

## Case Study

# MANUAL TYRE INFLATION MANAGEMENT



## TRIAL SUMMARY

This trial sought to quantify the fuel efficiency benefits of manual tyre inflation management. The trial was conducted with six vehicles running a mixture of metropolitan LPUD in Melbourne. The results are summarised in the table.	<b>Fuel benefit (L/100 km)</b>	<b>GHG benefit (gCO<sub>2</sub>-e/km)</b>	<b>Economic benefit (\$/100 km)</b>
	Inconclusive (-3.4L to +2.3L)	Inconclusive (-91g to +62g)	Inconclusive (-\$4.80 to +\$3.30)

↑ performance better than conventional vehicle  
↓ performance worse than conventional vehicle

The *Green Truck Partnership* is designed to be a forum for the objective evaluation of the merits of clean vehicle technologies and fuels by heavy vehicle operators. This report discusses the results of a manual tyre inflation management trial conducted under the program in 2012.

### 1 TYRE INFLATION MANAGEMENT

Under-inflated tyres increase rolling resistance, which can not only reduce fuel economy, but can also wear out tyres and reduce vehicle safety through poor handling. Maintaining correct tyre pressures and monitoring for uneven tyre wear (which can be caused by poor wheel alignment) can help to ensure optimum vehicle performance.

A tyre inflation monitoring and management program can be a relatively low cost and easily implemented strategy to maintain tyre performance. Overseas studies have shown that tyre inflation monitoring can produce fuel savings of 1-4% and can increase tyre life by up to 10%.

Regular tyre monitoring and corrective action can be either carried out by third party providers or resourced internally. Using internal resources means that drivers, onsite mechanics or yard hands must be trained to inspect tyres and to check and adjust tyre pressure.

### 2 TRIAL OBJECTIVE

The objective of this trial was to assess the economic and environmental performance of daily tyre inflation monitoring for rigid vehicles undertaking a local pickup and delivery (LPUD) application in a metropolitan area.

### 3 METHODOLOGY

#### DATA COLLECTION

This trial involved an in-field assessment of six rigid vehicles operating LPUD distribution routes in Melbourne. The vehicles operated over an average 13 week period between June 2012 and September 2012.

All six trial vehicles underwent a baseline monitoring period of 8 weeks during which vehicle tyre pressures were not monitored. This was followed by a 6 week period where all tyres were inflated to their optimum pressure at the beginning of each week, and then monitored and recorded on a daily basis by the fleet.

In order to ensure that the operation of each vehicle was directly comparable before and after the intervention, data loggers were fitted to each vehicle to capture key descriptors of vehicle operation.

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Specifically, information was collected in relation to:

- **AVERAGE SPEED:** average speed (km/h).
- **IDLE TIME:** time spent at idle.
- **STOPPING INTENSITY:** number of stops per kilometre travelled.

Owing to the nature of the vehicles being trialled, instantaneous fuel consumption data could not be captured. As a result, daily fuel consumption data was provided by the participating fleet and aggregated with the drive cycle data for the trial period.

### DATA ANALYSIS

The first stage of the analysis involved validating that the fuel consumption results could be compared before and after the trial. This was done by comparing three duty cycle descriptors (average speed, idle time and stopping intensity) for each truck during both phases of the trial.

As shown in Figure 1, a comparison of the speed profiles for five of the six vehicles revealed a strong level of correlation. Comparison of the speed profile for Truck 1 revealed a slight offset between the before and after speed profiles, however across the trial period the average speed was consistent and deemed to be comparable.

The stopping intensity for all vehicles also shows a strong correlation between the two phases of the trial (Figure 2). Truck 1 again showed the greatest variability for this parameter, but was still considered similar enough to be comparable.

In summary, comparison of the duty cycles indicated that operation of the vehicles both before and during tyre monitoring was very similar and that direct comparison of the fuel consumption values was valid (i.e. apart from Truck 1, there were no major differences in duty cycle that were thought to significantly affect fuel consumption).

Following data validation, the fuel consumption of the six vehicles was compared. The results are summarised in Section 4.

## 4 RESULTS

A summary of the results for each of the trial vehicles following the introduction of manual tyre inflation management is provided in Table 1.

Overall, the results of the trial showed a great degree of variability between the vehicles. Changes in fuel consumption following the tyre monitoring intervention ranged from an 8.4% fuel reduction to a 15.3% increase in the rate of fuel use. Average fuel consumption across the six vehicles actually increased by 4.8% (Figure 3), which was contrary to expectations.

In fact, only two of the trucks showed an improvement, while four demonstrated worse fuel economy after the intervention. Even if the results from Truck 1 are excluded (on the basis of variation in duty cycle), three vehicles still show an increase in fuel consumption after tyre monitoring began.

Analysis of the GHG performance (Figure 4) follows the fuel trend: GHG emissions generated by the trial vehicles were, on average, 4.8% higher than before the monitoring intervention.

## 5 CONCLUSION

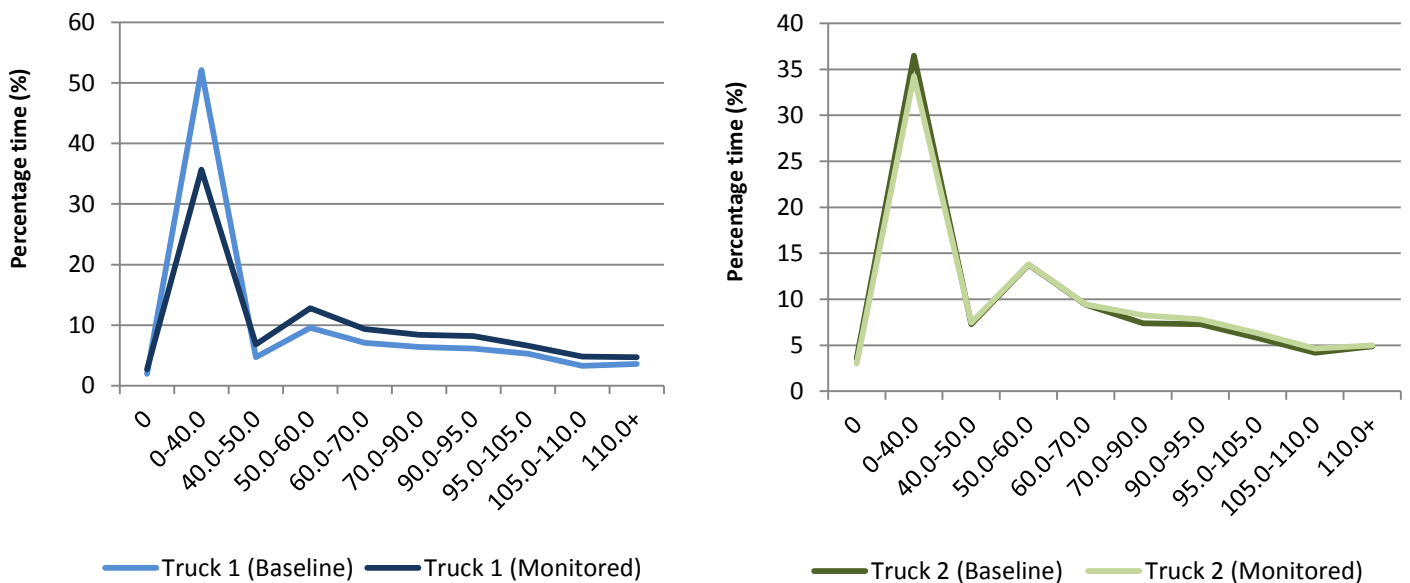
Overall, the results were inconclusive with respect to the fuel saving potential of better tyre management in an LPUD application. Contrary to anecdotal evidence and the results of many overseas studies, this trial showed (on average) an increase in fuel consumption despite regular tyre pressure monitoring. However, there were also contrasting results between vehicles.

It is unlikely that the increases in fuel consumption can be attributed to the tyre pressure intervention. Small differences might also be attributed to variations in payload and driving technique.

*Table 1*  
**Vehicle performance with manual tyre inflation management**

Driver	Vehicle size	Fuel saving (L/100 km)	Relative fuel saving (%)	GHG benefit (g CO <sub>2</sub> -e/km)	Economic benefit (\$/100 km)
Truck 1	4 t	-1.1	- 5.2	- 29	- 1.5
Truck 2	4 t	-2	- 9.7	- 55	- 2.8
Truck 3	4 t	0.5	1.8	13	0.7
Truck 4	4 t	-2.1	- 8.6	- 56	- 3
Truck 5	4 t	-3.4	- 15.3	- 91	- 4.8
Truck 6	6 t	2.3	8.4	62	3.3

*Figure 1*  
**Comparison of average vehicle speed across the trial period**



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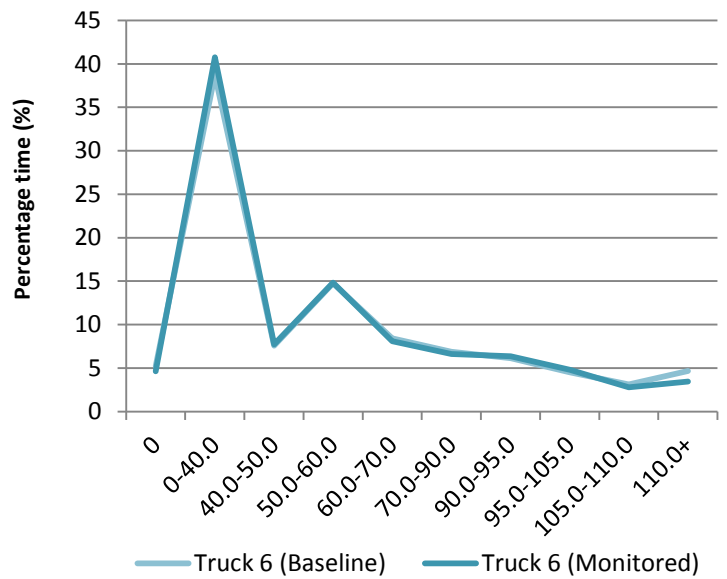
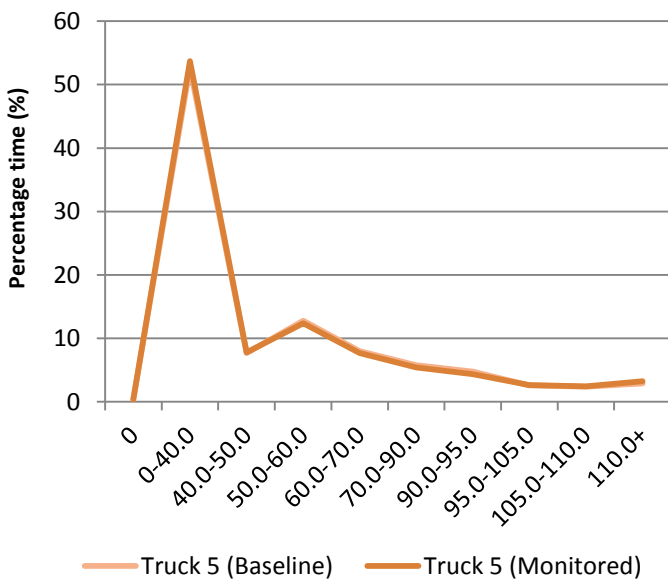
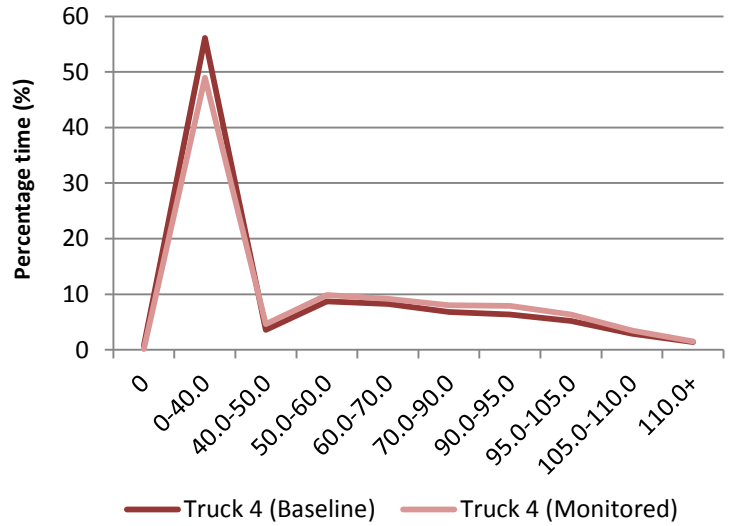
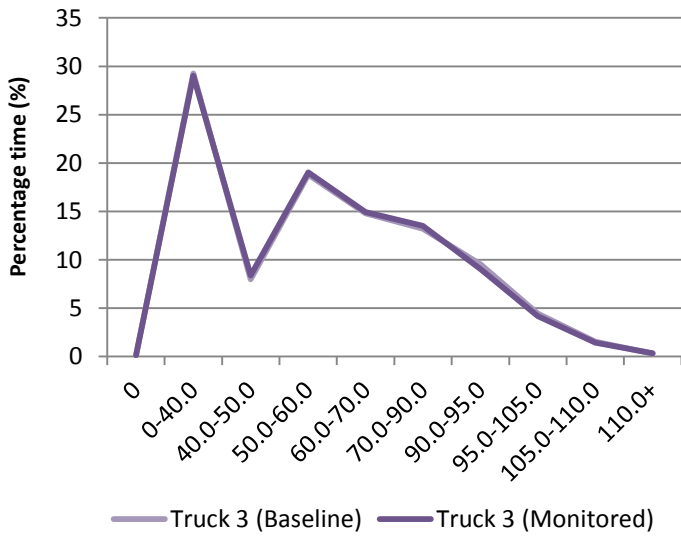


Figure 2  
Comparison of vehicle stopping intensity across trial period

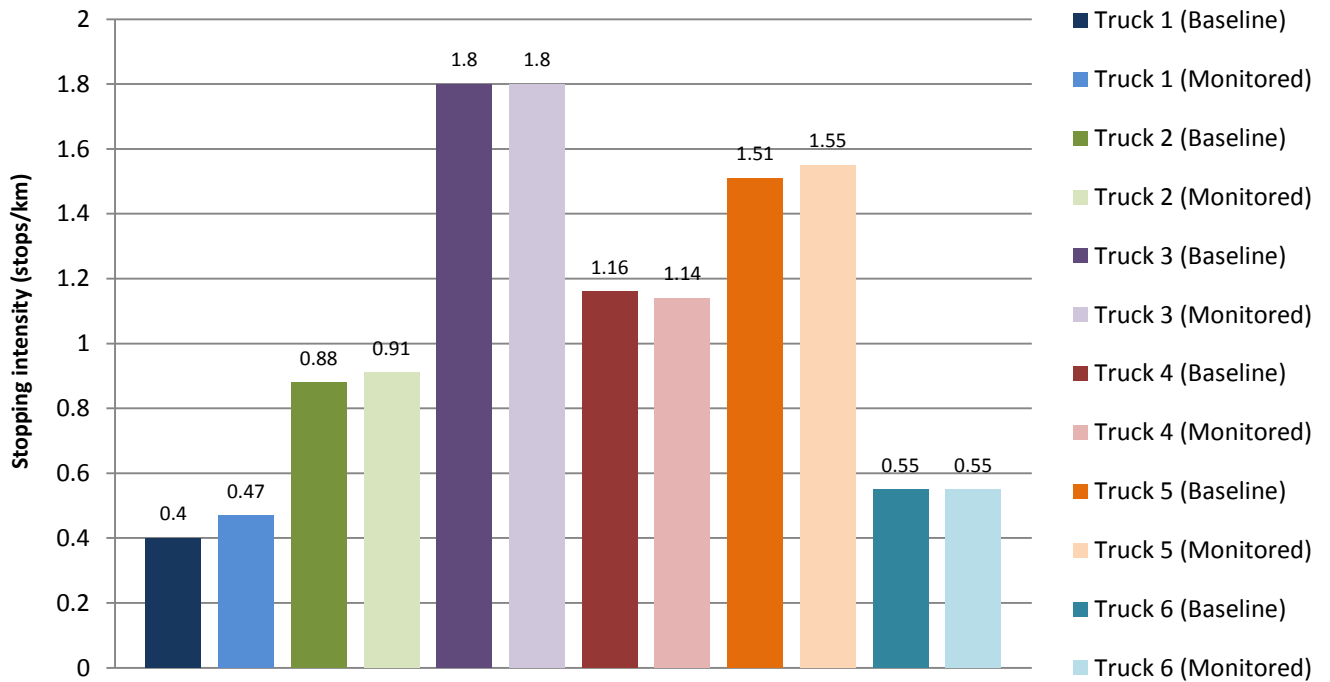


Figure 3  
Comparison of average vehicle fuel consumption across trial period

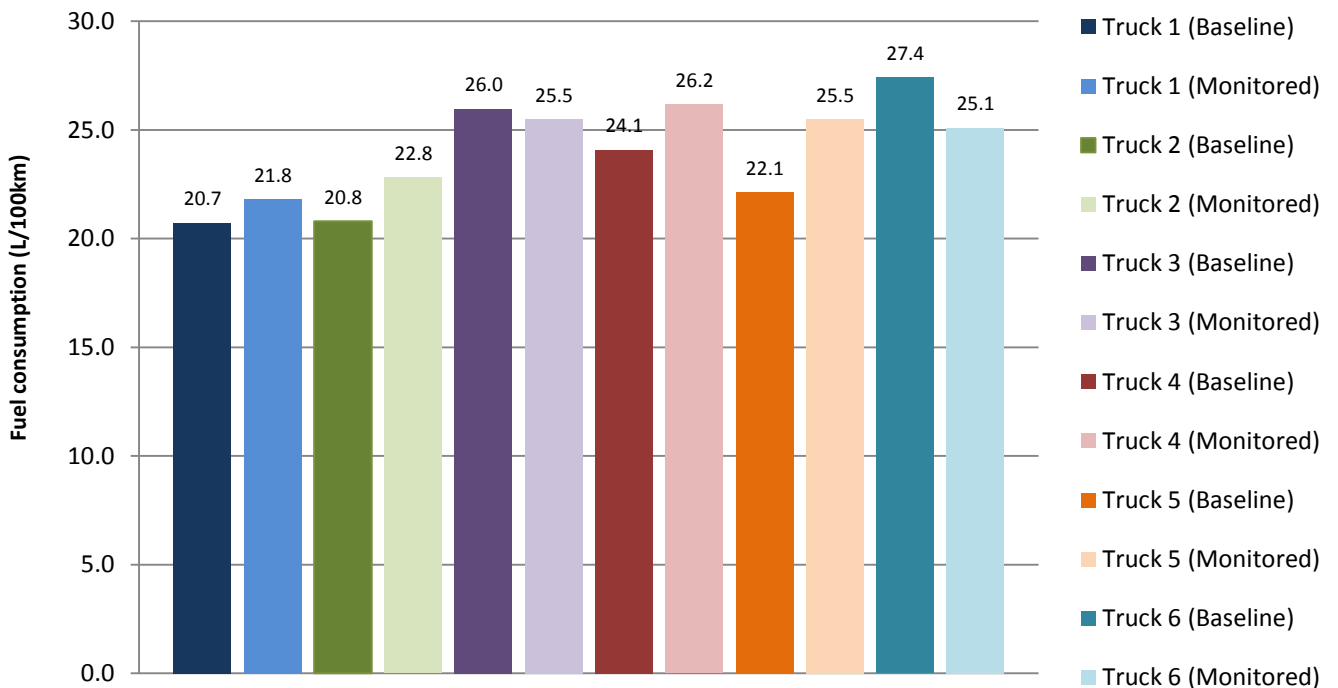


Figure 4  
Comparison of average vehicle GHG emissions across trial period

