

Pilot Green Transport Fund

Final Report On
Trial of Hybrid Light Goods Vehicle
for Chemical Waste Collection and Treatment
Services
(Ecospace 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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**Pilot Green Transport Fund
Trial of Hybrid Light Goods Vehicle for Chemical Waste Collection and
Treatment Services
(Ecospace Limited)**

**Final Report
(Trial Period: 1 August 2015 – 31 July 2017)**

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. Ecospace Limited (Ecospace) was approved under the Fund for trial of one diesel-electric hybrid light goods vehicle (LGV) for chemical waste collection and treatment services. Through the tendering procedures stipulated in the Subsidy Agreement, Ecospace procured one Hino 300 series diesel-electric hybrid light goods vehicle (HV) for trial.

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. One diesel LGV providing the same type of services was assigned as the conventional vehicle for comparing with the HV.

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

2 Trial and Conventional Vehicles

2.1 Ecospace procured one Hino 300 series XKU710R-HKUQS3 diesel-electric LGV (HV) with a gross vehicle weight (GVW) of 5500 kg for trial. One Hino 300 series diesel LGV (namely DV) with a GVW of 5500 kg was assigned for comparison with the HV in this trial. The HV and DV were used for chemical waste collection services across all areas of Hong Kong.

2.2 Key features of the HV and the DV are shown in Appendix 1 and their photos are shown in Appendix 2.

3. Trial Information

The trial started on 1 August 2015 and lasted for 24 months. Ecospace 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. 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 drivers and Ecospace were also collected to reflect any problems of the HV. The service hours of the vehicles are from 07:30 to 17:30 from Monday to Saturday.

4. Findings of Trial

4.1 Table 1 summarizes the key operation statistics of the HV and the DV. The average fuel cost of the HV was HK\$0.39/km (about 16%) lower than that of the DV. The average total operating costs of the HV was HK\$0.72/km (about 26%) lower than that of the DV.

Table 1: Key operating statistic of each vehicle (August 2015 – July 2017)

| | Hybrid LGV | Diesel LGV |
|--|------------|------------|
| | HV | DV |
| Total mileage (km) | 20,391 | 9,517 |
| Average fuel economy (km/litre) | 5.50 | 4.60 |
| Average fuel cost (HK\$/km) ^[1] | 1.98 | 2.37 |
| Average total operating cost (HK\$/km) | 2.03 | 2.75 |
| Downtime (working day) ^{[2] [3]} | 6 | 12 |

^[1] Market rate was adopted 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 were not included for comparison.

4.2 During the trial period, the HV had 5 scheduled maintenances for regular check-ups, resulting in 6 days of operation downtime. There was no unscheduled maintenance for the HV. The DV had 8 scheduled maintenances for regular check-ups, resulting in 11 days of operational downtime. There were 3 unscheduled maintenances for the DV, resulting in 1 day of operational downtime. These led to 6 and 12 days of operational downtime for the HV and DV respectively. The utilization rates of the HV and DV were 99% and 98% respectively.

4.3 Ecospace had no designated driver for the HV. Although the drivers adapted to the HV operation, they had strong opinions on the vehicle. Its performance was lower than the drivers' expectations, i.e. it was less responsive and did not have sufficient power for acceleration when compared to the DV. It also lacked power when driving uphill when compared to the DV. The drivers were disappointed with these aspects of the HV and they did not see any distinctive advantages in using this HV. Furthermore, one of the drivers preferred not to drive the HV.

4.4 However, Ecospace was satisfied with the HV's performance and considered the HV functioned well in the trial period. Ecospace agreed that, in general, using the HV was good.

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 of the HV varied from 5.37 to 5.56 km/litre (i.e., about 3% variation). During the 24-month trial period, the variation in the fuel economy of the HV was not significant, indicating that any deterioration of the HV during the trial period was minor.

4.6 Based on the total distance travelled by the HV in the trial period, the carbon dioxide equivalent (CO_{2e}) emission from the HV was 10,280 kg, while from the DV it was 12,295 kg. Hence there is a reduction of 2,015 kg (about 16%) CO_{2e} emission for the HV in the trial.

5. Summary

5.1 Although the drivers adapted to the HV operation, they had strong opinions on the HV. Its performance was lower than their expectations, i.e. it was less responsive and did not have sufficient power for acceleration when compared to the DV. It also lacked power when driving uphill when compared to the DV. The drivers were disappointed with these aspects of the HV and they did not see any distinctive advantages in using this HV. Furthermore, one of the drivers preferred not to drive the HV. Ecospace was however satisfied with its performance, and considered that it functioned well in the trial period.

5.2 The utilization rates of the HV and DV were 99% and 98% respectively. During the 24-month trial period, the variation in the fuel economy of the HV was not significant, indicating that any deterioration of HV was minor. Also, the usage of the HV was on the high side as reflected in the difference in the total mileage travelled between the HV (20,391 km, i.e. 33 km on average per working day) and the DV (9,517 km, i.e. 16 km on average per working day).

5.3 There HV incurred a lower average fuel cost of HK\$0.39/km (about 16%) compared to that of the DV. Taking into account the maintenance costs, the average total operating cost of the HV was about HK\$0.72/km (about 26%) lower than that of the DV. The CO₂e emission from the HV was 2,015 kg (about 16%) lower than that from the DV during the trial period.

Appendix 1: Key Features of Vehicles

1. Trial HV

| | |
|--------------------------|----------------------------------|
| Registration Mark | TL3950 |
| Make: | HINO |
| Model: | 300 Series Hybrid XKU710R-HKUQS3 |
| Class: | Light Goods Vehicle |
| Gross vehicle weight: | 5.5 tonnes |
| Seating capacity: | Driver + 2 passengers |
| Year of manufacture: | 2015 |
| Cylinder Capacity: | 4,009 c.c. |

2. DV used for comparison

| | |
|--------------------------|---------------------------|
| Registration Mark | TG7932 |
| Make: | HINO |
| Model: | 300 Series XZU710R-HKFQT3 |
| Class: | Light Goods Vehicle |
| Gross vehicle weight: | 5.5 tonnes |
| Seating capacity: | Driver + 2 passengers |
| Year of manufacture: | 2014 |
| Cylinder Capacity: | 4,009 c.c. |

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