Pilot Green Transport Fund

Final Report On
Trial of Hybrid Medium Goods Vehicles for Pharmaceutical Product Delivery (Pharmason Company Limited)

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Trial of Hybrid Medium Goods Vehicles for Pharmaceutical Product Delivery
(Pharmason Company Limited)

Final Report
(Trial Period: 1 March 2018 – 29 February 2020)

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. The Pharmason Company Limited (Pharmason) was approved under the Fund for trial of two hybrid medium goods vehicles (hereafter called HVs: HV-1 and HV-2) for pharmaceutical produce delivery.

1.2 The Hong Kong Institute of Vocational Education (Tsing Yi) has been engaged by the Environmental Protection Department as an independent third-party assessor to monitor the trial and evaluate the performance of the trial vehicles.

1.3 This Final Report summarizes the performance of the HVs in the trial period as compared with their conventional diesel counterparts.

2. Trial Vehicles

2.1 Through the tendering procedures stipulated in the Subsidy Agreement, Pharmason procured two Hino 300 series hybrid medium goods vehicles (HV-1 and HV-2) for trial. The vehicles are used to deliver pharmaceutical and healthcare products to doctors, hospitals and general consumers. Two diesel medium goods vehicles (DVs: DV-1 and DV-2) providing similar services were assigned for comparison with the HVs.

2.2 Key features of the HVs and the DVs are in Appendix 1 and photos of the vehicles are in Appendix 2.

3 Trial Information

3.1 The trial started on 1 March 2018 and lasted for 24 months. Pharmason was required to collect and provide trial information including the HVs' odometer reading at refueling, the date of refueling, the refueled amount, cost and operation downtime associated with scheduled and unscheduled maintenance of the HVs. Similar data from the DVs were also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the drivers and Pharmason were collected to reflect any problems of the HVs.

4 Findings of Trial

4.1 Table 1 summarizes the statistical data of the HVs and the DVs. The fleet average fuel cost of the two HVs was HK$0.66/km (i.e., about 20%) higher than that of the two DVs and the fleet average total operating costs of the two HVs was HK$0.64/km (i.e., about 20%) higher than that of the DVs.

Table 1: Key operation statistics of each vehicle (1 March 2018 – 29 February 2020)

	HVs		**DVs**	
	HV-1	**HV-2**	**DV-1**	**DV-2**
Total traveled distance (km)	33,406	22,707	49,550	46,824
Average distance travelled (km) per working day	56.6	38.4	83.7	78.9
Average fuel economy (km/litre)	4.15	3.18	4.71	4.03
Fleet average fuel economy (km/litre)	3.67		4.37	
Average fuel cost (HK$/km) [1]	3.37	4.41	2.98	3.48
Fleet average fuel cost (HK$/km)	3.89		3.23	
Average total operating cost (HK$/km) [2]	3.37	4.41	3.02	3.48
Fleet average total operating cost (HK$/km)	3.89		3.25	
Downtime (working day) [2] [3]	3	2	5	4

[1] Market rate was adopted for calculation.
[2] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.
[3] Downtime refers to the period the vehicle was not in operation, which counted from the first day it stopped operation till it was returned to the operator

4.2 HV-1 and HV-2 had 3 days and 2 days of downtime in the trial period, while DV-1 and DV-2 had 5 days and 4 days of downtime in the trial period. There were 593 working days in the trial period, so the utilization rates of HV-1, HV-2, DV-1 and DV-2 were 99.5%, 99.7, 99.2% and 99.3%, respectively.

4.3 Pharmason had a designated driver for each HV. The HV drivers had no problem in operating the HVs and opined that the HVs were quieter than the DVs. They found that the HVs had slower gearbox response than the DVs, so they had to adjust their driving habit and turned off the eco-mode (i.e., hybrid function off). In addition, the HVs drivers and Pharmason expressed that the HVs had less power compared with the DVs when going uphill, so the drivers had to manually shift down one gear to gain more torque and power as well as turned off the eco-mode.

4.4 Pharmason agreed with the drivers on the aforesaid problem of the HVs. Pharmason also believed that the HVs had less power compared with the DVs when going uphill. Pharmason and the drivers were not satisfied with the overall performance of the HVs. They found that the performance of the HVs could not meet the operational requirements and the HVs had comparatively less power for going uphill and higher fuel cost than DVs.

4.5 To eliminate the effect of seasonal fluctuations, 12-month moving averages were used to evaluate the trend of the HVs' fuel economy. The fuel economy of HV-1 showed signs of decline (from 4.53 to 3.84 km/kWh). However, the fuel economy of HV-2 only varied slight downward (from 3.25 to 3.16 km/kWh). During the 24-month trial period, the average fuel economy varied broadly for HV-1. It can be observed that the fuel economy of HV-1 had a steady fall during the trial period. However, the variation in fuel economy of the HV-2 is insignificant and hence there is no indication that the fuel economy and the batteries had deteriorated during the trial period.

4.6 Based on the distances travelled by the HVs in the trial, the equivalent carbon dioxide (CO_2e) emissions from HV-1 and HV-2 were 21,231 kg and 18,842 kg respectively, while those from the DV-1 and DV-2 were 18,720 kg and 14,871 kg. The total CO_2e emission from the HVs was 6,482 kg (i.e., about 19%) higher than that from the DVs.

5 Summary

5.1 The fleet total fuel economy of HVs was unobvious. The fleet average fuel cost of the two HVs was HK$0.66/km (i.e., about 20%) higher than that of the two DVs. Including the maintenance costs, the fleet average total operating cost of the two HVs was HK$0.64/km (i.e., about 20%) higher than that of the DVs. The fuel economy or driving range is affected by various factors such as driving behavior, road gradient, traffic condition, air-conditioning load and cargo load. Overall, HV fuel economy is not obvious.

5.2 The utilization rates of HV-1, HV-2, DV-1 and DV-2 were 99.5%, 99.7, 99.2% and 99.3%, respectively. In addition, the total CO_2e emission reduction from the HVs was 6,482 kg (i.e., about 19%) higher than that from the DVs.

5.3 The average fuel costs of HVs were unobvious. The 12-month moving average fuel economy figures suggest the fuel economy of HV-1 had decreased. However, the variation in fuel economy of the HV-2 was insignificant and hence there is no indication that its fuel economy and batteries had deteriorated during the trial period.

5.4 The drivers had no problem in operating the HVs, except that the power of the HV was not as good as that of the DV and the response of the gearbox was slow. Pharmason and the drivers were not satisfied with the overall performance the HVs. They found that the performance of the HVs could not meet their operational requirements.

Appendix 1: Key Features of Vehicles

1. Trial HVs

Registration Mark	**VE895 (HV-1) / VE4825 (HV-2)**
Make:	Hino
Model:	300 Series Hybrid XKU720R – HKUTS3
Class:	Medium Goods Vehicle
Gross vehicle weight:	8,500 kg
Seating capacity:	Driver + 2 passengers
Engine capacity:	4,009 c.c.
Maximum output(ps/rpm):	150/2,500
Battery type:	Nickel-Metal
Year of manufacture:	2017

2. DVs for comparison

Registration Mark	**TS4428 (DV-1) / TS3189 (DV-2)**
Make:	Isuzu
Model:	NQR75K-V
Class:	Medium Goods Vehicle
Gross vehicle weight:	9,000 kg
Seating capacity:	Driver + 2 passengers
Engine capacity:	5,193 c.c.
Year of manufacture:	2015

Appendix 2: Photos of Vehicles

1. Trial HVs

(a) HV-1

Front view of HV-1

Rear view of HV-1

Left side view of HV-1

Right side view of HV-1

(b) HV-2

	
Front view of HV-2	Rear view of HV-2
	
Left side view of HV-2	Right side view of HV-2

2. DVs for comparison

(a) DV-1

Front view of DV-1

Rear view of DV-1

Left side view of DV-1

Right side view of DV-1

(b) DV-2

	
Front view of DV-2	Rear view of DV-2
	
Left side view of DV-2	Right side view of DV-2