

Pilot Green Transport Fund

Final Report On
Trial of Hybrid Light Goods Vehicle for
Landscaping & Horticultural Maintenance Service
(Yee Sun Garden Limited)

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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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Trial of Hybrid Light Goods Vehicle
for Landscaping & Horticultural Maintenance Service
(Yee Sun Garden Limited)**

**Final Report
(Trial Period: 1 January 2018 – 31 December 2019)**

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. Yee Sun Garden Limited (Yee Sun) was approved under the Fund for trial of one hybrid light goods vehicle (HV) for landscaping and horticultural service.

1.2 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 vehicle. Yee Sun assigned one diesel light goods vehicle (DV) providing the similar service as the conventional vehicle for comparing with the HV.

1.3 This report summarizes the performance of HV in the 24 months of the trial as compared to its conventional diesel counterpart.

2. Trial Vehicle

2.1 Through the tendering procedures stipulated in the Subsidy Agreement that Yee Sun entered into with the Government, Yee Sun procured one Mitsubishi Fuso hybrid light goods vehicle (HV) for trial.

2.2 The HV has a gross vehicle weight (GVW) of 5,500 kg and the engine capacity is 2,998 c.c. The DV has a GVW of 5,500 kg and the engine capacity is 4,899 c.c. Both the HV and the DV do not have a fixed serving area, but include Hong Kong Island, Kowloon and the New Territories.

2.3 Key features of the HV and the DV are in Appendix 1 and photos of the vehicles are in Appendix 2. The vehicles were used for landscaping and horticultural maintenance service.

3 Trial Information

3.1 The trial started on 1 January 2018 and lasted for 24 months. Yee Sun was required to collect and provide trial information including the HV odometer reading at refueling, the date of refueling, the refueled amount, cost and operation downtime associated with scheduled and unscheduled maintenance of the HV. A similar set of data from the DV was also required. In addition to the cost information, reports on maintenance work, operational difficulties and opinions of the driver and Yee Sun were also collected to reflect any problems of the HV.

4 Findings of Trial

4.1 Table 1 summarizes the statistical data of the HV and DV. The average total operating cost of the HV was about HK\$0.61/km (15%) lower than that of the DV. The average fuel cost of the HV was HK\$1.09/km (27%) lower than that of the DV.

Table 1: Key operation statistics of each vehicle (January 2018 – December 2019)

	HV	DV
Total mileage (km)	41,841	22,369
Average fuel economy (km/litre)	4.77	3.49
Average fuel cost (HK\$/km) ^[1]	2.91	4.00
Average total operating cost (HK\$/km)	3.39	4.00
Downtime (working day) ^{[2][3]}	6	0

[1] The market fuel price was used for calculation.

[2] Downtime refers to the equivalent number of working days in which the vehicle is not in operation due to maintenance, counting from the first day it stops operation till the day it is returned to the operator.

[3] Maintenance due to incidents unrelated to the performance of the vehicle was not included for comparison.

4.2 During the 24 months of the trial, the HV had one unscheduled and four scheduled maintenances, leading to 6 days of operation downtime. The DV had no unscheduled and scheduled maintenance. In the 24 months of the trial, there were 592 working days. The utilization rates of HV and DV were 99% and 100% respectively.

4.3 Yee Sun had a designated driver for the HV. The HV driver expressed that the HV ran quieter than the DV. It was more energy efficient and it produced less air pollutants. The HV driver also expressed that the HV had less power compared to the DV when climbing uphill and also at start-up. The response time of auto-transmission gearbox of the HV was slow during acceleration and start-up. However, the driver expressed he encountered less difficulties in driving the HV when the trial went on, and he started to like driving the HV.

4.4 Yee Sun agreed that, in general, using hybrid vehicle was good because the performance of the HV met the operational requirements and the HV could help improve roadside air quality, and it was not particularly difficult to repair and perform maintenance for the HV. Yee Sun was willing to replace the DV by the HV and encourages other transport operators to try out the HV.

4.5 To eliminate the effect of seasonal fluctuations, 12-month moving averages were used to evaluate the trend of the HV's fuel economy. The fuel economy varied slightly from 4.58 to 5.21 km/litre for HV. It appears that the engine of the HV was still in normal working conditions and the fuel economy could be maintained through proper maintenance. No deterioration in the performance of the HV was observed during the trial period.

4.6 The carbon dioxide equivalent (CO₂e) emissions from the HV and the DV were 24,332 kg and 33,237 kg, respectively, and hence there was a reduction of 8,905 kg CO₂e emission, which was about 27% reduction, in the trial.

5 Summary

5.1 The driver had no problem in operating the HV and felt the HV was quiet and environment-friendly. However, the driver expressed that the HV had less power compared to the DV when climbing uphill and also at start-up. Yee Sun agreed that, in general, using hybrid vehicle was good because the performance of the HV met the operational requirements, and was willing to encourage other transport operators to try out the HV.

5.2 The HV had a better fuel economy than the DV. On average, the HV had 27% fuel cost saving as compared to the DV. Including the maintenance cost, the average total operating cost of the HV was 15% lower than that of the DV. Compared with the DV, the HV achieved about 27% reduction in CO₂e emission in the 24-month trial.

5.3 In the 24 months of the trial, the HV had one unscheduled and four scheduled maintenances, leading to 6 days of operation downtime. The DV had no unscheduled and scheduled maintenance. In the 24 months of the trial, there were 592 working days. The utilization rates of HV and DV were 99% and 100% respectively.

5.4 No deterioration in the performance of the HV was observed during the trial period.

Appendix 1: Key Features of Vehicles

1. Trial HV

Registration Mark	VB6517	
Make:	Mitsubishi Fuso	
Model:	FEB74ER3SDAL	
Class:	Light Goods Vehicle	
Gross vehicle weight:	5,500 kg	
Seating capacity:	Driver + 5 passengers	
Engine capacity:	2,998 c.c.	
Maximum output (ps/rpm)	150/3,500	Battery type: Lithium ion Battery
Year of manufacture:	2017	

2. DV for comparison

Registration Mark	SH4152
Make:	Mitsubishi Fuso
Model:	FE83DGZSRDAA
Class:	Light Goods Vehicle
Gross vehicle weight:	5,500 kg
Seating capacity:	Driver + 5 passengers
Engine capacity:	4,899 c.c.
Year of manufacture:	2011

Appendix 2: Photos of Vehicles

1. Trial HV



Front view of HV



Rear view of HV



Left side view of HV



Right side view of HV

2. DV for comparison



Front view of DV



Rear view of DV



Left side view of DV



Right side view of DV