Pilot Green Transport Fund

Final Report
On
Trial of Hybrid Light Goods Vehicles (Non-van Type) for Courier Service
(SF Express (Hong Kong) Limited)

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(Trial Period: 1 October 2013 – 30 September 2015)

Executive Summary

1. Introduction

1.1 The Pilot Green Transport Fund (the Fund) is set up to encourage transport operators to try out green innovative transport technologies, contributing to better air quality and public health for Hong Kong. S.F. Express (Hong Kong) Limited (SF Express) was approved under the Fund for trial of three hybrid light goods vehicles (non-van type) for courier service. Through the tendering procedures stipulated in the Subsidy Agreement, SF Express procured three Hino 300 Series hybrid light goods vehicles (non-van type) (HVs) for trial.

1.2 PolyU Technology and Consultancy Company Limited (PolyU) has been engaged by the Environmental Protection Department (EPD) 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 HVs as compared with the diesel light goods vehicles (non-van type) (DVs) which provided the same service in the same areas. The information collected includes the said vehicles' operation data, refueling amount, maintenance records, reports on operation difficulties, and opinions of the HV drivers from survey questionnaires.

1.3 This report summarizes the performance of the HVs in the 24-months trial as compared with their conventional counterparts.

2. Trial Vehicles

2.1 SF Express procured three Hino 300 Series hybrid light goods vehicles (non-van type) with 5,500 kg gross vehicle weight (GVW) and cylinder capacity of 4,009 cc (HV-1, HV-2 and HV-3) for trial. The vehicles were used for providing courier services in Hong Kong.

2.2 Three 5,500 kg GVW Isuzu diesel light goods vehicles (non-van type) (DV-1, DV-2 and DV-3) with GVW of 5,500 kg and cylinder capacities of 5,193, 5,193 and 4,751 cc respectively were assigned for comparison with the three HVs. They were providing same services with the 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 via Tsing Long Highway and Tai Lam Tunnel to their destinations while HV-3 travelled mostly on highways in the New Territories. 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.

4. Findings of Trial

4.1 Operating Costs

4.1.1 Table 1 below summarizes the fuel cost data of the HVs and the DVs in the trial period. The average fuel cost of HV-1, HV-2 and HV-3 were lower than their conventional counterparts by 22%, 13% and 11% respectively.

Table 1: Key operation statistics of each vehicle

	Hybrid Light Goods Vehicle (Non-van Type)			**Diesel Light Goods Vehicle (Non-van Type)**		
	HV-1	**HV-2**	**HV-3**	**DV-1**	**DV-2**	**DV-3**
Total distance travelled (km)	53,712	53,057	28,090	62,116	83,844	30,030
Average fuel economy (km/litre)	7.48	7.20	5.49	5.90	6.31	4.87
Average fuel cost (HK$/km) [1]	1.59	1.66	2.18	2.03	1.90	2.45

[1] The market fuel price was used for calculation

4.1.2 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. From the trial results, the HVs saved an average of 15% of fuel as compared to the DVs which was similar to that the manufacturer's claim.

4.1.3 During the trial period, HV-1 had two scheduled maintenances and two unscheduled maintenances. Both unscheduled maintenances (i.e. cracking of windscreen and malfunctioning of cargo compartment door) were not related to the performance of the vehicle and were therefore

excluded from the comparison. The total maintenance cost was HK$4,130. HV-2 had two scheduled maintenances and two unscheduled maintenances. Both unscheduled maintenances (i.e. bursting of a tire and severe wear out of rear wheel tires) were not related to the performance of the vehicle and were therefore excluded from the comparison. The total maintenance cost was HK$8,753. HV-3 had one scheduled maintenance and four unscheduled maintenances. All unscheduled maintenances (i.e. bursting or severe wear out of tires and cracking of the windscreen) were not related to the performance of the vehicle and were therefore excluded from the comparison. The total maintenance cost was HK$3,376. It should be noted that in the first two scheduled maintenances of HVs, the labour cost was waived and only the parts to be replaced were charged.

4.1.4 Table 2 below summarizes all costs incurred for HVs and DVs. The average total operating costs include maintenance costs and other indirect costs such as towing fee, vehicle replacement fee. The average total operating cost per km of HV-1, HV-2 and HV-3 were 29%, 11% and 23% lower than DV-1, DV-2 and DV-3 respectively. The overall average total operating cost of three HVs was about 22% lower than that of the DVs.

Table 2: Average total operating cost and downtime of each vehicle

	Hybrid Light Goods Vehicle (Non-van Type)			**Diesel Light Goods Vehicle (Non-van Type)**		
	HV-1	**HV-2**	**HV-3**	**DV-1**	**DV-2**	**DV-3**
Total operating cost (HK$) [2]	89,577.2[1]	96,572.9[1]	64,508.8[1]	146,841.0	172,063.7	90,109.2
Average total operating cost (HK$/km)	1.67	1.82	2.30	2.36	2.05	3.00
Average total operating cost by vehicle type (HK$/km)	1.93			2.47		
Downtime (working days) [3]	2	2	4	6	7	9

[1] The labor cost was waived in the first two scheduled maintenances and only the parts to be replaced were charged.
[2] Cost of maintenance due to incident not related to the performance of the vehicle was excluded in comparison.
[3] Downtime refers to the working days that the vehicle is not in operation, which counted from the first day it stops operation till the day it is returned to the operator.

4.1.5 There was no accident throughout the trial period that incurred towing fee or vehicle replacement fee. The total operation downtime for HV-1, HV-2 and HV-3 were 2 days, 2 days and 4 days respectively and their utilization rates were 99.7%, 99.7% and 99.5% respectively.

4.2 Performance and Reliability

4.2.1 The HV drivers had no problem in operating the HVs but they reflected that the HVs had lacked power when going uphill as compared with the DVs.

4.2.2 Overall, SF Express was satisfied with the performance of the HVs. SF Express agreed that using hybrid vehicle is good because it can provide a greener environment.

4.2.3 To remove the effect of seasonal fluctuations, 12-month moving averages are used to evaluate the trend of the HVs' fuel economy. For HV-1, the fuel economy varied between 7.85 km/litre and 8.23 km/litre. For HV-2, the fuel economy varied between 7.27 km/litre and 7.63 km/litre. For HV-3, the fuel economy varied between 5.55 km/litre and 5.97 km/litre. There is no indication of deteriorating fuel economy of HVs. It appears that the engines of the HVs were still in normal working conditions and the fuel economy could be maintained through proper maintenance.

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. HV-1, HV-2 and HV-3 had 22%, 13% and 11% fuel cost per km lower than the DVs respectively, with an average fuel saving of about 15%.

5.2 The HV drivers found no problem in operating the HVs but they reflected that the HVs had lacked power when going uphill as compared with the DVs. Overall, SF Express was satisfied with the performance of the HVs. SF Express agreed that using hybrid vehicle is good because it can provide a greener environment.

5.3 During the trial period, HV-1, HV-2 and HV-3 had lost 2 days, 2 days and 4 days and the utilization rates of HV-1, HV-2 and HV-3 were 99.7%, 99.7% and 99.5% respectively.

5.4 There is no indication of deteriorating fuel economy of HVs in the trial period.

5.5 Compared with DVs, there are reduction of 5,315 kg, 2,881 kg and 1,807 kg CO2 equivalent emission by HV-1, HV-2 and HV-3 respectively, with a total emission reduction of 10,003 kg CO2 equivalent (which is about 15.5%) in the trial.

Appendix 1: Key Features of Vehicles

1. Trial HVs

HV-1

Registration Mark:	**SD5896**
Make:	Hino
Model:	HINO 300 SERIES HYBRID
Class:	Light goods vehicle (non-van type)
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder Capacity:	4,009 cc
Year of manufacture:	2013

HV-2

Registration Mark:	**SD6193**
Make:	Hino
Model:	HINO 300 SERIES HYBRID
Class:	Light goods vehicle (non-van type)
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder Capacity:	4,009 cc
Year of manufacture:	2013

HV-3

Registration Mark:	**SE7032**
Make:	Hino
Model:	HINO 300 SERIES HYBRID
Class:	Light goods vehicle (non-van type)
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder Capacity:	4,009 cc
Year of manufacture:	2013

2. DVs used for comparison

DV-1

Registration Mark:	**PH2608**
Make:	ISUZU
Model:	NPR75HH-V
Class:	Light goods vehicle (non-van type)
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder capacity:	5,193 cc
Year of manufacture:	2010

DV-2

Registration Mark:	**PA7015**
Make:	ISUZU
Model:	NPR75HH
Class:	Light goods vehicle (non-van type)
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder capacity:	5,193 cc
Year of manufacture:	2009

DV-3

Registration Mark:	**MR1933**
Make:	ISUZU
Model:	NPR70LU-5JMF-D
Class:	Light goods vehicle (non-van type)
Gross vehicle weight:	5,500 kg
Seating Capacity:	driver + 2 passengers
Cylinder capacity:	4,751 cc
Year of manufacture:	2006

Appendix 2: Photos of Vehicles

1. Trial HVs

Hybrid Vehicle HV-1 (SD5896) (front view)

Hybrid Vehicle HV-1 (SD5896) (end view)

Hybrid Vehicle HV-1 (SD5896) (side view)

Hybrid Vehicle HV-1 (SD5896) (side view)

Hybrid Vehicle HV-2 (SD6193) (front view)

Hybrid Vehicle HV-2 (SD6193) (end view)

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

2. DVs used for comparison

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

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