

## Case Study

# ONGOING ENVIRONMENTAL DRIVER TRAINING – RIGID



### TRIAL SUMMARY

<p>This trial sought to quantify the fuel efficiency benefits of ongoing environmental driver training, following a case study on the initial benefits of driver training in Phase 2 of the Green Truck Partnership.</p> <p>The trial was conducted for four rigid trucks running an LPUD (local pick-up and delivery) application in Sydney and Melbourne. (A similar but separate case study was completed for a prime mover.)</p>	<p><b>Average immediate fuel efficiency improvement (after 2 months) (%)</b></p>	<p><b>Average long-term fuel efficiency improvement (after 10 months) (%)</b></p>	<p><b>Average fuel efficiency benefit after follow-up driver training (after 1–2 months) (%)</b></p>
	<p>10.5%↑</p>	<p>13.5%↑</p>	<p>14.5%↑</p>
<p>↑ performance better than conventional vehicle ↓ performance worse than conventional vehicle</p>			

The *Green Truck Partnership* is designed to be a forum for the objective evaluation of the merits of clean vehicle technologies and fuels used by heavy vehicle operators. This report discusses the results of an ongoing environmental driver training trial for rigid vehicles, conducted under the program in 2013.

## 1 ONGOING ENVIRONMENTAL DRIVER TRAINING

Environmental driver training has the potential to reduce vehicle fuel consumption and wear and tear, in addition to its recognised safety benefits. The fuel efficiency elements of traditional driver training programs have been repackaged under the banner of environmental driving, which essentially covers the driver-controlled functions of operating a vehicle’s powertrain and support systems in a way that optimises fuel efficiency.

Under Phase 2 of the Green Truck Partnership in 2012, two trials were conducted measuring the impact of one-off driver training on the fuel efficiency of rigid and prime mover vehicles.

As seen in overseas trials, immediate fuel efficiency results were realised. On average the trials saw a fuel efficiency benefit of 7% for rigid trucks, and 8% for prime movers.

However, published literature also shows that the long-term benefits of one-off training vary widely, and nearly always tend to drop off over longer periods of time. Therefore ongoing driver training is critical to ensure long-term changes in behaviour and fuel consumption benefits (driver commitment and company culture are also important).

A number of Australian driver training companies promoting improved driver practices report an immediate 5–20% reduction in fuel consumption, but the longer term reduction in fuel consumption through changes in driver behaviour still remains relatively undocumented.

## 2 TRIAL OBJECTIVE

The purpose of this trial was to assess the permanence of real-world economic and environmental improvements from driver training. These improvements were compared across two groups of drivers:

- Drivers that completed simulator and in-cab driver training with no follow-up training.
- Drivers that completed simulator and in-cab driver training, and then received two additional sessions of in-cab training after 12 months.

### 3 METHODOLOGY

#### DATA COLLECTION

This particular trial involved an in-field assessment of four rigid trucks operating LPUD distribution routes in metropolitan Sydney and Melbourne.

The drivers were monitored for 12 months with Phase 1 of the trial running between May and July 2012, and Phase 2 running between August 2012 and May 2013 (Table 1). The performance of one driver who did not undergo driver training was also monitored for comparison.

Table 1 Driver training overview

Training phase	Description	Drivers trained
<b>Phase 1</b> <i>May–Jul 2012</i>	Simulator training	Driver 1 Driver 2
	In-cab training	Driver 3 Driver 5
		NB: Driver 9 participated in trial but was not trained
<b>Phase 2</b> <i>Aug 2012 – Mar 2013</i>	Monitoring	Driver 1 Driver 3
	Additional in-cab training	NB: Driver 9 participated in trial but was not trained

The driver training focused on the following aspects of vehicle operation and behaviour.

- Route planning.
- Planning and observation.
- Gear shifting.
- Speed.
- Acceleration and cruise control.
- Steady braking.
- Idle time.
- Driver awareness and attitude.

During the trial period, data loggers were used to collect data from the vehicles to ensure fuel consumption comparisons were valid. The data collected by the loggers included:

- **DISTANCE:** kilometres travelled.
- **IDLE TIME:** time spent at idle.
- **AVERAGE SPEED:** average speed (km/h).

Other datasets were collected but were not relevant to this particular trial.

During the trial period, fleet fuel records were used to capture fuel consumption data (as this could not be captured from the data loggers). The fuel data included:

- **FUEL CONSUMPTION:** total fuel (litres).

#### DATA ANALYSIS

The first stage of analysis (i.e. Phase 1) was covered in the published 2012 Green Truck Partnership case study *Environmental driver training – rigid vehicle*. It focused on the fuel efficiency of eight drivers who had undertaken simulator and in-cab training.

The data analysis undertaken in this case study focuses on the permanence of the fuel efficiency benefit over time, and the impact of additional follow-up training on vehicle fuel consumption.

Seven of the nine original Phase 1 trial vehicles were selected to participate in Phase 2 of the trial. Of the seven participating vehicles, data for only four vehicles was used in the final case study analysis. This was a result of erroneous fuel data and operational changes to drivers participating in the trial. Furthermore, the data sample size for Driver 2 was reduced to 9 months (rather than 12 months) as the vehicle was sold during the trial period. The results from a fifth trial vehicle with a driver that was not trained were documented for comparison.

Speed profile data was used as the key duty cycle descriptor to validate the average fuel consumption of the vehicles ‘before’ and ‘after’ driver training. The results of this comparison are discussed in Section 4.

Figures 1 and 2 show the monthly speed profile data for all trial vehicles throughout the trial period. All speed profiles show a suitable level of fit between the monthly operation of each vehicle, ensuring the validity of ongoing fuel consumption comparisons following driver training.

#### 4 RESULTS

An overview of the fuel consumption results for each of the trial vehicles across the 12-month period is provided in Table 2 and Figures 3 and 4. In summary, for drivers who undertook both Phase 1 and Phase 2 training:

- An immediate fuel efficiency improvement was observed following initial driver training.
- The average fuel efficiency benefit either reduced or plateaued over the 10-month period following initial driver training.
- The fuel efficiency improved again in the immediate period after follow-up training.

As noted in the original case study, two months after initial driver training the four participating trial vehicles showed an average fuel efficiency improvement of 10.5% and an average idle reduction of 71%. The reduction in fuel use corresponds to a financial saving of \$4.25 per 100 km and an emissions reduction of 82.02 g CO<sub>2</sub>-e/km. The driver who was not trained showed a fuel efficiency improvement of 5% and no change in idle time.

Monitoring of the four drivers over a 10-month period following the initial driver training took place, with the four trained drivers noticing an average fuel efficiency benefit of 13.5% and an average idle reduction benefit of 70%. This resulted in a financial saving of \$5.28 per 100 km and an emissions reduction of 102 g CO<sub>2</sub>-e/km. The driver who was not trained produced a fuel efficiency improvement of 17% and reduced engine idling by 24%.

Two of the four trial drivers received follow-up in-cab driver training after 10 months following the initial driver training. Following this secondary training, the two drivers achieved an average fuel efficiency benefit of 14.5% and an average idle reduction of 77%.

Of the two drivers that did not receive follow up training, one noticed an average increase in fuel consumption of 5% (due to a 10% increase in fuel consumption in April) and yet an average idle reduction benefit of 96%, while the other participating vehicle was sold and therefore any change in fuel consumption and idle time could not be quantified.

The driver who was not trained throughout the trial period noticed a further significant improvement in fuel consumption of 25% and an idle reduction benefit of 47% compared to the original baseline period.

A summary of the idle reduction results for each of the trial vehicles across the 12-month period is provided in Table 3.

#### 5 CONCLUSION

The findings of this trial suggest that environmental driver training for drivers operating LPUD rigid vehicles in metropolitan areas can achieve:

- an immediate improvement in fuel efficiency following initial driver training (in this case, it was approximately 10.5%), relative to their driving without training intervention;
- an ongoing fuel saving (in this case it was an average of 13.5% over a 10-month period), compared with the pre-training period;
- a further improvement in fuel efficiency (in this case, it was approximately 14.5%) as a result of secondary follow-up driver training, relative to vehicle operation without training intervention.

International studies suggest that the typical trend followed by drivers who had undergone environmental training begins with an immediate fuel saving, followed by a decline in savings over time (as training practices are either forgotten, or original driving habits resume).

Contrary to that expectation, this trial shows that fuel efficiency can continue to improve over time even in the absence of follow-up training. However when evaluated on a vehicle-by-vehicle basis, results varied. For example, the fuel consumption of the two drivers who undertook two driver training interventions follows the fuel consumption trend suggested by international studies. Whereas the fuel consumption of the two drivers who only undertook one initial driver training intervention followed a different trend: an improvement in fuel efficiency over 10 months, then an observed increase in fuel consumption after 12 months.

Interestingly, the driver who did not undertake any form of driver training noticed a continuous improvement in fuel efficiency benefit over the entire trial period.

Despite the difference in individual fuel efficiency variations of the driver sub-groups, there is a clear trend of average fuel consumption improving as a result of both initial and follow-up environmental driver training. However, a whole-of-life economic analysis is still needed to assess these fuel savings against the cost of the driver training, and any changes in vehicle repairs and maintenance.

**Table 2** Fuel consumption benefit after driving training intervention

Training model	Driver	Phase 1: Single simulator and in-cab training (May 2012)		Phase 2: Ongoing driving and/or follow-up in-cab training (Mar–May 2013)
		Immediate fuel saving (2-month average) (%)	Ongoing fuel saving (10-month average) (%)	Immediate fuel saving (1-month minimum data average) (%)
Phase 1 & 2	Driver 1	16	13	18
Phase 1 & 2	Driver 3	8	8	11
Phase 1 only	Driver 2	13	21	n/a (vehicle sold)
Phase 1 only	Driver 5	5	12	–5
No training	Driver 9	5	17	25

**Table 3** Idle performance after driver training intervention

Training model	Driver	Phase 1: Single simulator and in-cab training (May 2012)		Phase 2: Ongoing driving and/or follow-up in-cab training (Mar–May 2013)
		Immediate idle reduction (2-month average) (%)	Ongoing idle reduction (10-month average) (%)	Immediate idle reduction (1-month minimum data average) (%)
Phase 1 & 2	Driver 1	63	59	72
Phase 1 & 2	Driver 3	48	42	81
Phase 1 only	Driver 2	66	94	n/a (vehicle sold)
Phase 1 only	Driver 5	70	83	96
No training	Driver 9	0	24	47

Figure 1  
Monthly speed profiles for Phase 1 only trial participants

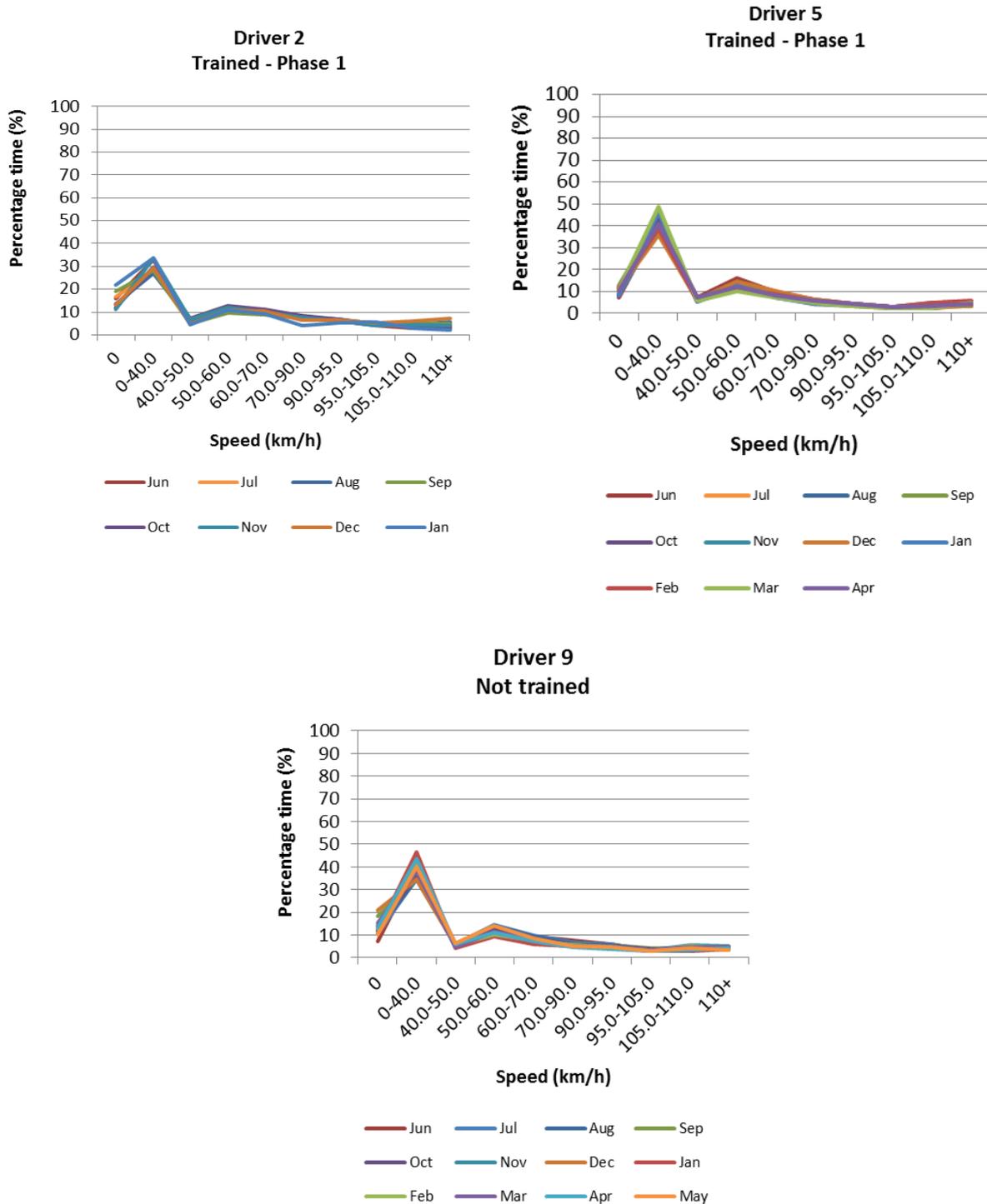
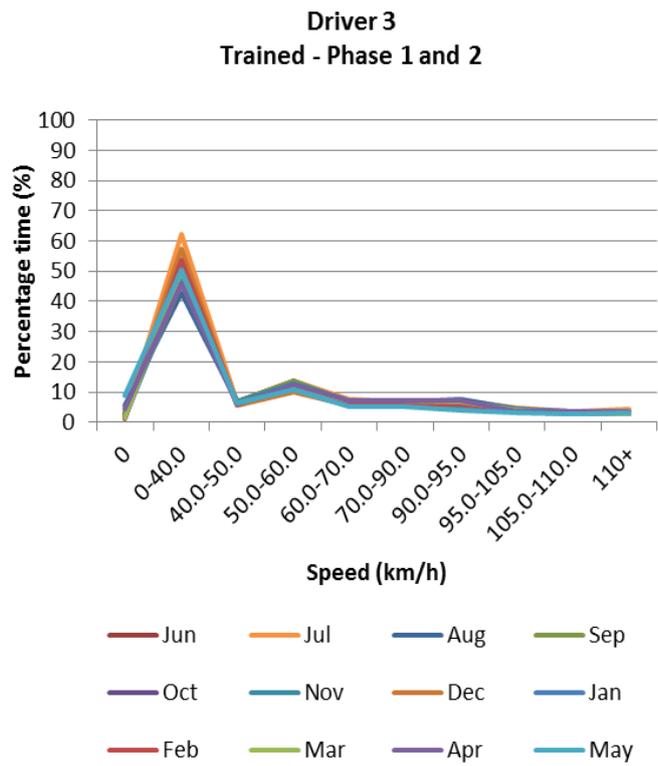
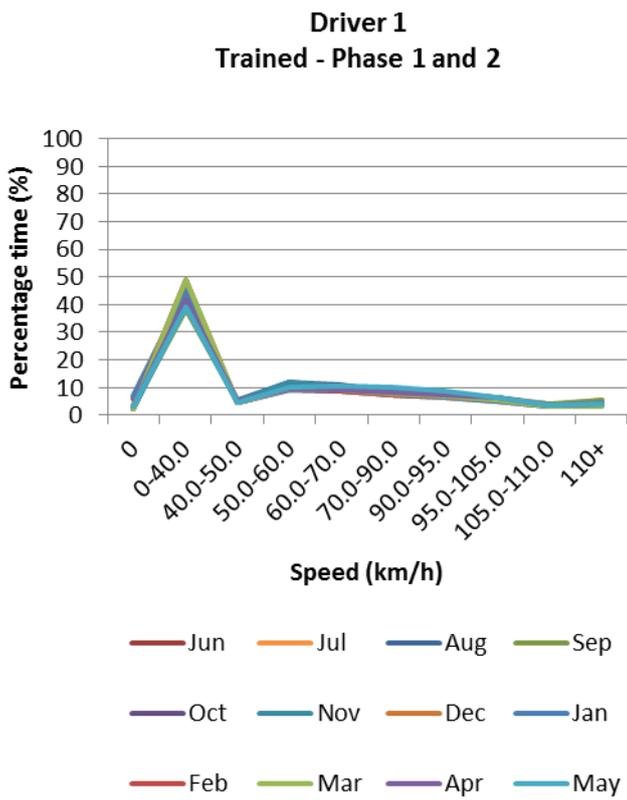
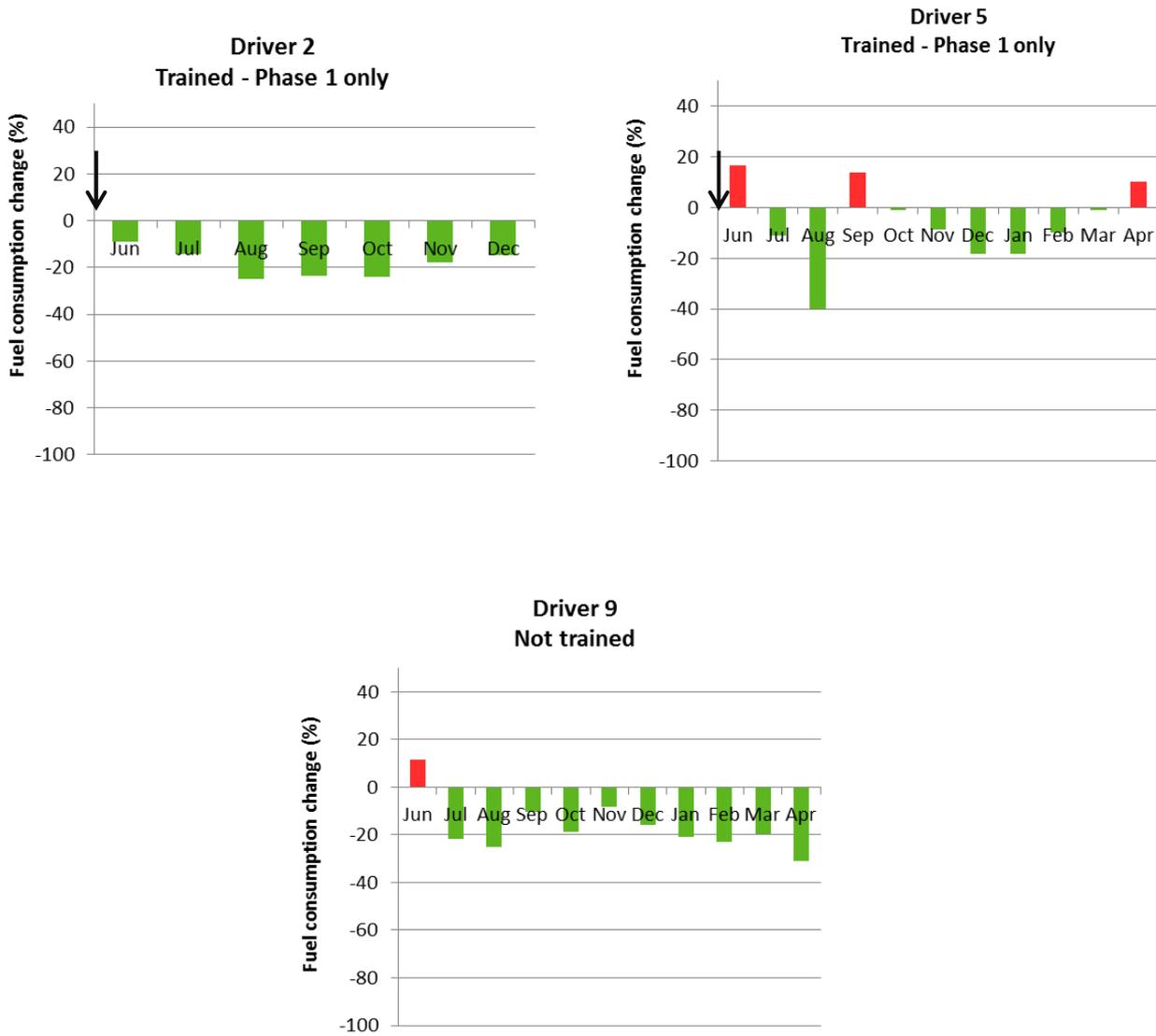


Figure 2  
Monthly speed profiles for Phase 1 and 2 trial participants



*Figure 3*  
**Average fuel consumption benefit following initial driver training  
in Phase 1 of the trial only**

\*\*Arrows point to the driver training intervention



*Figure 4*  
**Average fuel consumption benefit following driver training  
in Phase 1 and follow-up training in Phase 2 of the trial**

\*\*Arrows point to the driver training intervention

