Pilot Green Transport Fund

Interim Report
On
Trial of Hybrid Medium Goods Vehicles for Beverage Delivery (Swire)

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(Trial Period: 1 February 2013 – 31 January 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 Swire Beverages Limited (Swire) to try three hybrid medium goods vehicles for beverage delivery.

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 Swire to collect information for evaluating the performance of the hybrid medium goods vehicles (HVs) as compared with the diesel medium goods vehicles (DVs) which provided the same service in similar areas or with similar 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 HVs for beverage delivery in the first twelve months of the trial as compared with their conventional counterparts.

2. Trial Vehicles

2.1 Swire procured three 7.5 tonnes GVW Mitsubishi FUSO Canter Eco Hybrid medium goods vehicles (HV-1, HV-2 and HV-3) of 2988 cc cylinder capacity for trial. Only HV-1 is equipped with a tail lift.

2.2 Three 9.0 tonnes GVW Mitsubishi FUSO Canter diesel medium goods vehicles (DV-1, DV-2 and DV-3) of 4899 cc cylinder capacity 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 February 2013. Both HVs and DVs are stationed at the depot of Swire Coca-Cola building in Sha Tin. The vehicles operate from Monday to Saturday according to the daily plan and it was reported by Swire that the service routes were random in their designated service areas.

3.2 During this twelve-month report period, HV-1, HV-2 and HV-3 travelled about 14,280 km, 14,942 km and 19,963 km respectively whereas DV-1, DV-2 and DV-3 travelled about 14,490 km, 12,269 km and 17,764 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	5.57 km/litre	4.75 km/litre	5.51 km/litre	3.94 km/litre	3.35 km/litre	4.81 km/litre
Average fuel cost [1]	$2.25/km	$2.63/km	$2.27/km	$3.18/km	$3.73/km	$2.59/km
Average total operating cost [1],[2]	$2.95/km	$2.77/km	$2.43/km	$3.95/km	$4.76/km	$3.49/km

[1] The market fuel price is used for calculation

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

3.3 The average fuel cost of HV-1, HV-2 and HV-3 were lower than their conventional counterparts by 29%, 29% and 12% 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 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. On an average the HVs saved 25% of fuel as compared to the DVs, a possible explanation for the higher fuel saving performance of the HVs is that they have smaller GVW than their counterparts. In general, the heavier the vehicle, the lower will be the fuel economy. To discount the effect due to higher GVW of the DVs, the fuel economy of the HVs were also compared with that of three 5.5 tonnes diesel light goods vehicles used by Swire and the average fuel saving was found to be 4%. Given that these diesel LGVs have lower GVW than the HVs, it is considered that the HVs in general have better fuel economy than the DVs.

3.4 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 vehicles, the labour cost was waived and only the parts to be replaced were charged. The total operating cost of HV-1, HV-2 and HV-3 was 25%, 42% 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 three scheduled maintenance and one unscheduled maintenance due to the leakage of lubrication oil. The total operation downtime for HV-1 was 10 days. HV-2 had undergone two scheduled maintenance and two unscheduled maintenance. One of the unscheduled maintenance was due to damage of door lock which is unrelated to the performance of HV-2 and therefore was not included for comparing the performance of HV-2 with its counterpart. The other unscheduled maintenance was due to lack of lubrication oil. The total operation downtime for HV-2 was 6 days. HV-3 had undergone two scheduled maintenance and one unscheduled maintenance due to lack of lubrication oil. The total operation downtime for HV-3 was 8 days. The utilization rates of HV-1, HV-2 and HV-3 were 97%, 98% and 97% respectively, which were similar to DV-1 and DV-2 while DV-3 had a lower utilization rate.

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 25% fuel cost as compared to the DVs. To discount the effect due to higher GVW of the DVs, the fuel economy of the HVs were also compared with that of three 5.5 tonnes diesel light goods vehicles used by Swire and the average fuel saving was found to be 4%. Therefore, the HVs in general have better fuel economy than the DVs.

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

5.3 The HVs had regular scheduled maintenance similar to the DVs. The HVs seldom had any failure and out of the 295 working days in the twelve month trial period, HV-1, HV-2 and HV-3 had lost 10, 6, and 8 days only and the utilization rates of HV-1, HV-2 and HV-3 were 97%, 98% and 97% respectively.

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

Registration Mark:	**RV9394 (HV-1)**
Make:	Mitsubishi Fuso
Model:	Canter Eco Hybrid FEB74GR3SDAG
Class:	Medium goods vehicle
Gross vehicle weight:	7,500 kg
Seating Capacity:	2
Cylinder Capacity:	2998 cc
Year of manufacture:	2012

Registration Mark:	**RW4275 (HV-2)**
Make:	Mitsubishi Fuso
Model:	Canter Eco Hybrid FEB74GR3SDAG
Class:	Medium goods vehicle
Gross vehicle weight:	7,500 kg
Seating Capacity:	2
Cylinder Capacity:	2998 cc
Year of manufacture:	2012

Registration Mark:	**RW4280 (HV-3)**
Make:	Mitsubishi Fuso
Model:	Canter Eco Hybrid FEB74GR3SDAG
Class:	Medium goods vehicle
Gross vehicle weight:	7,500 kg
Seating Capacity:	2
Cylinder Capacity:	2998 cc
Year of manufacture:	2012

2. DV used for comparison

Registration Mark:	**MZ9320 (DV-1)**
Make:	Mitsubishi Fuso
Model:	Canter Double Cab FE85DGWSRDA
Class:	Medium goods vehicle
Gross vehicle weight:	9000 kg
Seating Capacity:	6 (include driver)
Cylinder capacity:	4899 cc
Year of manufacture:	2007

Registration Mark:	**NM541 (DV-2)**
Make:	Mitsubishi Fuso
Model:	Canter Double Cab FE85DGWSRDAA
Class:	Medium goods vehicle
Gross vehicle weight:	9000 kg
Seating Capacity:	6 (include driver)
Cylinder capacity:	4899 cc
Year of manufacture:	2008

Registration Mark:	**NA7299 (DV-3)**
Make:	Mitsubishi Fuso
Model:	Canter FE85DGZSRDA
Class:	Medium goods vehicle
Gross vehicle weight:	9000 kg
Seating Capacity:	3 (include driver)
Cylinder capacity:	4899 cc
Year of manufacture:	2007

Appendix 2: Photos of Vehicles

1. Trial Hybrid Medium Goods Vehicles

	
Hybrid Vehicle HV-1 (RV9394) (front view)	Hybrid Vehicle HV-1 (RV9394) (end view)
	
Hybrid Vehicle HV-1 (RV9394) (side view)	Hybrid Vehicle HV-1 (RV9394) (side view)
	
Hybrid Vehicle HV-2 (RW4275) (front view)	Hybrid Vehicle HV-2 (RW4275) (end view)

	
Hybrid Vehicle HV-2 (RW4275) (side view)	Hybrid Vehicle HV-2 (RW4275) (side view)
	
Hybrid Vehicle HV-3 (RW4280) (front view)	Hybrid Vehicle HV-3 (RW4280) (end view)
	
Hybrid Vehicle HV-3 (RW4280) (side view)	Hybrid Vehicle HV-3 (RW4280) (side view)

2. Diesel Medium Goods Vehicles for Comparison

	
Diesel Vehicle DV-1 (MZ9320) (front view)	Diesel Vehicle DV-1 (MZ9320) (end view)
	
Diesel Vehicle DV-1 (MZ9320) (side view)	Diesel Vehicle DV-1 (MZ9320) (side view)
	
Diesel Vehicle DV-2 (NM541) (front view)	Diesel Vehicle DV-2 (NM541) (end view)

	
Diesel Vehicle DV-2 (NM541) (side view)	Diesel Vehicle DV-2 (NM541) (side view)
	
Diesel Vehicle DV-3 (NA7299) (front view)	Diesel Vehicle DV-3 (NA7299) (end view)
	
Diesel Vehicle DV-3 (NA7299) (side view)	Diesel Vehicle DV-3 (NA7299) (side view)