1. High concentration of air pollutants at roadside level, particularly respirable suspended particulates (RSPs) and nitrogen oxides, is a major concern for public health because both pollutants aggravate respiratory illnesses. Diesel vehicles account for about 90% each of RSPs and nitrogen oxides emitted by all vehicles throughout the territory. Reduction of emissions from diesel vehicles is vital to the prevention and abatement of roadside air pollution in Hong Kong.

2. In 1987, the Government established 14 air quality objectives (AQOs) to provide a framework for air quality management. These AQOs spell out the maximum safe levels of major air pollutants in the ambient air, including those for RSPs and nitrogen dioxide, which is one form of nitrogen oxides.

3. In 1999, the Chief Executive announced in his Policy Address that the Government would allocate $1.4 billion to implement a comprehensive programme to reduce 80% of RSP emissions and 30% of nitrogen oxides emissions from vehicles by 2005. However, the annual averages of RSPs and nitrogen dioxide at roadside level in 2004 still exceeded the respective maximum safe levels as laid down in the AQOs by 45% and 26%.

Diesel vehicle inspection and maintenance programme

4. ***Transport Department smoke test procedures.*** Presently, the Transport Department (TD) is using the free acceleration smoke test procedures to test smoke emissions from diesel vehicles. Audit comparison of the TD test procedures with the standards recommended by the US Environmental Protection Agency (US EPA) indicated that several test procedures required by the US EPA standards were not required by the TD. The TD explained that the free acceleration smoke test was carried out as part of the annual roadworthiness test. Most of the test procedures required by the US EPA standards had, in fact, been carried out at different stages of the roadworthiness test prior to the smoke test. The TD agreed to revise and update its smoke test procedures, where appropriate.

5. During their visits to the TD vehicle examination centres, Audit staff found that drivers were involved in the setting up of smoke test equipment. *Audit has recommended that the Commissioner for Transport should conduct periodic verification inspections to ensure that the smoke test procedures and standards laid down are strictly followed. He should also prohibit drivers from participating in the setting up of smoke test equipment, and ensure that they are not involved in the test procedures without proper supervision.*

6. ***Use of dynamometer in smoke emission test.*** The dynamometer smoke test is more effective because it assesses a vehicle's emissions under simulated driving conditions. When the TD's first dynamometer became fully operative in 2002, the TD pledged that 10% of the diesel vehicles presented for the annual roadworthiness test at the Kowloon Bay Vehicle Examination Centre would be randomly selected to undergo the dynamometer smoke test.

7. Audit examination of the TD records showed that the percentage of vehicles selected for dynamometer smoke test had dropped from 9.4% in 2002 to 0.4% in 2004. The utilisation rate of the dynamometer had also dropped from 55% in 2002 to 2.4% in 2004. The low utilisation problem will continue because another dynamometer is currently being installed. *Audit has recommended that the Commissioner for Transport should ensure that more vehicles undergo the dynamometer smoke test to improve the utilisation of the dynamometer.*

8. ***Engine power output check.*** Audit examination of the dynamometer smoke test records indicated that the TD adopted a lenient standard (i.e. 50% of that specified by the vehicle manufacturer) for the maximum engine power output check. Forty-nine percent of the 70 vehicles that passed the dynamometer smoke test produced only 60% or less of their maximum engine power output. *Audit has recommended that the Commissioner for Transport should consider adopting stringent standards for the maximum engine power output check.*

9. ***Smoke test standard.*** The current 60 Hartridge Smoke Units (HSUs) smoke opacity standard adopted by the TD was set in the 1970s. In 1992, the Environmental Protection Department (EPD) proposed to tighten this standard to 50 HSUs. The Motor Trade Association of Hong Kong commented that vehicles manufactured in 1990 and thereafter, if properly maintained, should have no difficulties in complying with the 50-HSU standard throughout their useful life. *Audit has recommended that the Commissioner for Transport should tighten the smoke opacity standard and consider establishing a mechanism to review the standard regularly.*

Smoky vehicle control programme

10. The smoky vehicle control programme (SVCP) is operated by the EPD. Under the SVCP, trained spotters would report smoky vehicles to the EPD. The EPD would serve an emission testing notice (ETN) on the vehicle owners, requiring them to bring their vehicles to one of its designated vehicle emission testing centres (DVETCs) for smoke tests.

11. ***Smoky vehicle control programme administrative procedures.*** Under the SVCP, owners of suspected smoky vehicles would be given 14 days to bring their vehicles to one of the DVETCs for smoke test. Audit examination of the 17,810 ETNs issued in 2003 and 2004 indicated that in 3,156 cases (or 18%), the time allowed was more than 30 days. *Audit has recommended that the Director of Environmental Protection should review the time allowed for smoky vehicle owners to have their vehicles passed the EPD smoke test.*

12. ***Monitoring the performance of designated vehicle emission testing centres.*** To ensure that smoke tests are conducted properly by the DVETCs, EPD inspectors conduct monitoring inspections of all the DVETCs quarterly. Audit examination of the inspection records indicated that the 11 DVETCs were inspected only three times in 2004. In 25 (76%) of the 33 inspections, EPD smoke test procedures were not observed as no vehicle was presented for smoke test at the time the inspections were conducted. *Audit has recommended that the Director of Environmental Protection should ensure that the DVETCs are inspected quarterly and, if the smoke test procedures cannot be observed in the first visit, the DVETC concerned is re-inspected.*

13. ***Recruitment of spotters.*** The effectiveness of the SVCP depends on the number and enthusiasm of spotters. As at 31 December 2004, there were 4,718 spotters. Audit noted that the EPD had done little to promote the recruitment of spotters. There was neither advertisement nor other forms of publicity. Audit also noted that 90% of the spotters did not make a report to the EPD in 2004. *Audit has recommended that the Director of Environmental Protection should take action to publicise the recruitment of spotters and to promote their enthusiasm.*

Use of liquefied petroleum gas

14. One of the Government's main strategies to reduce the levels of ambient RSPs and nitrogen oxides is to promote the use of liquefied petroleum gas (LPG) vehicles. LPG vehicles emit almost negligible RSPs and 75% to 85% less nitrogen oxides than diesel vehicles. According to the EPD, the comparative advantages of LPG vehicles over diesel vehicles will persist even after the introduction of more environmental-friendly vehicles after 2005. As at 31 December 2004, the number of LPG vehicles (about 20,000) was small, compared with the 129,000 diesel vehicles.

15. ***Scope of extending the use of LPG to other diesel vehicles.*** In 2003, the Government informed the Legislative Council that it was impracticable to extend the use of LPG to light vans and light goods vehicles having a permitted gross vehicle weight not exceeding 5.5 tonnes (hereinafter referred to as light vehicles) on the following grounds:

(a) the existing LPG terminal throughput capacity could not support the entire fleet of light vehicles in Hong Kong;

(b) there were inadequate LPG filling stations; and

(c) there would be an unacceptable increase in marine and road transport risk due to transporting more LPG to the terminals and filling stations.

16. Audit review of a consultancy report found that, while the existing infrastructure could support additional LPG light vehicles, it was insufficient to support the entire fleet of light vehicles (see paras. 17 and 18).

17. ***LPG terminal throughput capacity.*** According to the consultancy report, the existing annual throughput capacity of the Tsing Yi LPG terminals was about 579,000 tonnes. If the entire fleet of taxis and light buses was powered by LPG, the annual LPG consumption would be about 472,000 tonnes. The spare capacity of 107,000 tonnes may be used to support additional LPG vehicles.

18. ***The existing LPG filling stations can support additional vehicles.*** In the first half of 2004, Audit staff visited 15 LPG filling stations and were informed that, other than during the peak hours (i.e. one or two in the afternoon and early morning), business was light. Audit analysis of the filling records of a number of dedicated LPG filling stations showed that the average number of vehicles refilled by each nozzle at the busiest filling station during peak hours (i.e. 3:00 pm to 5:00 pm) was 14.5, whereas the corresponding figures during non-peak hours at other stations ranged from 0.6 to 9.4 (the median was 1.9). This indicates that the existing LPG filling stations have spare capacity to support additional LPG vehicles. This spare capacity will further increase by early 2006 as 6 new filling stations (with 32 nozzles) are being planned.

19. ***Safety concern.*** To contain the risks associated with the storage and distribution of LPG, the consultancy report has suggested, among others, two risk mitigation measures worthy of exploration, namely importing LPG from Shenzhen and building additional LPG terminals. The consultant said that the transport risk of supplying LPG to filling stations in the north of the New Territories would be lower, if LPG was supplied from Shenzhen instead of the Tsing Yi LPG terminals. The consultant also suggested a number of sites, including the one at the waste disposal facility in Kennedy Town, for building additional LPG terminals. Audit considers that an LPG terminal on Hong Kong Island would reduce the risk to the population in Tsing Yi, the transport risk of supplying LPG to filling stations on Hong Kong Island, and the risk that the supply of LPG would run out on Hong Kong Island in the event of a disruption of vehicular ferry service.

20. ***Implications on government revenue.*** Further extending the use of LPG would result in the loss of a considerable amount of government duty from diesel. Audit notes that, in countries where LPG and diesel are both available, duty is levied on LPG. For this reason, the pump price differentials between LPG and diesel in many countries are significantly less than the 63% differential in Hong Kong. The Financial Services and the Treasury Bureau informed Audit that the measure of not levying duty on LPG would be reviewed. *Audit has recommended that the Secretary for the Environment, Transport and Works should consider inviting the LPG importers to supply LPG from Shenzhen to filling stations in the north of the New Territories to reduce the transport risk, and examine the feasibility of building a new LPG terminal on Hong Kong Island. She should also consider extending the use of LPG to other diesel vehicles, after the relevant issues, including the readiness of LPG infrastructure and implications on government revenue, have been properly addressed.*

Response from the Administration

21. The Administration generally agrees with the audit recommendations.

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