Pilot Green Transport Fund

Interim Report
On
Trial of Hybrid Light Goods Vehicles for Transportation Industry (MTR)

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The Monitoring and Evaluation Team's views expressed in this report do not necessarily reflect the views of the Environmental Protection Department, HKSAR.

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Interim Report
(Trial Period: 1 April 2013 – 31 March 2014)

Executive Summary

1 Introduction

1.1 The Pilot Green Transport Fund (the Fund) is set up to encourage transport operators to try out green and innovative transport technologies, contributing to better air quality and public health for Hong Kong. The Fund has subsidized MTR Corporation Limited (MTR) to try one hybrid light goods vehicle for services in the transportation industry.

1.2 PolyU Technology and Consultancy Company Limited (PolyU) has been engaged by Environmental Protection Department as an independent third party assessor to monitor the trials and evaluate the operational performance of the trial vehicles. PolyU regularly visited MTR to collect information for evaluating the performance of the hybrid light goods vehicle (HV) as compared with the diesel light goods vehicle (DV) which provided the same service in similar areas and road conditions. The information collected includes the said vehicles' operation data, fuel bills, maintenance records, reports on operation difficulties, and opinions of the HV drivers from survey questionnaires.

1.3 This Interim Report summarizes the performance of the HV for services in the transportation industry in the first twelve months of the trial as compared with its conventional counterpart.

2 Trial Vehicle

2.1 MTR procured one 5.5 tonnes GVW Mitsubishi FUSO Canter Eco Hybrid light goods vehicle (HV) of 2988 cc cylinder capacity for trial.

2.2 One 5.5 tonnes GVW Hino diesel light goods vehicle (DV) of 4009 cc cylinder capacity was assigned for comparison with the HV.

2.3 Key features and photos of the HV and DV are in Appendices 1 and 2 respectively.

3 Trial Information

3.1 The 24-month trial started on 1 April 2013. Both HV and DV are stationed at the depot of MTR in Kowloon Bay. The vehicles operated from Monday to Saturday to deliver spare parts and other materials from Kowloon Bay depot to other MTR stations and MTR-owned land properties.

3.2 During this twelve-month report period, the HV travelled about 11,664 km whereas the DV travelled about 16,360 km. The performance of the HV and its average operating cost as compared with the DV in the first twelve months of the trial is summarized below:

Table 1: Average fuel economy and average fuel cost of trial vehicles

	Hybrid Light Goods Vehicle	**Diesel Light Goods Vehicle**
	HV	**DV**
Average fuel economy	7.21 km/litre	6.46 km/litre
Average fuel cost [1]	$1.73/km	$1.94/km
Average total operating cost [1],[2]	$2.31/km	$2.52/km

[1] The market fuel price is used for calculation

[2] Including costs incurred from maintenance. MTR did not pay for the labour cost of the first two scheduled maintenance of the HV.

3.3 The average fuel cost of the HV was lower than the DV by 11%. In fact, the vehicle operating conditions and the drivers' driving habit would affect its fuel saving performance. According to the manufacturer's information, the trial vehicle could save up to about 20% fuel per km as compared with its diesel counterpart if it travels in urban areas at an average speed of 20 km/h with frequent start-stops. If it travels in suburban areas or on highways at an average speed of 44 km/h, the fuel saving performance would however be reduced to about 12% because the energy recovered by the electric generator at start-stops is much reduced. It should be noted that the HV is a Mitsubishi make while the DV is a Hino make which has a different engine design, therefore the manufacturer's fuel saving information is less applicable to this case. A possible explanation for the lower fuel saving performance is that the trial HV travelled part of its journeys on suburban and highways, and hence it was unable to achieve the best fuel saving performance according to the manufacturer because of less start-stops to recover the energy by the electric generator as compared to traveling in urban areas. Therefore the trial HV was unable to achieve the best fuel saving performance.

3.4 It is noted that the HV in this trial had a better fuel economy than that of the same Mitsubishi model tried out in other trials under the Fund. In the other trials, the fuel economy of this model ranged from 5.18 km/litre to 6.33 km/litre while the fuel economy in this trial was 7.21 km/litre. It might be due to the smaller loading carried by the HV in this trial. Besides, good driving habit might also contribute to higher fuel economy.

3.5 Besides fuel costs, maintenance cost and other costs associated with breakdowns, such as replacement of components and parts, were also accounted for in calculating the total operating cost. It should be noted that in the first two scheduled maintenance of the hybrid vehicle, the labor cost was waived and only the parts to be replaced were charged. The total operating cost of the HV was 8% lower than the DV.

4 Maintenance and Downtime

4.1 During the report period, the HV had undergone two scheduled maintenance and one unscheduled maintenance due to a failure in starting the engine. The total operation downtime for the HV was 9 days. The utilization rate of the HV was 97%, which was close to the DV.

5 Summary of Findings

5.1 The vehicle operating conditions and the drivers' driving habit would affect the fuel saving performance of the hybrid vehicle. The trial HV travelled part of its journeys on suburban and highways, and hence it was unable to achieve the best fuel saving performance according to the manufacturer because of less start-stops to recover the energy by the electric generator as compared to traveling in urban areas. Nevertheless, the HV in general has better fuel economy than the DV. The HV saved 11% fuel cost as compared to the DV.

5.2 The HV drivers reflected that it took time to familiarize with the operation of the HV, especially in the automatic switch of gear ratio when going uphill or when the vehicle was travelling at low speed. Generally speaking, the drivers were satisfied with the performance of the HV.

5.3 The HV had regular scheduled maintenance similar to the DV. The HV seldom had any failure and out of the 298 working days, the HV had lost 9 days only and the utilization rate of HV was 97%.

5.4 No deterioration in the performance of the HV was observed from the reported data.

5.5 The findings only reflect the performance of the HV in the first twelve months of the trial. More time is needed to test the fuel saving performance and the reliability of the HV.

Appendix 1: Key Features of Vehicles

1. Trial HV

Registration Mark:	**RY3856 (HV)**
Make:	Mitsubishi Fuso
Model:	Canter Eco Hybrid FEB74ER3SDAC
Class:	Light goods vehicle
Gross vehicle weight:	5500 kg
Seating Capacity:	2
Cylinder Capacity:	2998 cc
Year of manufacture:	2012

2. DV used for comparison

Registration Mark:	**RH9190 (DV)**
Make:	Hino
Model:	XZU710RHKFQT3
Class:	Light goods vehicle
Gross vehicle weight:	5500 kg
Seating Capacity:	2
Cylinder capacity:	4009 cc
Year of manufacture:	2011

Appendix 2: Photos of Vehicles

1. Trial HV

HV (RY3856) (front view)	HV (RY3856) (end view)
HV (RY3856) (side view)	HV (RY3856) (side view)

2. DV used for comparison

DV (RH9190) (front view)	DV (RH9190) (end view)
DV (RH9190) (side view)	DV (RH9190) (side view)