

Pilot Green Transport Fund

Final Report
On
Trial of Hybrid Light Goods Vehicle
for Courier Service
(DHL Express (Hong Kong) 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 Courier Service
(DHL Express (Hong Kong) Limited)**

**Final Report
(Trial Period: 1 June 2016 – 31 May 2018)**

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 DHL Express (Hong Kong) Limited (DHL) to try out two hybrid light goods vehicles for courier service.

1.2 PolyU Technology and Consultancy Company Limited has been engaged by the Environmental Protection Department as an independent third party assessor (the assessor) to monitor the trials and evaluate the operational performance of the trial vehicles. The assessor regularly visited DHL 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 and 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 Final Report summarizes the performance of the HVs in the 24 months of the trial as compared with their conventional counterparts, i.e., the DVs.

2. Trial Vehicles

2.1 DHL procured two Mitsubishi FUSO hybrid light goods vehicles of 5.5 tonnes gross vehicle weight and 2998 cc cylinder capacity for trial. Two Mitsubishi FUSO 5.5 tonnes GVW diesel light goods vehicles (one 4899 cc; one 2998 cc cylinder capacity) were assigned for comparison with the HVs. All the vehicles were equipped with air-conditioning.

2.2 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 June 2016. One pair of vehicles (HV-1 and DV-1) operated from Tsuen Wan Depot to deliver posted packages to Tung Chung and Tsuen Wan areas; the other pair of vehicles (HV-2 and DV-2) operated from Cheung Sha Wan Depot to deliver posted packages to Shatin and Hunghom areas. There was no fixed route. All of them provided service every day from Monday to Saturday (8:00 am – 6:30 pm) excluding Sundays and public holidays.

4. Findings of Trial

4.1 Table 1 shows a summary of the all key statistics for each vehicle.

Table 1: Summary of all the costs of each vehicle

	HV-1	HV-2	DV-1	DV-2
Total distance travelled (km)	41,873	31,829	8,579 ^[5]	32,273
Fuel cost (HK\$) ^[1]	84,720	62,143	23,993	76,995
Average fuel economy (km/litre)	5.92	6.14	4.14	4.98
Average fuel cost (HK\$/km) ^[1]	2.02	1.95	2.80	2.39
Average fuel cost by vehicle type (HK\$/km)	1.99		2.59	
Maintenance cost (HK\$) ^[2] ^[3]	2,321	6,061	2,495	22,974
Other cost (HK\$)	0	0	0	0
Total operating cost (HK\$)	87,041	68,204	26,488	99,969
Average total operating cost (HK\$/km)	2.08	2.14	3.09	3.10
Average total operating costs by vehicle type (HK\$/km)	2.11		3.09	
Downtime (working day) ^[4]	6	12	7	27.5

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

^[2] The HV was under warranty, the labour cost was waived and only the parts to be replaced were charged.

^[3] Maintenance due to incident not related to the performance of the vehicle was not included for comparing the performance.

^[4] Downtime refers to 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.

^[5] Vehicle not in use due to no driver in 6 months out of the 24 months of trial

4.2 The average fuel cost of HVs was lower than that of DVs by 23%. while the average total operating cost of the HVs was 32% lower than that of the DVs.

4.3 During the 24-months trial period, HV-1 and HV-2 had three and four scheduled maintenances as well as five and eight unscheduled maintenances with 6 and 12 days downtime respectively while DV-1 and DV-2 had two and one scheduled maintenances as well as zero and nine unscheduled maintenances with 7 and 27.5 days downtime respectively. There were 597 working days in the 24-month trial period and the utilization rate was 99.0% and 98.0% for HV-1 and HV-2 and 99.0% and 95.4% for DV-1 and DV-2 respectively, excluding those downtime unrelated to the vehicle performance.

4.4 To remove the effect of seasonal fluctuations, 12-month moving averages are used to evaluate the trend of the HV's fuel economy. The results show that the fuel economy of the HVs in general remained stable over the 24-month trial period. There is no indication of deterioration in their fuel economy.

4.5 The carbon dioxide equivalent (CO_{2e}) emission from HV-1 and HV-2 were 19,594 kg and 14,381 kg, respectively while that from using the conventional vehicles would be 28,030 kg and 17,732 kg respectively. Therefore, there was a total reduction of 11,787 kg CO₂ equivalent emission (i.e., around 26%) in the trial by using HVs.

5. Summary of Findings

5.1 In the 24-month trial period, the average daily mileages of HV-1 and HV-2 were 71 and 54 km while that of DV-1 and DV-2 was 15 and 54 km respectively. DV-1 had a lower average daily mileage because the vehicle could not be operated 6 months out of the 24-months trial owing to shortage of driver. The mileages of the HVs are higher than the DVs. The HVs had a better fuel economy than the DVs. The average fuel cost of the HVs was lower than that of the DVs by about 23%. Including the maintenance costs, the average total operating cost of the HVs was 32% lower than that of the DVs. The average utilization rate was 99.0% for the HVs and 98.0% for the DVs.

5.2 DHL assigned a driver for each of the two HVs. The drivers of the HVs had no problem in operating the vehicles. They in general felt the HVs were clean and less polluted. However, they reflected that the HVs rolled back on uphill start. They had to use hand brake to perform the uphill start. They also had to adjust the gear from third to second gear at start on flat.

5.3 DHL was satisfied with the HVs and will consider replace the entire light goods vehicle fleet with green vehicles including HV.

5.4 There was a total of 11,787 kg CO_{2e} reduction (i.e., 26%) by using the HVs during the 24-month trial period.

5.5 There was no deterioration in the performance of the HVs observed during the trial period.

Appendix 1: Key Features of Vehicles Involved in the Trial

1. Trial HVs

Registration Mark: UB1433 (HV-1) and UB1966 (HV-2)
Make: MITSUBISHI FUSO
Model: FEB74ER3SDAL
Class: Light goods vehicle
Gross vehicle weight: 5500 kg
Seating Capacity: driver + 2 passengers
Cylinder capacity: 2998 cc
Year of manufacture: 2016

2. DV used for comparison

Registration Mark: NK2784 (DV-1)
Make: MITSUBISHI FUSO
Model: FE83DEZSRDA
Class: Light goods vehicle
Gross vehicle weight: 5500 kg
Seating Capacity: driver + 2 passengers
Cylinder capacity: 4899 cc
Year of manufacture: 2007

Registration Mark: RT4992 (DV-2)
Make: MITSUBISHI FUSO
Model: FEB71ER3WDAD
Class: Light goods vehicle
Gross vehicle weight: 5500 kg
Seating Capacity: driver + 2 passengers
Cylinder capacity: 2998 cc
Year of manufacture: 2012

Appendix 2: Photos of the Trial Vehicles

1. Trial HVs



Front view of HV-1 (UB1433)



Side view of HV-1



Side view of HV-1



Rear view of HV-1



Front view of HV-2(UB1966)



Side view of HV-2



Side view of HV-2



Rear view of HV-2

2. DVs used for comparison



Front view of DV-1



Side view of DV-1



Front view of DV-2



Side view of DV-2