Pilot Green Transport Fund

Interim Report
On
Trial of Hybrid Light Goods Vehicles for Courier Service (SF Express)

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(Trial Period: 1 October 2013 – 30 September 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 S.F. Express (Hong Kong) Limited (SF Express) to try three hybrid light goods vehicles for courier service.

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 SF Express to collect information for evaluating the performance of the hybrid light goods vehicles (HVs) as compared with the diesel light goods vehicles (DVs) which provided the same service in the same areas. 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 HVs for courier service in the first twelve months of the trial as compared with their conventional counterparts.

2 Trial Vehicles

2.1 SF Express procured three 5.5 tonnes GVW Hino 300 Series Hybrid light goods vehicles (HV-1, HV-2 and HV-3) of 4009 cc cylinder capacity for trial.

2.2 Three 5.5 tonnes GVW Isuzu diesel light goods vehicles (DV-1, DV-2 and DV-3) of 5193, 5193 and 4751 cc cylinder capacity respectively and of the same service areas were assigned for comparison with the three HVs.

2.3 Key features and photos of the HVs and DVs are in Appendices 1 and 2 respectively.

3 Trial Information

3.1 The 24-month trial started on 1 October 2013. All the HVs and DVs are stationed at SF Express depot at Tin Shui Wai. HV-1, HV-2 and HV-3 made regular trips to Mong Kok, Hung Hom, and Yuen Long respectively. HV-1 and HV-2 travelled mostly on highway and HV-3 travelled partly on highway. Each HV shares the same service areas with its diesel counterpart. The vehicles provide year round service from Monday to Sunday and on public holidays, with twelve working hours per day.

3.2 During this twelve-month report period, HV-1, HV-2 and HV-3 travelled about 26,688 km, 26,672 km and 14,790 km respectively whereas DV-1, DV-2 and DV-3 travelled about 33,316 km, 43,318 km and 16,218 km respectively. The performance of the HVs, and their average operating costs as compared with the DVs in the first twelve months of the trial are summarized below:

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

	Hybrid Light Goods Vehicle			**Diesel Light Goods Vehicle**		
	HV-1	**HV-2**	**HV-3**	**DV-1**	**DV-2**	**DV-3**
Average fuel economy	7.68 km/litre	7.25 km/litre	5.58 km/litre	5.83 km/litre	6.29 km/litre	4.98 km/litre
Average fuel cost [1]	$1.66/km	$1.76/km	$2.29/km	$2.19/km	$2.03/km	$2.57/km
Average total operating cost [1], [2]	$1.82/km	$2.09/km	$2.51/km	$2.82/km	$2.33/km	$3.59/km

[1] The market fuel price was used for calculation

[2] SF Express has signed a maintenance contract to cover both the HVs and DVs and did not pay for some of the maintenance. Reference maintenance cost for each maintenance provided by SF Express was used in calculating the total operating cost.

3.3 The average fuel costs of HV-1, HV-2 and HV-3 were lower than their conventional counterparts by 24%, 13% and 11% respectively. 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 model could save about 15% fuel as compared with its diesel counterpart according to the calculation method approved by the Ministry of Land, Infrastructure, Transport and Tourism of Japan. Fuel economy depends on road condition. If it travels more in suburban areas or on highways, there would be less fuel saving because the energy recovered by the electric generator at start-stops is much reduced. It should be noted that the HVs are Hino make while the DVs are Isuzu make which have different engine design, therefore the manufacturer's fuel saving information is less applicable to this case. On an average, the HVs saved 16% of fuel as compared to the DVs.

3.4 It is noted that the HVs in this trial had a better fuel economy than that of the same Hino model tried out in other trials under the Fund. In the other trials, the fuel economy of this model ranged from 3.07 km/litre to 4.31 km/litre while the average fuel economy in this trial was 6.84 km/litre. It might be due to the HVs in this trial travelled more on highways, thus achieved higher fuel economy. Besides, the smaller loading carried by the HVs also increased the 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. SF Express has signed a maintenance contract to cover both the HVs and DVs and did not pay for some of the maintenance. Reference maintenance cost for each maintenance provided by SF Express was used in calculating the total operating cost. The average total operating cost of HV-1, HV-2 and HV-3 was 35%, 10% and 30% lower than DV-1, DV-2 and DV-3 respectively.

4 Maintenance and Downtime

4.1 During the report period, HV-1 had undergone two scheduled maintenance but no unscheduled maintenance. The total operation downtime for HV-1 was 2 days. HV-2 had undergone two scheduled maintenance but no unscheduled maintenance. The total operation downtime for HV-2 was 2 days. HV-3 had undergone one scheduled maintenance but no unscheduled maintenance. The total operation downtime for HV-3 was 4 days. The utilization rate of HV-1, HV-2 and HV-3 were all 99%, similar to the DVs.

5 Summary of Findings

5.1 The vehicle operating conditions and the drivers' driving habit would affect the fuel saving performance of the hybrid vehicles. On an average, the HVs saved 16% fuel cost as compared to the DVs.

5.2 The HV drivers reflected that they had to adjust their driving habits in the first month but after familiarization with the vehicle, they had no problem in its operation. However, two out of the three drivers reflected that the HVs were less powerful than the conventional trucks when driving upslope and responded slower than the DVs. According to the supplier, this is because the processor in the HV at the ECO driving mode controls the optimum power output in order to achieve higher fuel efficiency, and in turn giving a feeling to driver that the vehicle is less powerful. The HVs can give the driver a more powerful feeling when driving out of the ECO mode.

5.3 The HVs had regular scheduled maintenance similar to the DVs. The HVs seldom had any failure and out of the 365 working days in the twelve month trial period, HV-1, HV-2 and HV-3 had lost 2, 2, and 4 days only and the utilization rate of HV-1, HV-2 and HV-3 were all 99%.

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

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

Appendix 1: Key Features of Vehicles

1. Trial HV

Licence Plate No.:	**SD5896 (HV-1)**
Make:	Hino
Model:	300 SERIES HYBRID
Class:	Light goods vehicle
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder Capacity:	4009 cc
Year of manufacture:	2013

Licence Plate No.:	**SD6193 (HV-2)**
Make:	Hino
Model:	300 SERIES HYBRID
Class:	Light goods vehicle
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder Capacity:	4009 cc
Year of manufacture:	2013

Licence Plate No.:	**SE7032 (HV-3)**
Make:	Hino
Model:	300 SERIES HYBRID
Class:	Light goods vehicle
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder Capacity:	4009 cc
Year of manufacture:	2013

2. DV used for comparison

Licence Plate No.:	**PH2608 (DV-1)**
Make:	ISUZU (Euro 5)
Model:	NPR75HH-V
Class:	Light goods vehicle
Gross vehicle weight:	5500 kg
Seating Capacity:	driver + 2 passengers
Cylinder capacity:	5193 cc
Year of manufacture:	2010

Licence Plate No.:	**PA7015 (DV-2)**
Make:	ISUZU (Euro 4)
Model:	NPR75HH
Class:	Light goods vehicle
Gross vehicle weight:	5500 kg
Seating Capacity:	driver + 2 passengers
Cylinder capacity:	5193 cc
Year of manufacture:	2009

Licence Plate No.:	**MR1933 (DV-3)**
Make:	ISUZU (Euro 3)
Model:	NPR70LU-5JMF-D
Class:	Light goods vehicle
Gross vehicle weight:	5500 kg
Seating Capacity:	driver + 2 passengers
Cylinder capacity:	4751 cc
Year of manufacture:	2006

Appendix 2: Photos of Vehicles

1. Trial HVs

	
HV-1 (SD5896) (front view)	HV-1 (SD5896) (end view)
	
HV-1 (SD5896) (side view)	HV-1 (SD5896) (side view)
	
HV-2 (SD6193) (front view)	HV-2 (SD6193) (end view)

	
HV-2 (SD6193) (side view)	HV-2 (SD6193) (side view)
	
HV-3 (SE7032) (front view)	HV-3 (SE7032) (end view)
	
HV-3 (SE7032) (side view)	HV-3 (SE7032) (side view)

2. DVs used for comparison

	
DV-1 (PH2608) (front view)	DV-1 (PH2608) (end view)
	
DV-1 (PH2608) (side view)	DV-1 (PH2608) (side view)
	
DV-2 (PA7015) (front view)	DV-2 (PA7015) (end view)

	
DV-2 (PA7015) (side view)	DV-2 (PA7015) (side view)
	
DV-3 (MR1933) (front view)	DV-3 (MR1933) (end view)
	
DV-3 (MR1933) (side view)	DV-3 (MR1933) (side view)