

# **Fleet management commitment to fuel efficiency**

**April 2012**

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ISBN 978-0-478-39441-2 (electronic)

ISSN 1173-3764 (electronic)

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Baas PH (2012) Fleet management commitment to fuel efficiency. *NZ Transport Agency research report 482*. 65pp.

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**Keywords:** heavy commercial vehicle, heavy vehicle fleet, light vehicle fleet, fuel efficiency, fleet management, management, New Zealand, safety, transport productivity, trucks

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# Acknowledgments

This research project would not have been possible without the help of many organisations and individuals who assisted. The list would be too long to include them all.

I especially like to thank, in no specific order:

- Corinne Watson, CCS Logistics
- Tony Newth, TR Group Ltd
- James Smith, National Road Carriers Inc
- Alexander Petroleum
- Downer New Zealand
- JPM Holdings Ltd
- Port Otago Ltd
- Smith and Davies Ltd
- TNL Group
- Westland Milk Products.

I also want to thank the peer reviewers of this report, Dr Barbara Bibby and Dr Michael Coyle (M2 Training Limited, UK), and the members of the steering group:

- Rick Barber, NZ Transport Agency
- Iain McGlinchy, Ministry of Transport
- Mark Frampton, Ministry of Transport
- Liz Yeaman, Energy Efficiency and Conservation Authority
- Kerry Arnold, Road Transport Forum NZ
- Peter Sheppard, FleetSafe NZ.

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## Executive summary

The aim of this research, undertaken in 2009–2011, was to identify ways of overcoming the barriers faced by the managers of New Zealand's light and heavy vehicle fleets in attempting to implement fuel efficiency as an integral part of their normal way of doing business. The research furthers the government's aims, as expressed by the Ministry of Transport, to encourage the freight sector to use more efficient vehicles, low-carbon fuels and technologies, and other efficiency measures.

The first part of the project included a review of both New Zealand and overseas best practice in implementing fleet fuel efficiency measures. The review included determining what the main barriers are and how they have been overcome. Initiatives implemented by fleet operators in New Zealand were also reviewed. Overseas best practice was determined by reviewing British, Canadian, US and other case studies. Relevant research reports were also reviewed.

An evening workshop was held with transport operators and other key stakeholders to obtain their views on what the barriers to improving fuel efficiency are, and what assistance would help them with the adoption of fuel efficiency measures.

In addition, some fleet operators and other stakeholders were interviewed to find out what fuel efficiency measures had been implemented, what the barriers were and what could be done to increase the level of uptake.

Saving fuel is a rare win-win opportunity, with few other initiatives having as many co-benefits. Saving fuel:

- lowers fleet operating costs, which results in increased fleet profitability and productivity
- improves the New Zealand economy by reducing imports while not adversely affecting employment
- improves New Zealand's energy security by reducing New Zealand's dependency on imported fuel
- reduces carbon dioxide emissions and their effect on climate
- reduces noxious gases that adversely affect human health.

A strong link has been found between fuel efficiency and safety. Many of the ways of improving them are the same: managing speed, anticipating the situation ahead, reducing aggressive driving, checking tyre pressures, vehicle maintenance and reducing the amount of travel. More fuel-efficient driving can also reduce road contamination through reduced tyre and brake wear.

It is generally accepted that fuel savings of 10% or more can be obtained through a range of relatively low cost measures such as improved fleet management practice, driver training, speed management, reducing unnecessary idling, vehicle maintenance and vehicle design.

A reduction in peak speeds of 8km/h can typically result in a fuel saving of 10–15% with very little effect on travel time. It was found that trip times reduced when drivers were told not to speed, and to use safe and fuel-efficient driving techniques.

Fleet management is important because it is the transport operator who decides whether fuel efficiency is an important consideration when purchasing new vehicles and who needs to take the lead on promoting fuel-efficient driving. Transport operators also influence vehicle maintenance and other measures that affect fuel efficiency and safety.

Assistance was provided to a number of fleets with the aim of obtaining written case studies that could be used to show other transport operators what was involved and what could be achieved. Those case studies

are included in the report. The fleets saved between 4% and 15% of their fuel, with an average saving of 10.7%. Speeding events and safety-related incidents were also greatly reduced.

Fleet operators cite a number of reasons why they do not put more effort into saving fuel. The main reasons given are as follows:

- Managers are too busy dealing with day-to-day issues.
- They lack awareness of what can be saved.
- A lot of other schemes have been promoted that did not produce the results claimed.
- The benefits of training disappear as drivers slip back to their old way of doing things (although few, if any, have systematically measured this).
- Very few fleets measure what is happening in their fleets in a systematic way. While many fleets have global positioning system based systems, those systems are generally used to address day-to-day dispatch and driver behaviour issues.
- Many fleet managers started in the industry as drivers and have received very little formal training in financial management.

The common feature of the British, US and Canadian government fleet fuel efficiency programmes and fleets that have successfully implemented fuel efficiency and safety management practices is the adoption of an evidence-based practice. That approach is used extensively in other sectors, including aviation, medicine and education. An important aspect of evidence-based practice is feedback that enables ongoing improvement to occur. Feedback that is positive and directed towards measures that are very relevant to the person is the most effective. For example, feedback to drivers on their improvements in fuel consumption and speed compliance will help them to automate the techniques required to drive efficiently. Praise, rewards and punishment for activities that are largely outside the person's or organisation's control can be very negative because they undermine motivation, and often lead to increased avoidance of responsibilities and the need for greater levels of surveillance.

The adoption of problem-solving evidence-based practice requires a change in the way most fleets currently operate. This report provides a model that is based on what worked best for the case study fleets and others who have been successful in improving fuel efficiency and safety both in New Zealand and overseas. The main elements of the model are the following steps:

1. **Investigate** what the options are and what has worked best for others. Read available reports and guides, review case studies, seek advice from independent sources and ask other operators.
2. **Develop a plan of action**, including the strengths and weaknesses of the various options for your organisation, the costs and benefits, and who will champion the project.
3. **Monitor** fuel consumption and other key performance indicators.
4. **Pilot** the initiative that has been selected. Provide feedback to drivers and other staff. Make refinements as the trial progresses.
5. **Evaluate** whether the pilot has been successful or not.
6. **Roll the programme out** across the whole fleet if the pilot is successful.
7. **Continue** to monitor and refine the programme.



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The report also recommends a number of initiatives that could be provided by government and industry associations to assist fleets with saving fuel, improving productivity, improving safety and reducing emissions. Those initiatives include:

- raising awareness of the potential benefits through, for example, trade press articles, an impartial website, case studies and advisory services
- using incentives to encourage the adoption of evidence-based practice (these incentives could include Accident Compensation Corporation levy discounts and regulatory concessions such as less frequent Certificate of Fitness inspections)
- encouraging fleets to appoint fuel champions
- assisting the industry with improving the quality and usefulness of the monitoring of fuel consumption, speeding, idling and other parameters that fleet managers require to manage their fleets
- providing advice, information and training to the industry to assist them with the adoption of safety and fuel-efficient practices.

## Abstract

The aim of this research, undertaken in 2009–2011, was to identify ways of overcoming the barriers faced by managers of New Zealand’s light and heavy vehicle fleets in attempting to implement fuel efficiency as part of their normal way of doing business. It included a review of best practice documents, interviews and meetings with fleet managers and key stakeholders, and case studies.

A strong link can be found between fuel efficiency and safety. Many of the ways of improving them are the same: managing speed, anticipating the situation ahead, reducing aggressive driving, checking tyre pressures, vehicle maintenance and reducing the amount of travel.

The common feature of fuel efficiency programmes and the successfully implemented fuel efficiency and safety management practices is the adoption of evidence-based practice. The report provides a model based on what worked best for the case study fleets and others who have been successful in improving fuel efficiency and safety.

The report recommends a number of ways to assist fleets with the adoption of evidence-based practice for saving fuel, improving productivity, improving safety and reducing emissions, eg awareness raising, the use of incentives, encouraging the appointment of fuel champions in fleets, and providing advice and training.

# 1 Introduction

## 1.1 Scope

The aim of this research, undertaken in 2009–2011, was to identify ways of overcoming the barriers faced by the managers of New Zealand’s light and heavy vehicle fleets in attempting to implement fuel efficiency as an integral part of their normal way of doing business. The research furthers the government’s aims expressed in Connecting New Zealand, which include ‘encourag[ing] the uptake of more efficient vehicles and low-carbon fuels and technologies, and other efficiency measures in the freight sector’ (Ministry of Transport (MoT) 2011). The implementation of fuel-efficient fleet management has the potential to be one such efficiency measure.

The term ‘heavy vehicle fleet’ is clearly defined in the New Zealand context: it means a group of heavy vehicles such as trucks or buses (where the gross vehicle mass of each vehicle is greater than 3.5 tonnes) that is managed by a single company even though it may include individual owner-operators within its umbrella; the vehicles are costly, the drivers need special training and the vehicles are often bespoke in the sense that they are designed or modified for a specific purpose. It is in the interest of the company to develop policies for the operation of the fleet. For instance, it will make the company more profitable to operate with good fuel efficiency, which will increase its productivity.

The term ‘light vehicle fleet’ is less clearly defined. It includes companies of five types: taxi companies, car or light vehicle rental companies, courier companies, companies that issue vehicles to employees, and government and public agency vehicles. Some companies set ‘safe driving policies’ for their employees but these are very variable.

This research was designed to be a wide-ranging study of the problems encountered by fleet managers in New Zealand in attempting to implement fuel-efficient practices within their fleets. The prime reason for wanting to reduce fuel use is to improve a company’s productivity, but it does, of course, have other benefits to the company, and to the country’s economy and the environment.

Research on heavy vehicle energy efficiency undertaken by Transport Engineering Research New Zealand (TERNZ) in 2005 for the Energy Efficiency and Conservation Authority (EECA) found that energy savings of 10% or more were relatively easy to achieve through a range of relatively low cost measures such as improved driver training, improved vehicle maintenance and vehicle-based measures (Baas and Latta 2005; Baas et al 2005). Those findings were confirmed during a trial TERNZ was involved in last year for the MoT and are consistent with overseas experience (Department for Transport (DfT) 2004). As a measure of what can be achieved in New Zealand, a nationwide heavy vehicle transport operator, Alexander Petroleum Services Ltd, which was already performing reasonably well, managed to improve its fuel efficiency by 18% and has also halved the number of safety-related incidents through attention to fuel efficiency and speed management. This is discussed in appendix A.

This research also includes a literature review of fuel-efficiency measures.

Case studies were undertaken in order to identify the problems encountered by fleet managers in improving fleet fuel efficiency. These case studies are included in this report. The results of this research include the development of fleet action plans that enable fleet managers to implement fuel-efficient practices.

## 1.2 Background

The aim of this research was to identify ways of overcoming the barriers faced by transport fleets in attempting to implement fuel efficiency as an integral part of their normal way of doing business. We also looked for ways of implementing fuel-efficient practices.

Saving fuel is a rare win-win opportunity, with few other initiatives having as many co-benefits. Saving fuel:

- lowers fleet operating costs, which results in increased fleet profitability and productivity
- improves the New Zealand economy by reducing imports while not adversely affecting employment
- improves New Zealand's energy security by reducing New Zealand's dependency on imported fuel
- reduces carbon dioxide CO<sub>2</sub> emissions and their effect on climate
- reduces noxious gases that adversely affect human health.

A strong link can be found between fuel efficiency and safety. Many of the ways of improving both of them are the same: managing speed, anticipating the situation ahead, reducing aggressive driving, checking tyre pressures, vehicle maintenance and reducing the amount of travel. More fuel-efficient driving can also reduce road contamination through reduced tyre and brake wear.

Diesel-powered trucks, buses, light freight vehicles (such as courier vans) and light passenger vehicles in fleets of more than 20 used approximately 66.8PJ, 4.7PJ, 5.9PJ and 10PJ of energy, respectively, in 2007 (EECA 2011a). The average wholesale cost of diesel was \$26.34/GJ (excluding goods and services tax) during the December 2010 quarter (Ministry of Economic Development 2011). Adjusting for the increase in the cost of diesel from December 2010 to September 2011 (17.9%), fleets spend about \$2.3 billion on diesel per annum. If fuel consumption was reduced by 5%, the net benefit would be in the order of \$115 million per annum.

In addition, a significant number of light vehicles in fleets run on petrol.

Transport is responsible for 20% of New Zealand's greenhouse gas emissions, and transport emissions have increased by 70% since 1990 (Ministry for the Environment 2009). The Organisation for Economic Cooperation and Development and the International Transport Forum's Joint Transport Research Centre (JTRC) found that, assuming a business-as-usual scenario, global CO<sub>2</sub> emissions from transport are likely to grow by 120% by 2050 if action is not taken (JTRC 2008). This assumes that sufficient energy supplies will be available to meet demand without major increases in fuel price.

While major reductions in emissions will require technological solutions, changes in travel demand and improved freight logistics, a 10% fuel saving through fuel efficiency measures is still worth having, especially as it can be implemented reasonably easily and will produce economic benefits at the same time.

Unless fuel efficiency is embedded within the culture of an organisation, most of the benefits of driver training and other measures may be lost as employees revert back to their old, familiar ways of doing things.

A number of countries, especially the United Kingdom (UK) the United States of America (USA) and Canada, have implemented very successful schemes aimed at improving the fuel efficiency of fleets that New Zealand can draw on (Office of Energy Efficiency Canada 1998; DfT 2011). However, the nature of transport fleets in New Zealand and those in other countries are significantly different because of the nature of the transport task, the road environment, fleet composition, fleet ownership structures, fleet

management culture, regulations, compliance and enforcement. These differences mean that New Zealand solutions need to be found.

## 1.3 Previous research investigations

### 1.3.1 Background

This research follows on from several earlier projects by the author aimed at improving light and heavy vehicle fleet fuel efficiency in New Zealand. Those studies included:

- the fuel efficiency of the heavy vehicle fleet
- light vehicle energy use in New Zealand
- driver training initiatives.

This previous research is summarised in the remainder of section 1.3.

### 1.3.2 Fuel efficiency of the heavy-vehicle fleet

The objective of this project (Baas and Latto 2005) was to identify interventions that could deliver fuel savings in the New Zealand road freight sector. The project was in two parts:

- a review of New Zealand and overseas information in order to identify the range of potential interventions for reducing fuel consumption
- consultation with key stakeholders on the effectiveness of current initiatives, and the barriers and opportunities for introducing new ways of saving fuel.

A wide range of factors affect fuel use, including the design of the vehicle, engine capacity, the nature of the load and how the vehicle is driven. An international literature review and personal contact with the leading agencies involved in promoting transport fuel reduction in the UK and North America identified a range of factors:

- **Driver behaviour:** The difference in fuel used by a good driver compared to a poor one can be as much as 35%. This difference largely arises from differences in road speed, gear selection, use of the accelerator and brakes, and the amount of time the driver leaves the vehicle idling.
- **Air-conditioning:** The use of air-conditioning can increase fuel consumption by 3–4%. Open windows also increase fuel use at highway speeds. Maximum use of the cab's air ventilation systems is recommended.
- **Aerodynamic losses:** Cab roof deflectors, front bumper air dams, minimising intervehicle spacing, smooth-sided trailers, side skirts and bonneted trucks (rather than cab-over trucks) all reduce fuel consumption.
- **Matching engines and transmissions to the transport task:** Using a large-engined vehicle where a smaller one would be more suitable (and vice versa) is inefficient.
- **Maintenance:** Poorly tuned engines can use 50% more fuel than well-tuned ones. Clogged air filters increase fuel consumption by up to 10%.
- **Tyres:** Underinflation increases fuel consumption, reduces tyre life and is a major contributor to flat tyres and blowouts.

A series of consultation meetings were held with transport operators, equipment suppliers, transport industry associations and the relevant government agencies. The feedback made a number of points apparent:

- Very few operators monitored fuel consumption.
- Many operators found that fuel cards are unreliable as a means of monitoring fuel consumption because multiple vehicles can be filled with the same card, different drivers may use the same vehicle, and auxiliary equipment is also fuelled (eg refrigeration units).
- Fuel efficiency played only a minor part in new vehicle purchase decisions. Factors such as Road User Charges (RUCs) played a much bigger role.
- Knowledge of truck performance and specification was highest amongst the purchasers of the larger rigs, especially those with fleets of more than five vehicles. The purchasers of small to mid-range trucks, such as city delivery vans, relied mainly on the knowledge of the truck sales staff.
- Driver training did not adequately cover fuel-efficient driving practices.
- Measures aimed at improving vehicle use could be very effective in reducing fuel consumption.
- Increased mass and dimensions could improve overall fuel efficiency.
- Recognising best practice was supported as a means of raising awareness.
- The industry wanted government agencies to coordinate the information they produce with common branding etc, as this would be seen as being more effective.
- Monitoring and facilitating the introduction of new technology was seen as necessary.
- The use of case studies was strongly supported.
- Support was shown for the introduction of triple bottom line reporting and key performance indicators (KPIs) that include fuel conservation.
- A strong preference was shown for measures that do not require the use of regulations.

The report recommended that EECA and the NZ Transport Agency (NZTA) consider introducing an operator-focused programme that included:

- developing and supporting a fuel-efficient driver training scheme
- increasing skills and awareness amongst operators on how to monitor and manage fuel consumption
- encouraging improvements in freight logistics as a means of reducing freight travel demand.

Other jurisdictions have already introduced similar packages, eg the UK Road Haulage Modernisation Fund, the Canadian Fleetsmart and Smart Driver Programmes, and the USA Smartway Transport partnership.

### 1.3.3 Light vehicle fleet energy use in New Zealand

This study (Baas et al 2005) was commissioned by EECA in order to address the lack of information on the energy used by the light vehicle fleet, how it is changing, what is driving those changes, what energy savings opportunities exist and what can be done to stabilise or reduce the growing energy demand of this sector.

The investigations included an analysis of transport demographic data, a detailed telephone survey of fleet operators, personal contact with overseas agencies, a review of current initiatives and an international literature review.

The main types of vehicles in the fleet were:

- private passenger vehicles such as company cars: the 379 fleets with over 100 vehicles use 5PJ of energy; fleets with more than 20 vehicles use 10PJ
- goods service vehicles such as courier vans, which use approximately 5.9PJ of energy
- rental vehicles, which use 4.3PJ of energy
- taxis, which use 0.1PJ of energy.

The main options identified for improving light vehicle fleet fuel efficiency were:

- reducing travel demand, eg increasing teleconferencing, and creating incentives to encourage public transport use for travel to and from work
- encouraging the purchase of fuel-efficient vehicles and regular maintenance
- improving driving skills and practice – fuel consumption can vary as much as 30%, depending on how aggressively the vehicle is driven.

The recommendations included:

- **Initially focusing largely on light vehicle fleets** with more than 100 vehicles: Assistance could include supporting travel reduction programmes and improving vehicle selection procedures. These measures could result in energy savings of about 0.5PJ.
- **Developing an integrated light vehicle driver training package** that is linked to fuel monitoring and incentives package within fleets: Potential energy saving from better driver skills and behaviour could produce energy savings of approximately 0.4PJ.
- **Supporting freight operators** to improve vehicle use through advanced logistics and scheduling, and through improved fuel monitoring and analysis. These measures could result in energy savings of 0.3PJ.
- **Developing a single authoritative source** of transport energy efficiency and conservation information.
- The government leading by example by **adopting sound energy efficiency practices** with its own fleet of vehicles and sharing the knowledge gained with other fleet owners.

#### 1.3.4 Driver training initiatives

This initiative involved trialling three training options in New Zealand as part of the MoT Fleet Commitment Initial Work Programme (Baas 2008):

- The UK Safe and Fuel Efficient Driving (SAFED) training package (DfT 2011) was developed as part of the DfT's Freight Best Practice initiative. SAFED driver training includes an initial assessment drive, a theory session and an instructional drive. Fuel use, gear changes and driver performance are monitored during both drives and compared.
- The Green Torque fuel-efficient driver training package, which was developed by DECA Training for the trial. It included a theory session followed by an instructional drive and was based on similar training provided by DECA in Australia.

- An information toolkit was constructed by the MoT from material in the UK Freight Best Practice and the Canadian Fleetsmart programmes, and other sources. The toolkit included written advice, a tyre pressure gauge, a CD with guidance material, short instructional videos and background reports. The toolkit was presented to drivers and managers through a 45-minute on-site PowerPoint presentation.

Both the SAFED and DECA Training programmes were well received, and both short-term and medium-term improvements in fuel efficiency and safe driving practices were observed. The number of gear changes typically reduced by 40–60% and greater use was made of engine brakes. SAFED was a more refined training package than DECA's Green Torque, which is not surprising, given the considerable investment the UK government has made in its development and that it has now been used to train large numbers of drivers in the UK. The third initiative, the toolkit, resulted in some drivers improving their fuel efficiency, with one driver improving by 30%, but others showed little change. From a driver behaviour perspective, it was not as effective as the training options but produced wider reaching benefits by encouraging fleets to reduce engine idling, improve maintenance and check tyre pressures, amongst other things. In many ways, the toolkit and driver training are complementary. Only one driver read the written material in detail, with the others relying on the face-to-face presentations instead.

The report recommended the following measures:

- Fleet management awareness and commitment should be increased through advice, fleet audits and incentives. EECA has subsequently produced Energy Spot videos that promote fuel efficiency through case studies broadcast on TV and on the internet. The EECA case studies are based on the initiatives introduced by Winstone Aggregates and Downer NZ (EECA 2011b). The NZTA has developed a vehicle selection guide (NZTA 2009).
- A one-stop authoritative source of information on fuel efficiency should be developed and maintained. Very little progress has been made with implementing this initiative.
- Driver training could be improved by developing and implementing a New Zealand version of SAFED. This was implemented in 2010 when nine senior driver trainers were initially trained by Mr John Boocock from the UK. Since then, the senior driver trainers have been training other driver trainers and drivers. By September 2011, 285 drivers had been trained, with an average fuel saving of 7.26% on the day of the training. A dedicated website has been created to support SAFEDNZ: [www.safednz.govt.nz](http://www.safednz.govt.nz).

## 1.4 Industry fuel efficiency survey

The aim of this research undertaken by Kissling and Coyle (2008) was to ascertain New Zealand's practices, attitudes, perceptions and barriers to change in relation to introducing fuel efficiency interventions.

The research included:

- in-depth interviews with six key industry influencers
- in-depth interviews of 54 vehicle operators
- a telephone survey of 300 fleet operators
- on-the-job interviews with 300 commercial vehicle drivers.

The answers were consistent across the surveys and interviews. At the time of the surveys, fuel prices were increasing rapidly and interest in improving fuel efficiency was high. It was expected that technology



would continue to be a key element determining vehicle specifications, the type of fuel used and how the vehicles were deployed on tasks. Three key obstacles to attaining better fuel efficiency identified were:

- allocating sufficient management and supervisory time
- overcoming the lack of knowledge of fuel monitoring techniques and methods
- having better access to unbiased authoritative information.

Only management can solve the time allocation issue. External assistance may help alleviate the other two key obstacles.

Comments made during workshops that were attended by operators and the amount of prompting required during the interviews and surveys suggest a gap in management knowledge. Drivers were interested in how fuel-efficient they are personally and took a very positive view of improving their driving skills. The larger the company, the greater is the interest in fuel efficiency by their drivers.

The report noted opportunities for all stakeholders, including the government, trade and transport associations, vehicle operators and drivers, to benefit from a structured approach to improving fuel monitoring and fuel efficiency.

The report recommended:

- **Educating managers on how to develop a fuel efficient culture in their fleet:** This could be through, for example, bespoke training, case study material and best practice guides. These need to be New Zealand-specific, endorsed by the government and the transport associations, and easily accessible to vehicle operators.
- **Encouraging the development and implementation of fuel consumption monitoring and reporting systems:** Fuel monitoring and data management are essential parts of all fuel efficiency initiatives, including providing feedback to drivers on their fuel efficiency and operating self-financing fuel bonus schemes.
- **Providing advice and support:** This should include: case study material, guides, articles in the trade journals and other forms of assistance.

## 1.5 Overseas practice

### 1.5.1 Relevant schemes

Most governments in developed countries have introduced schemes aimed at improving transport fuel efficiency and environmental performance. Some countries, such as Australia, have produced guides and other information to assist operators. The three English-speaking countries that have been the leaders in this field are Canada, the UK and the USA. A brief summary of the main features of those initiatives that are relevant to New Zealand are discussed below, specifically:

- SmartWay (USA)
- FleetSmart (Canada)
- Freight Best Practice (UK).

## 1.5.2 SmartWay

SmartWay was launched in 2004 by the US Environmental Protection Agency (EPA) (2011). The aim of SmartWay is to reduce fuel consumption significantly, improve the environment and reduce transport costs. SmartWay incorporates a number of programmes, including:

- SmartWay certified vehicles
- SmartWay financing options (EPA loans for trucks and technologies that are better for the environment)
- SmartWay's Green leaf campaign, which promotes greener trucks and cars
- SmartWay certified trucks and trailers. A certified truck needs to have
  - a year 2007 or later engine model
  - an integrated high roof fairing on the sleeper cab
  - tractor-mounted side fairing gap reducers
  - tractor fuel-tank side fairings
  - aerodynamic bumper and mirrors
  - options for reducing periods of extended engine idling (auxiliary power units; generator sets; direct-fired heaters; battery-powered heating, ventilation and cooling systems; and automatic engine start/stop systems)
  - options for low-rolling resistance tires (single wide or dual), with aluminium wheels encouraged but optional
- SmartWay Transport.

SmartWay Transport recognises transport operators and shippers who are prepared to improve their environmental performance through fuel savings and other measures. Transport operators must agree to implement fuel efficiency and other cost-saving strategies in their business within three years. They are required to measure their performance using the SmartWay Fleet Logistics Energy and Environmental Tracking (FLEET) system and sign the SmartWay partnership agreement. Once they have reached a certain level of performance, they are able to display the SmartWay logo and receive other forms of recognition. Shippers (typically the major users of transport services) must commit to shipping at least 50% of their goods with SmartWay transport operators within three years. The amount they ship is monitored by FLEET. They also agree to reduce the emissions from their own facilities. An important aspect of the programme is to promote the public image of SmartWay operators and shippers in exchange for improving their environmental performance while reducing costs.

## 1.5.3 FleetSmart

The Canadian Government's FleetSmart programme provides funding and advice on how energy-efficient vehicles and business practices can reduce fleet operating costs, improve productivity and increase competitiveness (Natural Resources Canada 2011). The funding is used to support best practice and demonstration projects, training, awareness raising and research. The FleetSmart programme includes a number of elements:

- Smart Driver Training provides information on energy efficiency to fleet managers, instructors and drivers for all aspects of trucking, including vehicle selection, maintenance, operations and driving techniques. The training takes up to eight hours and is conducted in a classroom or on a computer. A

number of different versions are available, including versions for coaches and school buses, and highway, forestry and city trucks.

- The Fuel Management 101 workshop helps fleet managers to prepare a fuel management plan, implement it, monitor the results and continue to improve it over time.
- Success stories and case studies show real-world applications of the programme.
- A newsletter and reports on the latest research and development keep transport operators up to date.

FleetSmart has links with the US SmartWay programme.

FleetSmart undertook a fleet benchmarking survey in 1999. Of the 100 fleets invited to participate, 42 responded. They operated 9441 power units, 72% of which were tractors and 28% were straight trucks. Close to 70% of the fleets that responded delivered some form of driver training and 24% had a driver incentive programme. Almost 95% of the fleets checked tyre pressures regularly and had a policy on maximum speed.

#### 1.5.4 Freight Best Practice

Freight Best Practice is a DfT initiative (DfT 2011). The programme provides assistance on saving fuel through, for example, driver training (SAFED), aerodynamic devices, vehicle selection, preventative maintenance, anti-idling, scheduling and logistics. It includes many case studies, calculators for estimating potential savings, KPIs and management advice on how to implement fuel efficiency across a fleet.

Emphasis is placed on the need to treat fuel efficiency as an investment that requires both time and money for it to be successful. A senior manager needs to be appointed as the fleet's fuel champion and given enough time and resources to devote to this task.

### 1.6 Benefits of fuel efficiency

The literature review suggests that fuel savings of 10% or more can be obtained through a range of relatively low cost measures such as driver training, vehicle maintenance and vehicle design (Baas et al 2005; Baas and Latto 2005; DfT 2011).

A New Zealand case study on a nationwide heavy vehicle transport operator, Alexander Petroleum Services Limited (APSL), reported fuel savings of 17.8% and a halving of the number of safety-related incidents through attention to fuel efficiency and speed management. APSL received a Road Safety Trust Road Safety Innovation and Achievement Award in 2008 for their efforts in improving safety and fuel efficiency. The APSL case study is included as appendix A of this report, as it has not been published before and is very relevant to this project.

Winstone Aggregates, which is New Zealand's largest aggregate company, saved over 10% of its fuel bill by mid-1999 (EECA 2011a). They achieved this by:

- replacing trucks at the end of their lease with ones that had more efficient engines
- reducing idling time
- having covers on trucks at all times
- reducing vehicle speed
- improving tyre management
- improving travel planning and management.

It is generally accepted that saving fuel is a win-win opportunity for a number of reasons:

- **It is good for business.** Most fleets have the potential to save at least 10% of their fuel bill. The actual costs involved in doing so are relatively low, with payback normally being achieved within a few months. By using the National Road Carriers Inc fleet cost model, and Road Transport Forum New Zealand (RTFNZ)/Waikato University survey results, it was found a 10% fuel saving will typically increase the bottom line profit of a fleet operator by 10–30%, depending on the underlying profitability of the company (RTFNZ/Deloitte 2006; RTFNZ/Deloitte 2008). Achieving the same outcome through growing the business by 10% would require 10% more business, and hence more trucks, drivers and support staff, which is not an easy thing to do, especially in today's economic climate.

**It is good for the economy.** New Zealand spends approximately \$2.3 billion each year after tax on buying diesel for heavy vehicles (freight and passenger transport). If the heavy vehicle fleet saved, on average, 5% of its fuel bill, New Zealand would save over \$115 million per annum on fuel imports. As well as being good for the economy, it would improve energy security.

- **It is good for the environment.** Saving fuel reduces the amount of emissions in the air that cause asthma and other health problems, and reduces the CO<sub>2</sub> emissions that contribute to climate change. The carbon footprint of New Zealand's exports is increasingly being used as a barrier to trade.
- **It is good for road safety.** Fuel efficiency and safety are very closely linked. This is because both are dependent on how a vehicle is driven, how well it is maintained and other factors. The injury prevention and road safety literature generally accepts that human error partially or completely causes the vast majority of incidents (Sabey and Taylor 1980; McKenna et al 1998). Driving errors are not confined to careless drivers or drivers with a lack of ability. In fact, the distance travelled is a key factor in determining how many collisions a driver will have (Persaud et al 1999). All drivers are at risk of causing a crash. The level of risk depends on their abilities and attitudes as well as the circumstances, driving conditions, the quality of the road and the roadworthiness of their vehicles.

At no well-defined boundary does driving or other workplace activity become unsafe. Rather, risk is a continuum, with multiple factors contributing to its level. For example, unrealistic schedules result in pressure to speed and hence a higher level of risk. Similarly, poorly performing brakes increase the degree of difficulty in stopping a vehicle, and narrow roads reduce the margin for error. These also adversely affect fuel efficiency.

## 1.7 Fuel efficiency options

### 1.7.1 Possible measures

Baas and Latta (2005) and Baas et al (2005) reported that a wide range of factors affect fuel, including the design of the vehicle, engine capacity, the nature of the load and how the vehicle is driven. Specific avenues for improving fuel efficiency include the following measures, some of which are discussed in more depth in the remainder of this section:

- driver training
- speed management
- improving fleet management practices
- improving in-cab temperature control

- The use of air-conditioning can increase fuel consumption by 3–4%.
- Open windows also increase fuel use.
- Maximum use of the cab's air ventilation system should be made.
- reducing aerodynamic losses, which applies particularly to heavy vehicles: cab roof deflectors, front bumper air dams, smooth sided trailers and side skirts all reduce fuel consumption, as does minimising inter-vehicle spacing
- matching vehicles to the transport task
- improving maintenance management: poorly maintained truck and bus engines can use 50% more fuel than well-tuned ones and clogged air filters increase fuel consumption by up to 10%
- improving tyre management: underinflation increases fuel consumption, reduces tyre life and is a major contributor to flat tyres and blowouts.

### 1.7.2 Driver training

The difference in fuel consumption between a good driver and a poor one can be as much as 35%. This difference is largely created by differences in road speed, gear selection, the engine speeds at which gears are changed, aggressiveness of accelerator and brake pedal use, and the amount of time the driver leaves the vehicle idling. The recently introduced SAFEDNZ driver training is aimed at improving fuel-efficient driving. By mid-September 2011, 285 drivers had had been trained and had achieved an average fuel saving of 7.26% on the training day (SAFEDNZ 2011)<sup>1</sup>. An independent review of the UK SAFED programme (on which SAFEDNZ is based) found that drivers achieved an average fuel saving of 9.4% on the day of training (DfT 2004). A review of SAFED (Lawson et al 2008) in the UK found that, on average, a 5% long-term saving had been achieved through SAFED driver training. At that stage, 12% of the UK fleets with over 15 vehicles had introduced SAFED training.

Often, driver training has only a short-term effect. This is because drivers develop automated responses to road situations that require less mental effort to sustain for extended periods of time than driving with a high level of awareness. Implementing new driving techniques requires the reprogramming of our automated responses (Charlton et al 2010), which requires a conscious effort. This is unlikely to happen without some form of feedback.

### 1.7.3 Speed management

A reduction in peak speeds of 8km/h can typically result in a fuel saving of 10–15%. The Royal Automobile Club of Victoria (2000) (cited in (Archer et al 2008) found only a five-minute difference in travel time

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<sup>1</sup> The figures on the SAFEDNZ on the number of drivers trained and the average fuel savings are continually updated.

between aggressive driving and smooth driving, but a 30% difference in fuel consumption for a 61km journey on Melbourne roads. A 30% difference in fuel consumption was recorded between the two driving styles in a large passenger car. The large car driven smoothly used less fuel than a small car driven aggressively.

AMR Interactive (2006) found that fleet managers can have a major influence on speed behaviour. ‘Pressure to meet deadlines’ was by far the most common reason given in their survey on why truck drivers speed in Australia. As many as 20% of the drivers reported that they were speeding on at least half of their trips, even though the vehicle was supposed to be speed limited. Only half of the drivers reported that their company promoted a ‘do not speed’ policy. Many drivers believed that it was more important to keep their manager happy than to obey the law.

A general and often misleading assumption made by drivers is that speeding and driving more aggressively will result in a substantial reduction in their travel time. An independent review of the UK SAFED programme (DfT2004) noted that:

*One of the main barriers to SAFED training was the perception that driving fuel efficiently meant that journey times would be lengthened. There is now evidence from the training to show that this is not the case. Driving times are broadly comparable over the same distance using SAFED techniques and not using them. This combined with the cost savings identified have helped in getting training widely accepted within the industry.*

A New Zealand version of SAFED was developed and implemented in 2010 (MoT 2010). Initially, eight senior SAFEDNZ driver trainers were trained. In turn, they trained 15 driver trainers while being assessed by John Boocock of the UK. The training was undertaken both in a classroom and on the road while driving around a pre-selected circuit that was typically 35–40km long and included a mix of urban and rural roads and state highways, as well as intersections and different road terrains. Before and after the training, performance was measured, including fuel used, trip time and the number of gear changes. Drivers were told that they had to obey the speed limit on the second run. Table 1.1 show the improvements that were made.

**Table 1.1 Driving performance before and after SAFEDNZ driver training**

Driver	Reduced trip duration (%)	Reduced fuel use (%)	Reduced brake applications (%)	Reduced gear changes (%)	Reduction in braking distance (%)	Reduction in time spent braking (%)	Increased time in green band* (%)	Reduced time above green band (%)
Senior driver	6.0	4.9	25.7	48.2	38.3	49.8	31.3	50.8
Driver trainers	4.3	5.3	23.8	28.5	-	-	-	-
Senior drivers + driver trainers	4.9	5.1	24.7	36.0	-	-	-	-

\*The green band is marked on a truck’s rev counter to show the most efficient engine speed.

It is notable that these very experienced driver trainers reduced their trip time by nearly 5% while also improving their fuel efficiency and safety.

### 1.7.4 Improving fleet management practices

It is the transport operator who decides whether fuel efficiency is an important consideration when purchasing new vehicles and is the one who needs to take the lead on promoting fuel-efficient driving. Transport operators also influence vehicle maintenance and other measures that affect fuel efficiency and safety.

Safety and fuel efficiency cultures go hand in hand. A study undertaken in the UK for the DfT measured the safety culture in seven transport operations by using the UK Health and Safety Executive's Health and Safety Climate Tool (Bomel 2004). The study interviewed drivers and obtained company accident data, and examined the following key components of organisational safety culture: training, procedures, planning, incident feedback, management and communications. The study found clear indications that fleet safety is more likely to be improved by the introduction of an integrated set of measures based on a strong safety culture within an organisation.

The Trucksafe and National Heavy Vehicle Accreditation (NHVA) schemes in Australia are formal means of recognising operators who have good safety and other (eg mass) management systems in place. In order to become accredited, operators need to demonstrate, through independent audits, that they have effective management systems. Baas and Taramoera (2008) determined the safety benefits of accreditation by comparing police-reported crash rates over a three-year period of accredited and non-accredited vehicles in Victoria, Queensland and New South Wales. Approximately half of the 48,000 articulated heavy vehicles registered in these states belonged to operators who were accredited to Trucksafe or NHVA. It was found that vehicles belonging to operators accredited to TruckSafe or NHVA were, on average, significantly safer than vehicles that were not accredited. The calculated difference in average crash rates was substantial, with vehicles accredited to the schemes having 50–75% fewer crashes on average than non-accredited vehicles. The analysis also found that operators improved through the process of becoming accredited, with reductions on crash rates of approximately 50% in the two years after accreditation compared to the two years before.

A major judicial review on health and safety in the transport industry undertaken in Victoria by Maxwell (2004) makes a strong case for encouraging and rewarding compliance and the adoption of best practice. Transport operators interviewed by Maxwell uniformly supported the use of incentives, irrespective of the size of the enterprise. The reasons given for preferring carrots to sticks are that people and organisations usually respond better to incentives, they are less demanding of enforcement resources and they avoid unnecessary antagonism between the regulator and regulatee. The legislative approach does not address workplace culture, except perhaps in a negative way by encouraging minimum compliance and avoidance of inspection/audits by regulatory authorities. Without strong managerial support, policies aimed at preventing injuries will not be implemented within an organisation.

## 2 Methodology

### 2.1 Overview

This research focused on how fleets can be made more fuel-efficient rather than on whether saving fuel is worth doing. Earlier studies had shown that saving fuel was very beneficial (Baas and Latto 2005; Baas et al 2005; Archer et al 2008; DfT 2011).

The research was undertaken in three parts, namely:

- review and consultation
- case studies
- analysis and dissemination.

### 2.2 Review and consultation

A review was undertaken of both New Zealand and overseas best practice in implementing fleet fuel efficiency measures. The review included determining what the main barriers are and how they have been overcome. Initiatives implemented by fleet operators in New Zealand were also reviewed. Overseas best practice was determined by reviewing British, Canadian, American and other case studies. Relevant research reports were also reviewed.

An evening workshop was held with transport operators and other key stakeholders to obtain their views on what the barriers to improving fuel efficiency are and what assistance would help them with the adoption of fuel efficiency measures.

In addition, some fleet operators and other stakeholders were interviewed to find out what fuel efficiency measures had been implemented, what the barriers were and what could be done to increase the level of uptake.

### 2.3 Case studies

Assistance was provided to a number of fleets, with the aim of obtaining at least five written case studies that could be used to show other transport operators what was involved and what could be achieved.

The method used included:

- **Fleet selection:** Fleets that were included in the trial were selected on the basis of
  - their interest in taking steps to save fuel
  - whether they were typical of their sector
  - the nature of the fleet (light or heavy, type of operation, number of vehicles, location)
  - their industry sector (we wanted to include a number of sectors including large and light vehicles).

Fleets that met the criteria were identified through industry contacts and invited to participate. Additional fleets were added when it became apparent that four of the five fleets initially recruited would not make sufficient progress within the timescale of the project. The fleets that did not make sufficient progress were especially important in finding out what the barriers are to establishing a fuel efficiency culture.



- **Initial monitoring and collection of baseline data:** Vehicle and fleet data were collected on the amount of fuel used, distance travelled, idling, speeding and other information. Care was taken not to influence current practice through the process of collecting the data.
- **Development of fleet action plans:** Fleet action plans with the goal of producing a more fuel-efficient fleet were developed with senior managers. Those plans included, for example, SAFEDNZ driver training using in-house trainers, driver incentive schemes, fleet speeding policies and the introduction of an on-board fuel monitoring using technology based on a global positioning system (GPS).
- **Implementation:** The organisation's fleet action plan was implemented by their fleet managers with assistance from the researchers and driver trainers as required. The researchers held regular review meetings, spoke at staff meetings, produced information sheets and provided other assistance that would typically be available in other countries such as the UK.
- **Post-implementation monitoring:** The fleets were continuously monitored for at least three months, and a review was undertaken to determine what changes had been made, their effectiveness, problems and opportunities for further improvements.

## 2.4 Analysis and dissemination

The results were analysed and written up as case studies in a form suitable for dissemination in the wider transport industry. The case studies are included in the results section of this report.

Two meetings were held with the NZTA, MoT, the Accident Compensation Corporation (ACC) and EECA officials, and key industry representatives in Wellington to discuss the findings and to determine what steps could be taken to encourage fleets to improve fuel efficiency and safety.

The findings were also disseminated through presentations at industry meetings and conferences, and one-on-one meetings with transport operators and industry advisors.

## 3 Results

### 3.1 The nature of the transport sector

#### 3.1.1 Overview

The transport sector today is very diverse. Transport operations range in size from:

- single vehicle operations (eg truck owner-drivers, taxis and trades vehicles)
- light vehicle fleets such as those owned by hospitals, councils, government agencies and large companies
- large heavy vehicle fleets with comprehensive logistics operations.

As a group, heavy vehicle fleets use 4.5 times as much fuel per annum as light vehicle fleets. Individually, large heavy vehicles will typically travel 100,000km per year and use 50L/100km of fuel or approximately 50,000L per annum. Some heavy vehicles can travel several times that distance per year. Light vehicles, on the other hand, will typically travel between 15,000 and 30,000km per year and use 10L/100km or approximately 1500–3000L per annum. The difference in how much is spent per year has a direct bearing on the annual savings and the type of interventions that can be justified.

#### 3.1.2 Light vehicle fleets

The number of light vehicles by fuel type in fleets of more than 20 vehicles is shown in table 3.1. These values were obtained from the vehicle registration database. A small number of small fleets use other fuel types (liquid petroleum gas, compressed natural gas, electricity), which are not included. Note that the sum of the petrol and diesel fleets in each fleet size category does not equal the number of fleets of that size for all vehicles. The reason for this is that most large fleets contain a mix of vehicles with both fuel types. Thus a fleet of 450 vehicles might consist of 300 petrol-powered vehicles and 150 diesel-powered vehicles, which would result in three entries to the table, all in different rows.

**Table 3.1 Distribution of fleet size from registration data for light vehicles**

Fleet size (vehicles)	All light vehicles	Petrol light vehicles	Diesel light vehicles
21-50	1540	1078	476
51-100	527	330	164
101-200	242	159	54
201-400	89	53	18
400+	45	28	7

Table 3.2 shows the industry classes for diesel-powered light vehicles in fleets of over 200 vehicles from registration data. It also shows the industry classes for light petrol vehicle fleets from the registration database with 400+ vehicles. A further 53 fleets have 201–400 vehicles. Of the 28 fleet owners with 400+ vehicles, 16 are lease or rental companies, and three are major car companies.

**Table 3.2** Number of fleets with over 200 light vehicles in their fleet by industry class

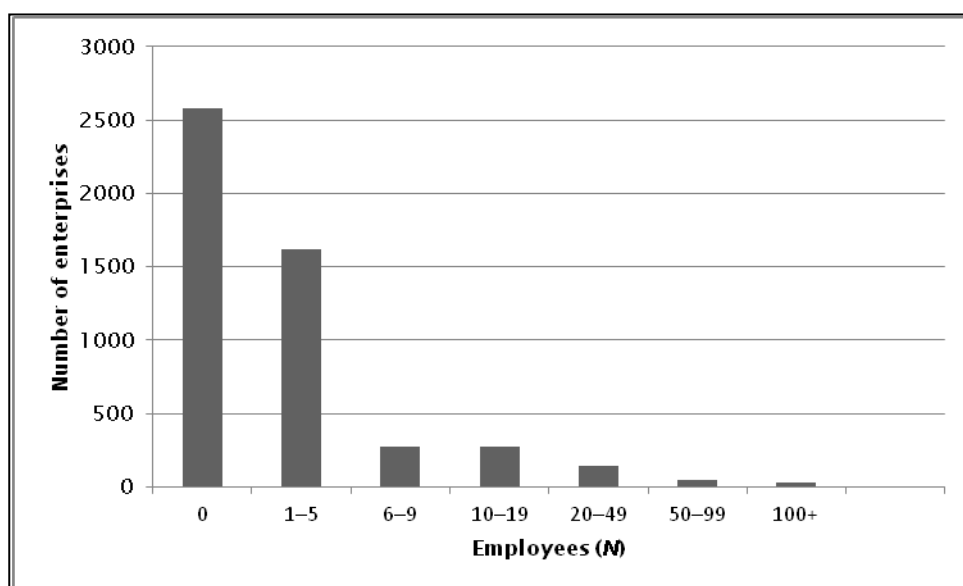
Industry class	Diesel fleets >200	Petrol vehicle fleets >200*
Agriculture/forestry/fishing	91	155
Business/financial	1684	1831
Commercial transport	19	10
Community service	550	447
Construction	674	21
Electricity/gas/water	389	21
Manufacturing	23	8
Mining/quarrying	114	0
Private	4472	6090
Tourism/leisure	1734	168
Unknown	496	524
Vehicle trader	2	2
Wholesale/retail/trade	690	134
<b>TOTAL</b>	<b>10,938</b>	<b>9414</b>

\* Excludes vehicle rental companies and dealers

### 3.1.3 Heavy vehicle fleets

#### 3.13.1 Characteristics

Statistics New Zealand data for 2009 show that 4986 enterprises were operating in the road freight transport sector (de Pont 2010). Figure 3.1 shows the distribution of enterprises by employee numbers.

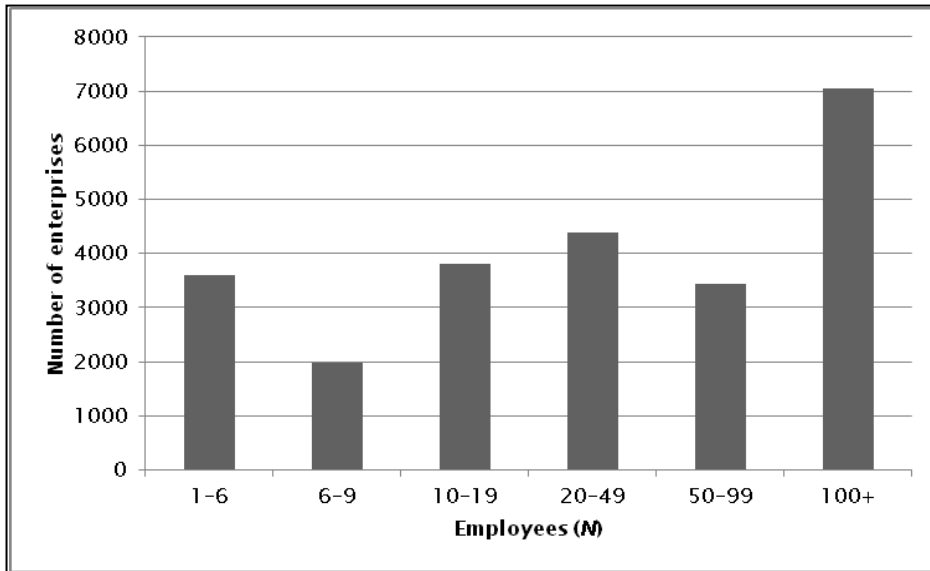
**Figure 3.1** Distribution of the number of road transport enterprises\* by employee numbers

\*Total number of road transport enterprises: 4986.

Overall, 52% of road transport enterprises had no employees (ie owner-operators).

Figure 3.1 shows that fewer than 4.6% (229 out of 4986) of road freight enterprises employed 20 people or more. However, from an examination of figure 3.2, which shows the number of people employed in road freight enterprises by enterprise size, it can be seen that these 229 enterprises employed over 61% of the people working in the industry. If we consider enterprises with 50 or more employees, they represented only 1.7% of the enterprises but employed 43% of the people working in the industry.

**Figure 3.2 Distribution of employees in road transport enterprises\* by enterprise size**



\* Total number of road transport enterprises: 24,250.

A major study of driver recruitment and retention which included interviewing over 200 drivers, dispatch staff, partners and others associated with drivers throughout the country, and a survey of transport operators identified a number of characteristics of the industry (Oliver et al 2003):

- They are highly competitive.
- They have a low cost of entry.
- They have low operator margins.

### 3.1.3.2 Highly competitive

The freight transport sector is highly competitive in nature. This affects the sector’s ability to maintain acceptable standards of health and safety, road safety and staff welfare. The pressures on the industry often lead to the following undesirable traits:

- Purchasers of truck transport services take a short-term view, leading to haulage rates being squeezed below the level required to maintain the general health of the transport industry and its long-term sustainability.
- Established truck transport operators take a short-term and unrealistic approach to tendering for work.
- Many new entrants to the truck transport industry are undercapitalised and do not fully appreciate the economics of sustainable trucking, leading to them being willing to undercut the haulage rates needed for sustainable operation.

Oliver et al (2003) noted a chain of organisations – ranging from freight forwarders to virtually all parts of New Zealand industry and commerce – whose activities depend on truck transport and whose policies,

behaviour and performance impact on the sustainability of the truck transport industry itself. As a consequence, these entities have responsibilities towards the transport industry that they need to recognise.

### 3.1.3.3 Low cost of entry

People interviewed as part of the driver recruitment and retention project (Oliver et al 2003) noted that it is possible to start a transport operation with as little as \$20,000, provided the person who controls the operation obtains a certificate of knowledge of law and practice, and is a fit and proper person. They do not have to show that they have safety management systems in place, nor do they have to prove financial 'viability' (as was formerly required). With second-hand trucks being very tradable, finance companies are willing to lend a significant proportion of the value of the vehicle. The low cost of entry is a characteristic of a number of other highly competitive service sectors, such as the retail, hospitality and building industries. Industry stakeholders often raised the influence of freight forwarders, transport industry clients and other users of freight transport on safety (Oliver et al 2003). Interviewees highlighted instances where clients imposed unrealistic schedules and conditions. The *Report of the transport committee on the inquiry into truck crashes* (NZ Parliament 1996) cited a number of examples of this and was concerned about how this compromises safety. This is not exclusively a New Zealand problem and it is being tackled in other developed countries in a number of different ways.

### 3.1.3.4 Low operator margins

Cost model information from National Road Carriers Inc. (NRC) suggests that the margins in truck operations are small, with net average profits of approximately 2–3% per year and a negligible return on assets, with the exception of larger operators, who might achieve up to 7%, especially if they are involved in integrated logistics operations (pers. comm. from James Smith, NRC).

A major proportion of the turnover of a transport operation is for items over which the transport operator has only limited control, both in terms of the amount and when it has to be paid. This makes transport operators very vulnerable to the increasing cost of fuel, cashflow problems caused by late payment of accounts by clients, downturn in work and other factors that are outside of the operators' control.

Typical costs as a percentage of turnover are shown in table 3.3.

**Table 3.3 Transport costs as a percentage of turnover**

	Typical costs as % of turnover, depending on vehicle size and use*
Road user charges (RUCs)	3–15%
Fuel and lubricants	5–20%
Tyres	2–3%)
Maintenance	5–10%
Vehicle ownership costs including depreciation	10%
Driver wages	17%

\* Other costs, including interest payments, administration and the cost of premises, can also be incurred.

Fuel efficiency is one of the few options available to reduce costs and to increase company viability and profitability.

Figures 3.3 and 3.4, which were produced using the NRC cost model, show the cost of operating a tractor semitrailer combination between two cities that are approximately 100km apart. The rig travelled 62,500km per year and had an engine running time of 980 hours. The graphs show the effect of a 14%

reduction in fuel use and a 5% reduction in repairs and maintenance. No other changes were made. These changes result in an increase in profit of:

- \$35,000–42,000 per annum
- \$0.56–0.68 per kilometre
- \$35.84–43.00 per hour.

**Figure 3.3 Comparison of profit, income and costs before and after fuel savings**

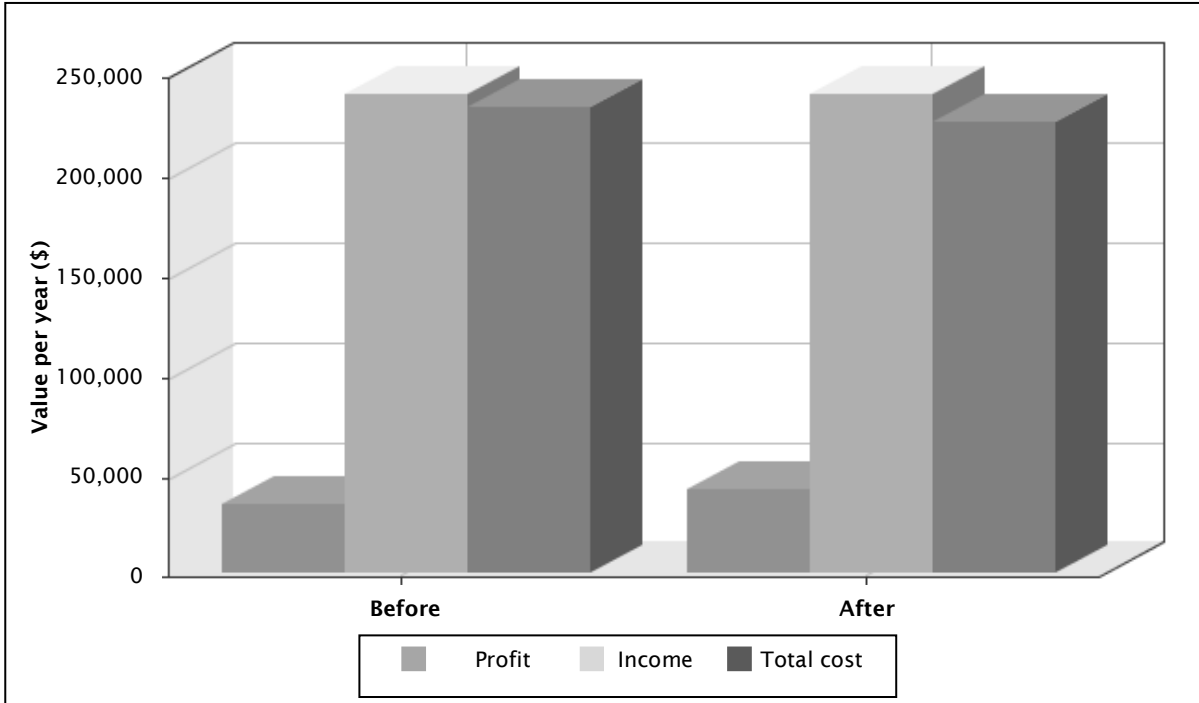
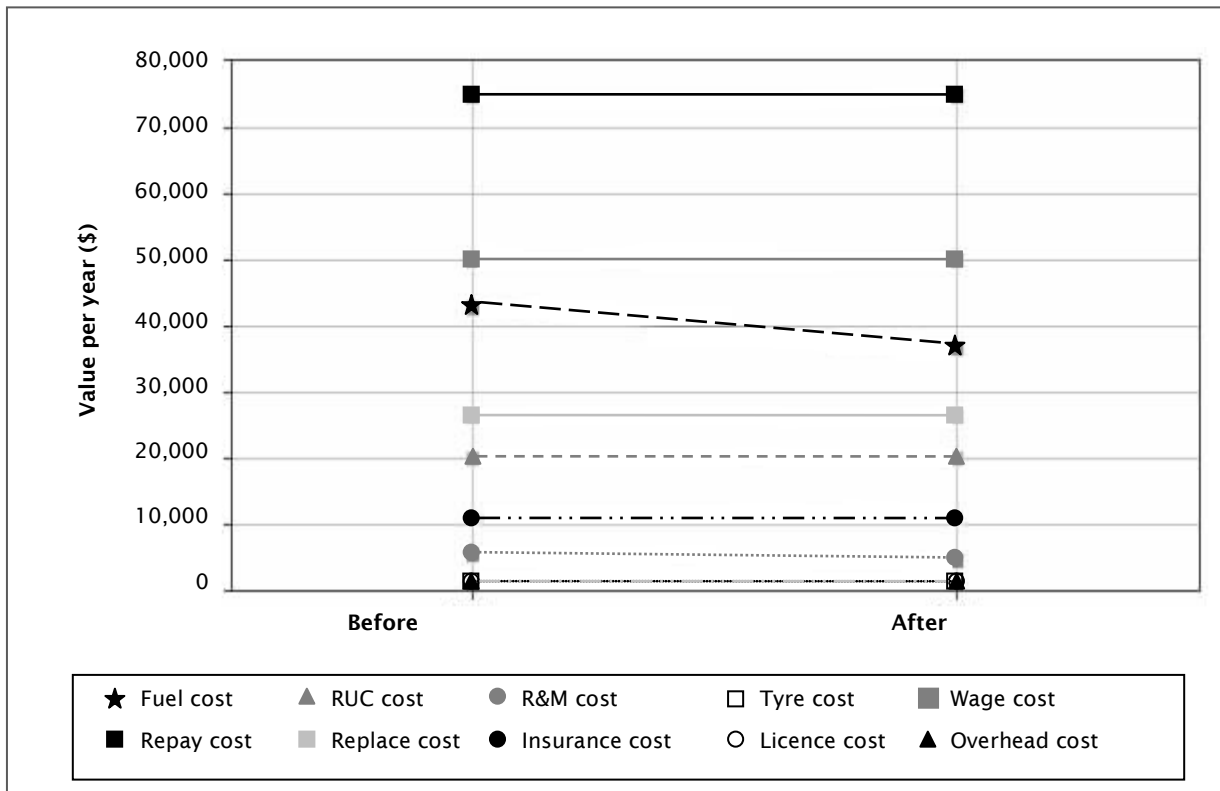


Figure 3.4 Cost components before and after fuel savings



## 3.2 Industry meetings and interviews

### 3.2.1 Interview questions

Fleet managers were interviewed at their workplace and a special evening meeting was held on 2 June 2010 in Penrose. The following lists the main topics discussed and the responses:

- What are the barriers to fleets adopting fuel-saving measures, and other systems and procedures to achieve best practice?
- What should be included in best practice to improve the bottom line?
- What type of information/assistance would help fleets, how should it be delivered and who should provide it?

### 3.2.2 Barriers to adopting fuel saving measures

- Fleet managers and owners largely base their decisions on the experience of previous generations of fleet managers and what they have picked up themselves. One fleet owner mentioned that he and others like him joined the industry in order to drive trucks and progressed from that to owning their own vehicles, initially as owner-drivers. Fleet managers often do not have any formal training in financial management and therefore do not have a good handle on what each truck costs to run over its lifetime (pers. comm. J. Smith, NRC). As a result, very few fleets are putting effort into saving fuel despite the financial benefits.
- Managers are too busy dealing with day-to-day issues to introduce new initiatives that require a proactive approach.

- Very few operators measure fuel used by individual vehicles.
- The attitude of drivers and other staff is often an issue.
- Some managers are not aware of what can be saved.
- Accurate and independent information on options is lacking.
- A lot of other schemes/ideas offered in the past have not produced results (the costs were greater than the benefits).
- The time involved for both management and drivers is an obstacle, as is lost productivity while drivers are being trained.
- Skills learnt over time are perceived to erode, with drivers slipping back into old habits.
- Measuring benefits is difficult because of the lack of quality information on the amount of fuel used by drivers and the validity of the data, especially if drivers are not doing a set run.
- If training is provided, is the driver going to stay with the company?
- Fleets generally use GPS tracking systems to solve particular issues and review specific events rather than looking for trends.

### 3.2.3 Factors to include in best practice

Workshop attendants and interview respondents listed the following possibilities:

- a need for consistent speed and less aggressive driving
- better planning and scheduling
- good communication between drivers and managers
- better use of information gathered within fleets (eg GPS data)
- user-friendly systems
- incentives
- ways of promoting competition among drivers.

### 3.2.4 Information and assistance

Workshop participants and interview respondents had several suggestions about potential information and the channels for providing it, such as:

- case studies that are easy to read
- information targeted at accountants, senior managers and directors
- website(s) that can be trusted, are comprehensive and easy to use
- industry magazines with articles on, for example, basic specifications for add-on devices
- local industry associations such as NRC and the road transport associations, as fleet operators already seek assistance from them.



### 3.2.5 Options for overcoming the barriers

The options that were identified are summarised in table 3.4.

**Table 3.4 Barriers and options or overcoming those barriers**

Topic	Barriers	Options
Management systems	<ul style="list-style-type: none"> <li>Managers too busy dealing with day-to-day issues to introduce new initiatives that require a proactive approach.</li> <li>Time involved for both management and drivers, and lost productivity while drivers are being trained.</li> <li>Attitude of drivers and other staff.</li> </ul>	<ul style="list-style-type: none"> <li>Encourage fleet managers to adopt fuel efficiency as a normal part of doing business. Make it one of the managers' KPIs.</li> <li>Provide information and guidance on adopting fleet management practices that are based on planning, measurement, continuous improvement, feedback, incentives etc.</li> <li>Assist fleet owners with the development of business cases for fuel efficiency and safety initiatives.</li> <li>Promote better management practices.</li> <li>Provide case studies of successful fleets.</li> </ul>
Measurement	<ul style="list-style-type: none"> <li>Very few operators measure fuel used by individual vehicles</li> <li>Difficulty in measuring benefits because of the lack of quality information on the amount of fuel used by drivers and the validity of the data, especially if drivers are not doing a set run.</li> </ul>	<ul style="list-style-type: none"> <li>Improve the systems available to monitor fuel use and distance travelled.</li> </ul>
Information and assistance	<ul style="list-style-type: none"> <li>Lack of awareness on what can be saved.</li> <li>Lack of information on options.</li> <li>Other schemes/ideas offered in the past that have not produced results.</li> <li>Perceived erosion of skills learnt over time.</li> <li>Driver retention after training.</li> </ul>	<ul style="list-style-type: none"> <li>Provide government and industry support.</li> <li>Provide case studies and other information.</li> <li>Provide easy access to reliable, easy to understand information on a single government website and via other media.</li> <li>Promote fuel efficiency and the need for a holistic approach.</li> </ul>

## 4 Case studies

### 4.1 Selection of case studies

Operators who attended the meetings, or who were recommended by the industry associations and advisors, were asked if they would be interested in being involved in case studies of fleet management. The final selection of operators took into account whether they were representative of their sector, and whether they had an interest in saving fuel but had not made any significant progress to date. They were promised help with setting up monitoring systems, implementing the changes required to save fuel and other assistance at no cost, provided they agreed to the case study.

Summaries of the completed case studies are presented in the remainder of this chapter. The case studies have been prepared as standalone documents that can be extracted from this report.

An additional case study that predates this research is included in appendix A. Alexander Petroleum Services Limited was awarded the 2007/08 Road Safety Innovation and Achievement Award for the improvements it made in safety and fuel efficiency.

### 4.2 JPM Holdings

#### 4.2.1 Key results

- 13% improvement in fuel efficiency
- 75% fewer speeding events (ie over 95km/hr)
- idling reduced from 2 hours to 35 minutes per day
- improved tyre life
- reduced depot turnaround times
- much better and more open communication between drivers and managers
- whole of company approach to problem solving.

#### 4.2.2 Background

JPM Holdings employs 32 drivers and 16 trucks, operating line-haul services on behalf of PBT Transport (figure 4.1) throughout the South Island, a contract which they have held since 2003.

As a line-haul contractor, JPM Holdings cannot control the freight, the loading or the time at which the freight will be ready to depart the depot. Without strong relationships, clear accountabilities or open communication within JPM Holdings and with their customer at all levels, it is possible that drivers will be encouraged to speed and cut corners in order to arrive on time. The consistent routes do, however, mean that drivers know their route well, allowing breaks to be planned. However, routine also breeds boredom and complacency, especially on the long, straight stretches leading to and from the main hub in Christchurch.

**Figure 4.1** A PBT Transport B-train operated by JPM Holdings



### 4.2.3 A focus on fuel efficiency

The owner and the general manager of JPM Holdings are always striving to do better. They were early adopters of GPS and put a lot of effort into improving efficiency and reliability. They have a very good understanding of most of their costs, but had paid very little attention to the fuel bill other than obtaining the best discount available.

JPM Holdings did not have the resources available in-house to monitor fuel use and sought the help of Corinne Watson of CCS Logistics in 2008. CCS Logistics has been working with JPM Holdings since then, and now analyses the GPS data and reconciles the fuel purchases each month to produce summary reports for managers and drivers, with supporting notes highlighting notable improvements or activities requiring additional focus.

Drivers have become accustomed to being their own boss during the hours that they spend on the road, and any suggestion regarding what they do during this time can easily be taken as a personal criticism of their driving skills. To mitigate this, JPM Holdings carefully planned the roll-out of the project.

- They introduced the project to the drivers in their monthly newsletter before feedback was given.
- They followed the newsletter up with face-to-face conversations with each driver, either in the cab on the road, or at a depot during turnaround. JPM Holdings' managers believe strongly in the value of face-to-face communication and make the effort to meet up with drivers, even if it means midnight visits to the depots around the South Island to see drivers who otherwise would not see their managers.
- They monitored the new reports for three months before publishing them to the drivers, so that the managers had time to familiarise themselves with the layout, meaning and patterns of the reports.

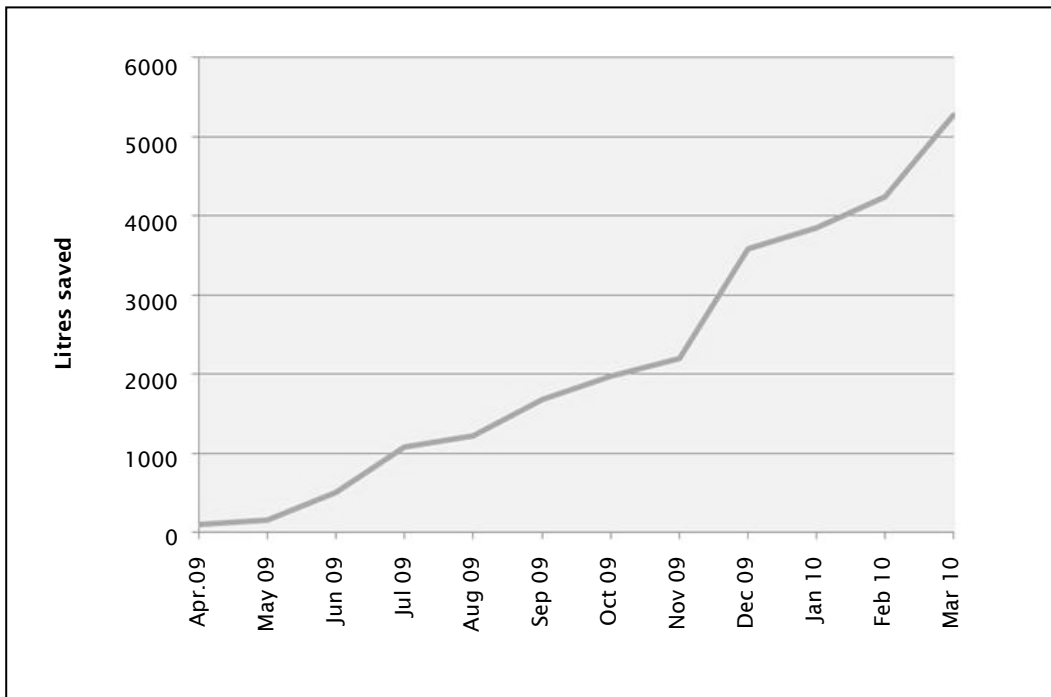
At first, the drivers were unsure about receiving feedback on the job. Several murmured about managers dreaming up ideas to keep themselves entertained during the long hours in the office. Ultimately, every driver believed himself to be the best in the fleet and curiosity is a big motivator. As drivers found that the reports genuinely reflected what they were doing on the road – and that other drivers were more fuel-efficient – the competition started.

Initially, drivers were somewhat confused about how to get better. Drivers who believed they were very fuel-efficient were genuinely confused when they found that another driver had beaten them. Over time, the denial gave way to cautious discussions as drivers tried to prise the 'winning techniques' from each other. Delays in loading were a key contributor to pressure on the road, and drivers now assist by fuelling the truck while the trailer is being loaded and chasing up the paperwork while the curtains are being

closed. Although not every driver was swept up in the enthusiasm, those who put their head down and just got on with the job attracted attention from the other drivers.

As the patterns started emerging and a very real saving in fuel spending became apparent (figure 4.2), JPM Holdings set targets for the fleet to meet, rewarding all drivers with a social evening as each target was met and awarding individual shopping vouchers to the most improved drivers. **The greatest reward for these drivers was being recognised in front of the rest of the fleet.**

Figure 4.2 Accumulated average fuel savings per truck by JPM Holdings, 2009-2010



#### 4.2.4 Results

The benefits have been wide ranging:

- A 13% improvement in fuel efficiency has been achieved across the fleet.
- Safety has improved. Key messages are 'We don't want you to speed,' and 'We will do our bit to make sure you don't have to.'
- The customer (PBT Transport) has benefited by having their brand on trucks that are managed professionally, have courteous drivers and are safe on the road. This, in turn, has benefited JPM Holdings' standing as a preferred supplier.
- A culture of a whole-of-company approach has now been created which encourages any ideas to be voiced, tried out and measured.
- The programme has engaged drivers more than any other initiative.
- The drivers confess to a feeling of accountability and pride in their job, and enjoy having something to improve and concentrate on during the long hours on the road.
- The managers are now more confident in their fleet: being able to monitor and manage driver behaviour and know that it is meeting standards has a significant positive effect on stress levels.

Although the actual life of individual tyres is difficult to measure, especially where different tyre agents are used for different depots, JPM Holdings is convinced that tyre life has improved alongside the fuel savings.

## 4.3 Smith & Davies Ltd

### 4.3.1 Key results

- Two in-house instructors are providing SAFEDNZ training to all drivers.
- Smith & Davies Ltd are assisting TR Group with the development of an automated vehicle and driver monitoring system.
- They are conducting pre-employment driving assessments using SAFEDNZ instructors and principles.
- Idling has been reduced by 90%.
- Speeding has been reduced by over 20%.
- It is still too early to quantify the overall fuel savings. SAFEDNZ training assessments currently show a 9% improvement.

### 4.3.2 Background

Smith & Davies Ltd was established in 1927, and is now one of the largest heavy vehicle and equipment fleets in the upper North Island and has over 215 employees. It specialises in large transport and civil engineering construction contracts including: bulk excavation and haulage (figure 4.3), general freight, log transport (figure 4.4), road construction (figure 4.5), marine works and plant hire.

**Figure 4.3** A Smith & Davies Ltd truck hauling and oversize vehicle



**Figure 4.4** A Smith & Davies Ltd logging truck



**Figure 4.5 A Smith & Davies Ltd truck working at a road construction site**



Smith & Davies Ltd places a lot of emphasis on providing a safe, efficient and quality service. This has been recognised by being the winner of numerous Westpac Trust Enterprise Business Excellence awards, including the supreme award in 2002, the Skill NZ Excellence in training and Development award in 2001 and the Truck Stops Large Fleet Operator of the Year award in 1999.

It was one of the first companies to apply to be part of the ACC Workplace Safety Management Practices scheme and employs a full-time health and safety manager. All drivers are encouraged to gain a national certificate and it has a programme in place to help drivers on a class 2 licence to obtain their class 5 licence. It is also committed to reducing its impact on the environment.

### 4.3.3 Focus on fuel efficiency

It was a natural progression for Smith & Davies Ltd to direct its attention to fuel efficiency. Smith & Davies Ltd currently uses around 7 million litres of diesel a year so any savings they can make is significant in reducing their carbon footprint. It is taking a broad long-term approach that includes:

- working with the TR Group with the development of an automated vehicle monitoring system that will provide reports in fuel efficiency, speeding, idling and other factors at the manager and driver level
- progressively providing SAFEDNZ training to all drivers, using two in-house SAFEDNZ driver trainers
- using the SAFEDNZ driver trainers to vet all applicants for driving jobs
- holding staff meetings, producing a newsletter and other means of communicating their commitment to fuel efficiency and safety to all staff.
- encouraging drivers to monitor their own performance after completing SAFED training so they take ownership of the continual improvement process.

### 4.3.4 Results

At the time of writing this report, some encouraging results had already been achieved, with at-work and motor vehicle accidents decreasing. The feedback received from the drivers who have participated has all been very positive. Using the SAFED principles to assess new applicants' driving standards and attitudes on the road prior employment to has prevented the company taking on several drivers whose applications looked good on paper but who, when tested on the road, fell well short in practice.

Forty-three drivers have now completed SAFEDNZ training, the highest number of participants put through by one single company in New Zealand.

## 4.4 Port Otago Ltd

### 4.4.1 Key results

- Fuel consumption per 1000 containers has reduced by 15%.
- Maintenance services required per 1000 containers have reduced by 19%.
- The number of machine hours required to service the same level of container activity has reduced by 15%.
- Turnaround of containers has become more efficient.
- The cost of running the machines has reduced.
- Increasing the service life of the machines will increase replacement intervals.

### 4.4.2 Background

Port Otago Ltd operates the Port Chalmers facility near Dunedin. As a full services port, it not only imports and exports containers for South Island industries, but also manages all container services related to the condition and storage of the containers on site. Port Otago operates a fleet of 20 container handling machines in addition to its three ship-to-shore cranes (figure 4.6). Working continually, this operation is manned by a staff of 130 cargo handlers on a constantly rotating shift pattern. The work profile can vary significantly, with machines working on short distance transfers to or from the ships, travelling longer distances across the terminal to supply containers to the packing warehouse on another site, or servicing road and rail container supplies.

**Figure 4.6** A Port Otago Ltd ship-to-shore crane at Port Chalmers



### 4.4.3 A focus on fuel efficiency

Port Otago Ltd saw an opportunity to improve the productivity of their wharfside container handling machines. However, with no real data to support their observations, the project kept getting pushed back into the file. When CCS Logistics helped them to draw the parallel between their challenges and those of any other transport operator, the steps to achieving real knowledge of their current performance levels and the actions required to achieve better results became clearer, and the project was set in action.

A robust plan to deliver a clearly stated and quantified goal spurred the project on through its troubled implementation. Port Otago Ltd has kept on a path of continuous improvement by delivering certainty to their operational supervisors by agreeing on operating guidelines to help to manage efficiency in the constantly changing operating environment, supported by continuing attention and consistent feedback.

The headline KPI of the number of containers lifted per hour per machine was looked at in detail. In improving the performance against this KPI, the number of machine-hours required to lift the same number of containers reduced in order to reduce the fuel consumed and to reduce the cost of running the machines.

By using fewer machines to service the same amount of work, the delays and risks incurred in working around other machines should be reduced, speeding up the flow of containers.

In order to capture this data, a GPS fleet management system was installed in the wharfside machines. The nature of the operation, the complexities of the machines and the lack of experience of the GPS supplier in this environment meant that what followed was almost two years of trouble-shooting and analysis to identify and resolve each issue, a process which was made more complex by none of the machines having a set work pattern on any given day. A summary of the key issues discovered included the following:

- Some machines reported no data at all, or reported container lifts but no travelling records.
- Machine-hours were distorted by different methods of starting and stopping the engines.
- Container lift counts were distorted by the voltage change when running lights were operated.
- Travelling and stationary uses were poorly segregated, because of low machine running speeds.

Faith, budgets and analytical capabilities were seriously tested through this phase. While communication was maintained with the supplier, the resolution was largely carried out by the onsite workshop. The belief in the size of the goal ensured the project team kept pushing for a robust resolution, something that was finally achieved in mid-2008.

#### 4.4.4 Results

By bringing visibility to a core issue, discussing it and openly tackling it, Port Otago Ltd has achieved the following measurable benefits:

- The number of machine-hours required to service the container business reduced by 15%.
- Fuel consumption per 1000 containers has reduced by 15%. The fuel bill has visibly reduced for this fleet of 20 container handling machines. The average of the first part of 2008 was used as a base while the GPS system data was being finalised (figure 4.7).
- Maintenance services required per 1000 containers have reduced by 19%. The routine maintenance interval has lengthened for each type of machine. Services are still planned at the same number of machine-hours, but increased diligence regarding machine productivity makes it longer for each machine to reach its service time (figure 4.8).



Figure 4.7 Fuel used per 1000 containers by Port Otago Ltd, 2008-2010

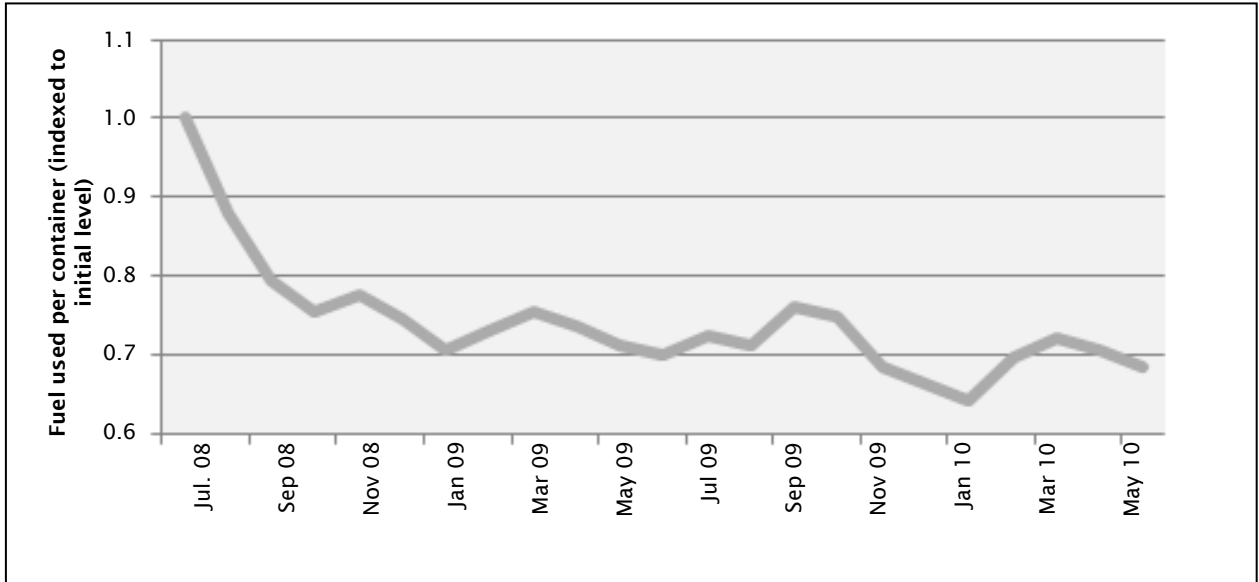
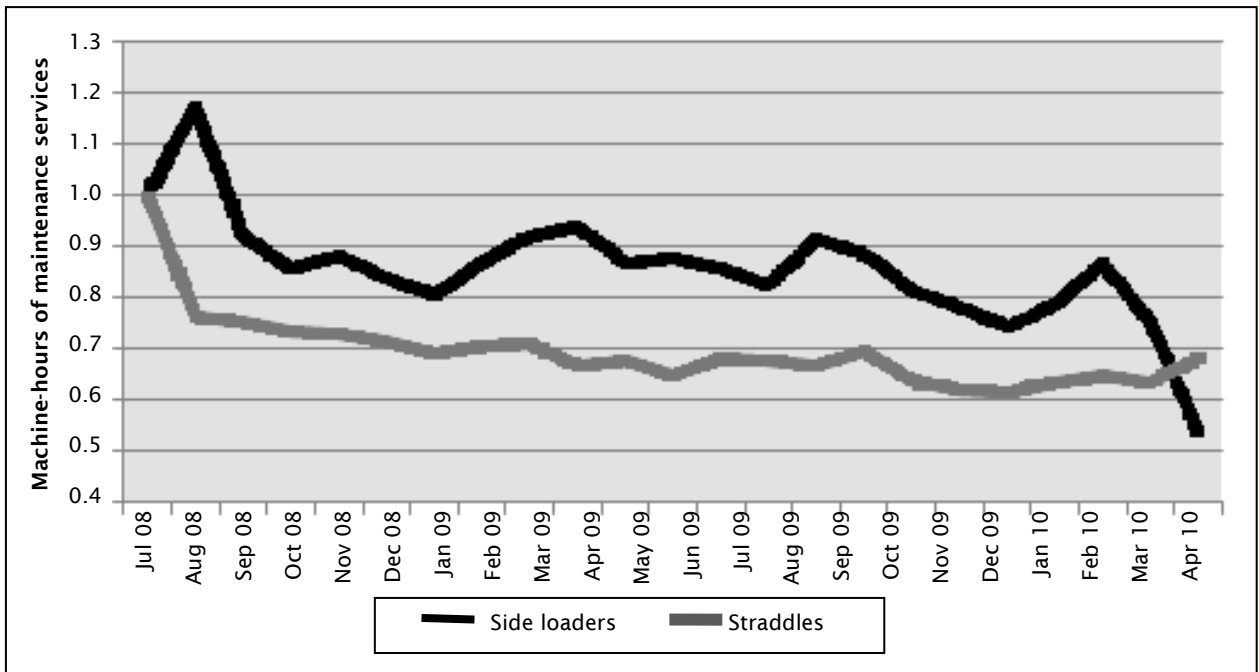


Figure 4.8 Maintenance services required per 1000 containers by Port Otago Ltd, 2008-2010 (indexed to initial level)



## 4.5 Westland Milk Products

### 4.5.1 Key results

- An improvement in fuel efficiency of 4%
- 33% improvement in speed management
- 13% reduction in harsh driving alerts triggered

- transparency gained in the fleet activity
- needs-based driver training initiated.

#### 4.5.2 Background

Westland Milk Products' transport division operate 20 truck and trailer-milk tanker combinations (figure 4.19), piloted by 57 drivers. Their task is to collect milk from all of the dairy farms between Fox Glacier and Karamea through the challenging environment of the West Coast region of the South Island. Travelling 4 million kilometres during the 10 months of the milking season, this fleet is tasked with keeping the milk flowing off the farms and through to the processing factory in Hokitika. From 1 August to 31 May, the trucks keep rolling in a 24/7 operation.

**Figure 4.19 A Westland Milk Products trailer-milk tanker combination vehicle**



#### 4.5.3 A focus on fuel efficiency

In 2010, Westland Milk Products launched the Westland Way for Excellence. For the transport division, this meant finding a way to measure their performance, introducing KPIs and working to better themselves. Cost is clearly a key consideration in improving transport efficiencies, as 4 million kilometres per annum is a big multiplier for transport costs. One of the main aims of the project when GPS was installed and KPIs became part of the agenda was to improve both fuel efficiency and road safety, ensuring that the fleet was one to be proud of.

When the managers first saw the new GPS system, they knew they needed help. The amount of data available was immense, but the path linking this data to their goals in efficiency and safety was unclear. Westland Milk Products approached CCS Logistics to help them select the right KPIs and to develop data analysis processes for monitoring progress against targets, and to provide feedback to the drivers.

With the volume of data available, the challenge was to address all of the goals of the stakeholders, without making the project unwieldy, diluting enthusiasm and ultimately achieving nothing. By targeting speeding; hard braking, accelerating and cornering; and idling, the twin goals of fuel efficiency and safety could be addressed.

During the annual maintenance period, a full driver briefing session was held. This was a joint presentation between the Westland Milk Product transport managers and CCS Logistics. The presentation was delivered in two parts:

- The Westland Milk Products transport managers covered the background to the project, the reasons for its introduction, the desired results and the process by which it would be managed.

- CCS Logistics covered the role of the GPS system in the project, the specific KPIs that had been selected and the initial review of the GPS profile of the fleet compared to other fleets.

The most important part of the briefing was providing the drivers with the opportunity to ask questions, which mostly focused on:

- the system, what it is and how it works
- how the driver KPIs are calculated
- what changes the drivers could expect as a result of rolling this project out
- seeking reassurance that the initial results were 'normal' or consistent with other fleets.

By showing the data in its component parts, the goal for any one driver was not to aim to be 'safer' or 'more fuel efficient', but to ensure that their performance in each area (speeding, cornering forces, idling and other down time) was within the target range. In achieving this, the broader improvement goals of safety and fuel efficiency would be met.

When the first reports were presented, only 42 of the 57 drivers had data because of problems with the hardware. When the results were checked against the distance each had travelled, they were not consistent with the work which had been allocated to each driver during the month.

This was a huge setback. The investment had been made and the drivers were asking for their reports, but the trucks were too busy working to be brought in for inspection out of their service rotation. By working closely with the GPS supplier, the issues were resolved one by one.

#### 4.5.4 Results

The benefits of the fuel efficiency programme at Westland Milk Products were:

- a 4% improvement in fuel efficiency in the first few months of the programme (figure 4.10)
- a 33% improvement in speed management (figure 4.11)
- 13% improvement in harsh driving alerts triggered (figure 4.12)
- improved fuel efficiency and safety arising from natural competition between the drivers
- needs-based driver training delivered to the right drivers for the right reasons.

Objective measures of performance are available to demonstrate the contribution which the transport division is making to the Westland Way for Excellence.

Figure 4.10 Improvement in average fuel consumption (km/litre)

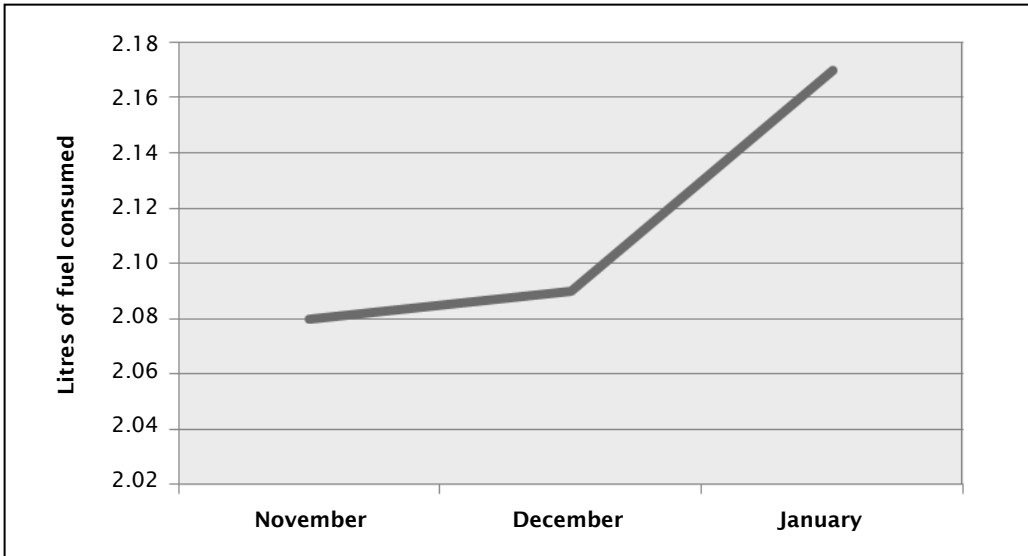


Figure 4.11 Improvement in speed management

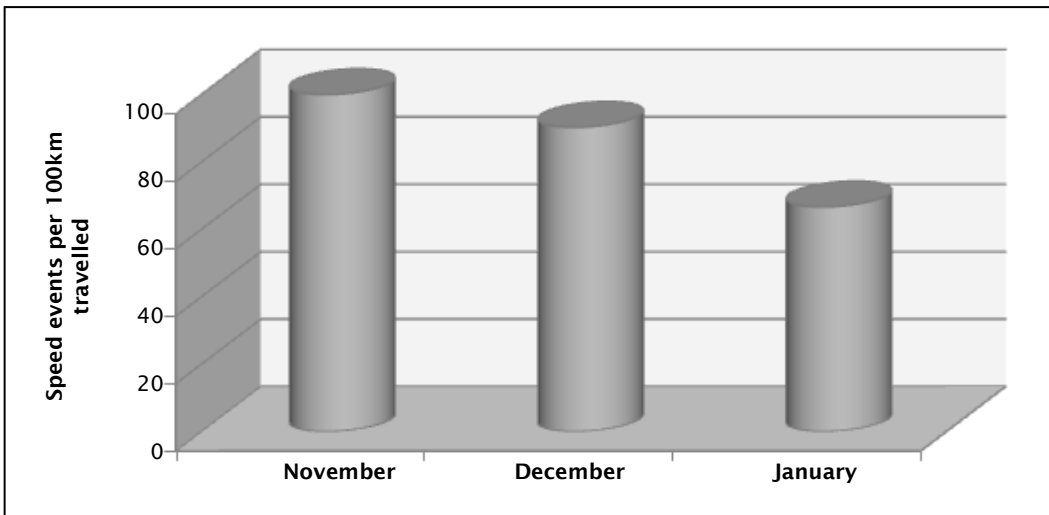
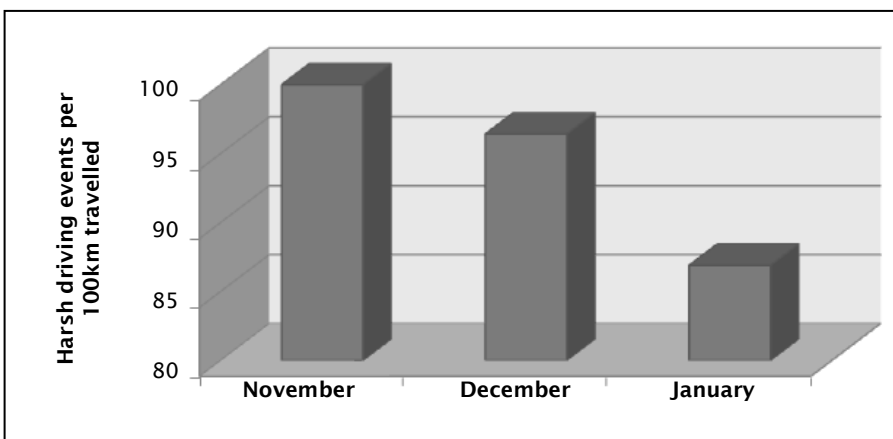


Figure 4.12 Reduction in harsh driving events



## 4.6 NZL Group

### 4.6.1 Key results

- 8% overall improvement in fuel efficiency
- 5% fuel saving from drivers that were involved in the trial and have been SAFEDNZ trained (these drivers improved by a further 2% after phone-text feedback to drivers several months after the trial)
- 33% reduction in time spent speeding
- 47% reduction in time and 65% reduction in distance for which brakes are on after SAFEDNZ training
- The overall fuel efficiency will improve even more as further drivers are SAFEDNZ trained

### 4.6.2 Background

The NZL Group started in 1949 as the New Zealand Lumber Company. At the beginning, it had one truck, one forklift and a straddle loader, and was based at the Tauranga Wharf. It is still a New Zealand-owned company, and now has over 350 staff and a contracted network of several hundreds of transport companies. It provides transport and supply chain management services (figure 4.13) throughout New Zealand, and port operational services in ocean and inland ports. It has six interconnected business divisions that can deliver a complete logistics solution or tailor individual services to suit specific client requirements while enjoying the benefits from the overall economy of scale.

**Figure 4.13** A NZL Group transport/supply chain vehicle



### 4.6.3 A focus on fuel efficiency

TR Group approached the NZL Group in July 2010 to see if they would be willing to assist in trialling a fuel saving programme that TR Group was developing into a product offering. This was timely because the NZL Group was looking for new ways to improve and was investing heavily in state-of-the-art equipment and efficient computerised operating systems. The focus on fuel efficiency was the next logical step in ensuring that the NZL Group stayed at the top of its game. They decided to take a holistic approach that considered all aspects of the operation that affect fuel efficiency. These include the vehicle, the driver, route selection, dispatch, maintenance and management systems, among others.

The key components of the trial were:

- using TR telematics technology to capture the information (measuring the status quo)
- training to raise driver skills and awareness (making improvements)
- monitoring what was happening and why (measuring the change)

- providing feedback to drivers/trainers and managers (enhancing improvements).

One of the first steps was to analyse the fuel used per vehicle on an ongoing basis. Without a measure of how well each vehicle was doing, it was very hard to know what worked or not. While NZL Group had Navman GPS tracking on all of its vehicles, TR Group also installed Navman Wireless engine management system units to capture the vehicles' engine information. The data collected was analysed to determine how the vehicle was being driven (idling, speeding etc) and its fuel consumption.

The initial focus was on driver training because how a vehicle is driven has a huge influence on the fuel economy; the difference between a good driver and a bad driver can be up to 30%.

Tony Newth of the TR Group provided SAFEDNZ training to a group of six drivers and the in-house driver trainer so the programme could eventually be rolled out across the whole fleet (figure 4.14).

**Figure 4.14** Some of the NZL Group drivers after SAFEDNZ training



Initially, feedback was provided to the drivers via reports sent to the in-house driver trainer. After a while, drivers were contacted via text messages and phone calls to discuss their results and what they needed to do to improve. At the same time, the in-cab displays were reconfigured to show fuel consumption, idling etc. The drivers responded well to the direct feedback and this proved to be the most valuable part of this trial.

The NZL Group also implemented a truck replacement programme to ensure that every truck was the best for the type of work it is required to do. Significant fuel savings have been made by using trucks with lower specifications where appropriate (figure 4.15). Generally, the higher the horsepower, the more fuel the truck will use. Not only does selecting the most suitable vehicle for the job save fuel, it can also significantly reduce capital and maintenance costs.

The NZL Group has also been reviewing routes and schedules to identify where improvements could be made. These initiatives are ongoing.

**Figure 4.15** An example of using the right truck for the job: this more powerful vehicle is more suitable for long-haul transport on the open road in steeper terrain than a truck with lower specifications



#### 4.6.4 Results

- A 5% fuel saving was realised one to three months after SAFEDNZ training was carried out.
- An extra 2% fuel saving was achieved by providing feedback to the drivers in the form of phone calls, text messages and the in-cab display.
- An 8% improvement has been achieved by also replacing trucks with ones that were better matched for the task, often leading to less powerful trucks being used where excess horsepower was not required, by making improvements in route selection and other changes.

### 4.7 Downer

#### 4.7.1 Key results

- Fuel bill reduced by 15%
- \$2 million savings per year
- each energy-efficient driver trainer costs less than \$500
- a two-year payback period.

#### 4.7.2 Background

Downer's core business is the construction and maintenance of transport, water, telecommunications and renewable energy infrastructure. It has more than 5000 employees and a fleet of over 4000 vehicles. A significant proportion of its fleet are light vehicles, including service vans for the 1000 field technicians who construct and maintain Telecom's copper and fibreoptic infrastructure (figure 4.16 and 4.17).

**Figure 4.16** An example of Downer's light vehicles: a sports utility vehicle used in servicing urban infrastructure



**Figure 4.17** Another example of Downer's light vehicles: a four-wheel-drive being used to access a remote location



An important aspect of Downer's energy efficiency programme has been to ensure that it is cost-effective, with payback periods of less than a year. Each initiative was trialled before being implemented across the company. Downer has:

- installed GPS in all of its vehicles at a cost of nearly \$4 million
- appointed fuel champions and in-house driver trainers at its depots and branches across the country
- developed a fuel efficiency driver training programme called SEED that uses a mobile classroom to train groups of about six drivers at a time; the cost to train each in-house driver trainer was less than \$500
- provided training and support material for the in-house fuel champions to use during regular staff meetings
- developed standard reports using the GPS and other data for fleet monitoring and to provide feedback to drivers.



One fleet issue that was identified early on was unnecessary idling, which was caused by engine-powered flashing traffic control lights. By introducing light-emitting diode lighting systems with a separate battery, fuel wastage was significantly reduced.

Another issue was speeding. This has been significantly reduced through the reporting and monitoring of excess speeds using GPS and by providing feedback to drivers.

Further information is available at:

- <http://www.eecabusiness.govt.nz/sites/all/files/downers-sustainability-programme-nov-2010.pdf>
- <http://www.eecabusiness.govt.nz/node/14663>.

## 5 Discussion and conclusions

### 5.1 Why save fuel?

Saving fuel is beneficial for a range of reasons:

- **Good for business:** A 10% fuel saving is achievable and will typically increase the bottom-line profit of fleets by between 10% and 30%.
- **Safety:** Fuel-efficient driving is also safer driving.
- **Good for the economy:** If truck and bus fleets reduced their fuel consumption by 5% on average, the country would save over \$100 million per year on fuel imports and would, as a result, increase its energy security.
- **Good for the environment:** Saving fuel will significantly reduce the emission of toxic gases that cause respiratory and other health problems, and will reduce the CO<sub>2</sub> emissions that are widely believed to contribute to climate change.

### 5.2 What are the barriers to saving fuel?

Fleet operators cite a number of reasons why they do not put more effort into saving fuel:

- Managers are too busy dealing with day-to-day issues.
- Managers (and others) are unaware of what can be saved.
- A lot of other schemes have been promoted that did not produce the results claimed.
- The benefits of training disappear as drivers slip back to their old ways of doing things (although few, if any, have systematically measured this).
- Very few fleets measure what is happening in their fleets in a systematic way. While many fleets have GPS-based systems, those systems are generally used to address day-to-day dispatch and driver behaviour issues.
- Many fleet managers started in the industry as drivers and have received very little formal training in financial management.

Typically, fleet profits are between -3% and +3% of turnover (pers. comm., K. Arnold, RTFNZ). Some fleets continue to operate with negative profits for some time by eating into their capital without knowing it.

Often, driver training, including SAFEDNZ, has only a short-term effect. This is because, as drivers, we develop automatic responses to road situations that require less mental effort to sustain for extended periods of time than driving with a high level of awareness. Implementing new driving techniques requires the reprogramming of our automatic responses (Charlton et al 2010), which requires a conscious effort. This is unlikely to happen without some form of encouragement or incentive.

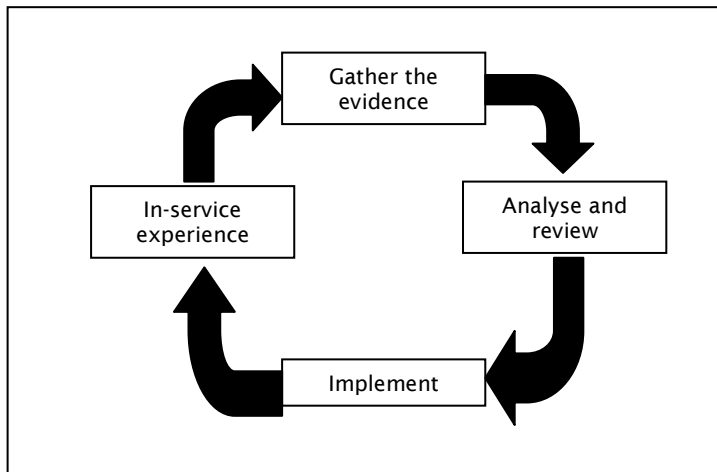
### 5.3 How can fuel saving become part of normal operation?

What the UK, US and Canadian government fleet fuel efficiency programmes and the fleets that have successfully implemented fuel efficiency and safety management practices have in common is the adoption of a progressive problem-solving approach that is evidence-based. This approach is used

extensively in other sectors, including aviation, medicine and education. Evidence-based practice bases decisions on empirical data that has been gathered repeatedly and rigorously, rather than the all-too-common practice of following tradition, rules, folklore and ‘the way we’ve always done things round here’.

The essential features of evidence-based practice are shown in figure 5.1.

**Figure 5.1 Evidence-based practice feedback loop**



This approach should not be confused with ‘best practice’. The US Government Accountability Office (1998) defines best practice as:

*the processes, practices, and systems identified in public and private organizations that performed exceptionally well and are widely recognized as improving an organization's performance and efficiency in specific areas. Successfully identifying and applying best practices can reduce business expenses and improve organizational efficiency.*

The problem is that ‘best practice’ as a term is too broad and has become a business buzzword used to describe a standard way of doing things that is, in fact, merely a set of rules. Best practice can imply that it is the best that can be done, ie the final answer.

An important aspect of evidence-based practice is feedback that enables ongoing improvement to occur. Feedback that is positive and directed towards measures that are very relevant to the person is the most effective (Hattie and Timperley 2007). For example, feedback to drivers about their improvements in fuel consumption and speed compliance will help them automate the techniques required to drive efficiently. Praise, rewards and punishment for activities that are largely outside the person's or organisation's control can be very negative because they undermine motivation, and often lead to increased avoidance of responsibilities and the need for greater levels of surveillance.

Effective feedback must answer three major questions (Hattie and Timperley 2007):

- Where am I going? (What are the goals?)
- How am I doing? (What progress is being made towards the goal?)
- Where to next? (What activities need to be undertaken to make better progress?)

The US government's SmartWay Transport scheme uses an evidence-based approach to encourage fleets to improve their environmental performance. In order to be recognised by SmartWay Transport, transport operators must agree to implement fuel efficiency and other cost-saving strategies in their business within three years. They are required to measure their performance using the SmartWay FLEET system and to sign the SmartWay partnership agreement. Once they have reached an acceptable level of performance, they

are able to display the SmartWay logo and receive other forms of recognition. The major users of transport services (called shippers in the US) who join must commit to shipping at least 50% of their goods with SmartWay Transport operators within three years. The amount they ship is monitored by FLEET. They also agree to reduce the emissions from their own facilities. An important aspect of the programme is to promote the public image of SmartWay operators and shippers in exchange for improving their environmental performance while reducing costs.

A major judicial review on health and safety in the transport industry undertaken in Victoria, Australia (Maxwell 2004) makes a strong case for encouraging and rewarding compliance and the adoption of evidence-based practice. Transport operators interviewed by Maxwell uniformly supported the use of incentives, irrespective of the size of the enterprise. Several reasons are given for preferring carrots to sticks:

- People and organisations usually respond better to incentives.
- They are less demanding of enforcement resources.
- They avoid unnecessary antagonism between regulator and regulatee.

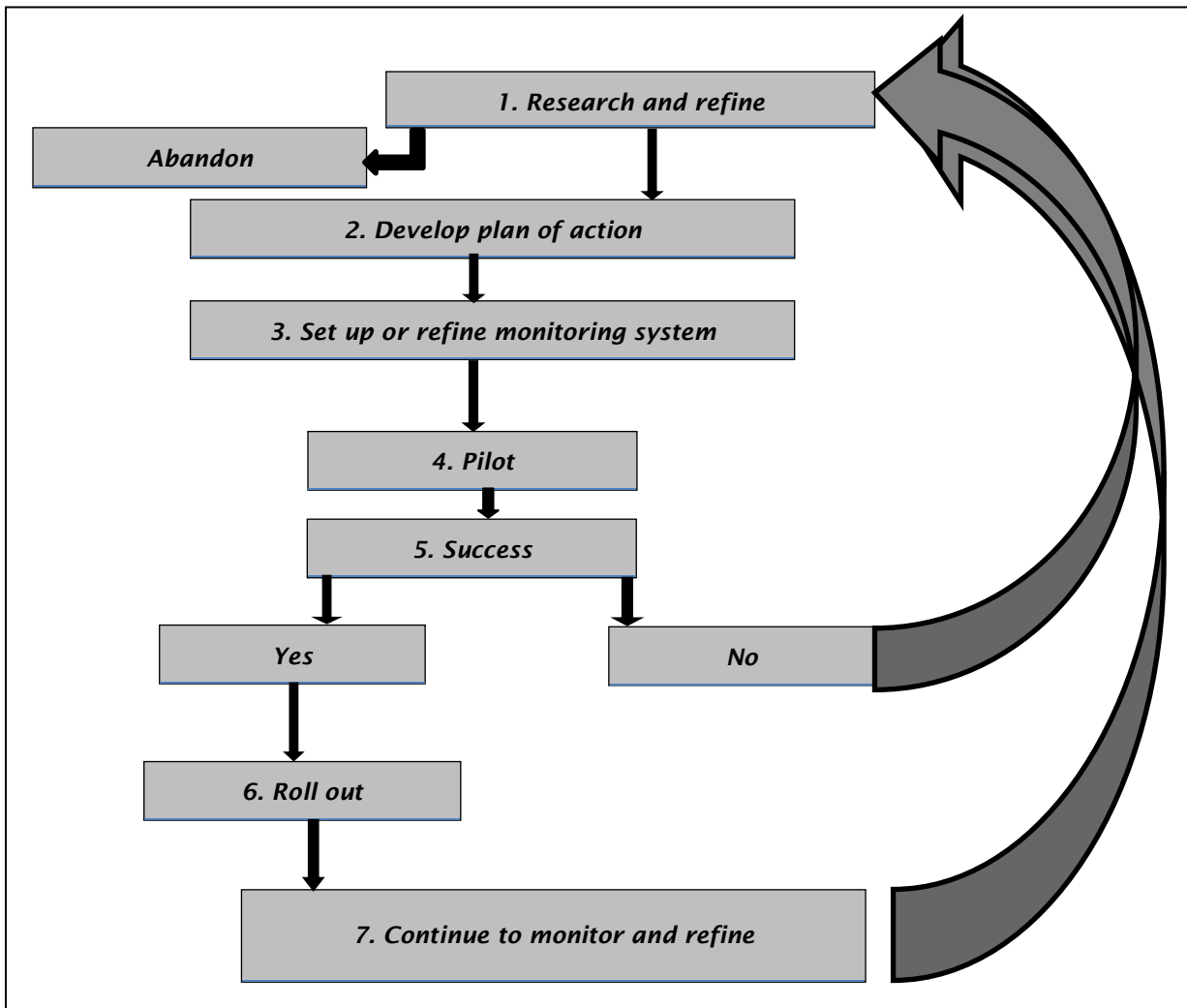
The legislative approach does not address workplace culture, except perhaps in a negative way by encouraging minimum compliance and avoidance of inspection/auditing by regulatory authorities. Without strong managerial support, policies aimed at preventing injuries (and improving fuel efficiency) will not be implemented within an organisation.

The Australian NHVAS and TruckSafe accreditation schemes are also largely evidence-based, with regular audits required to ensure operators are measuring, recording and taking action to remedy vehicle defects, manage driving hours and fatigue, and to comply with vehicle weight and dimensions regulations.

## 5.4 Fleet implementation

The adoption of evidence-based practice requires a change in the way most fleets currently operate. The process shown in figure 5.2 is recommended. It is based on what worked best for the case study fleets and others who have been successful in improving fuel efficiency and safety in New Zealand and overseas.

Figure 5.2 Model for identifying, assessing, implementing and monitoring new initiatives



The model has seven main steps:

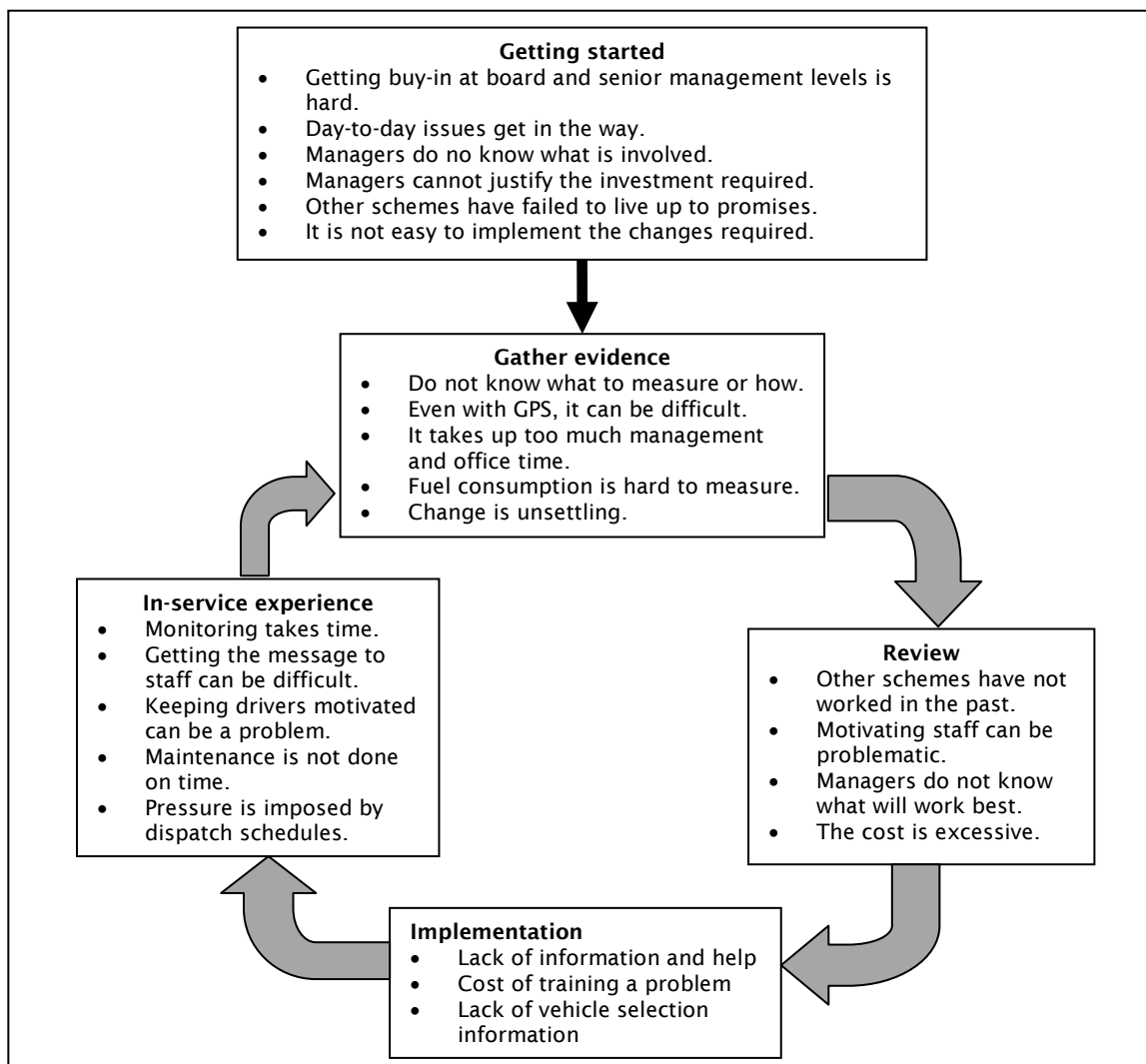
- 1 **Investigate** what the options are and what has worked best for others. Read available reports and guides, review case studies, seek advice from independent sources and ask other operators.
- 2 **Develop a plan of action**, including the strengths and weaknesses of the various options for your organisation, costs and benefits and who will champion the project.
- 3 **Monitor** fuel consumption and other KPIs.
- 4 **Pilot** the initiative that has been selected. Provide feedback to drivers and other staff. Make refinements as the trial progresses.
- 5 **Evaluate** whether the pilot has been successful or not.
- 6 **Roll the programme out** across the whole fleet if the pilot is successful.
- 7 **Continue** to monitor and refine the process.

## 5.5 Government and industry support

Government and industry assistance is required to overcome the barriers fleets face in implementing fuel efficiency and safety management practices. In order to identify what assistance is required, a technique that drew on the Logical Framework Analysis methodology was used to analyse stakeholder issues (Ministry of Foreign Affairs and Trade 1996; World Bank 1996; NORAD 1999). The technique first constructs a ‘problem tree’ of issues. These linked issues are then reframed as ‘negative states’ and used to derive a corresponding set of linked objectives, each aimed at changing a particular negative state into a positive one. The output from this analysis is a clear definition of elements of a ‘positive view’ of the industry. In this way, the analysis moves in a structured and systematic fashion from the set of issues identified in the investigative phase, to a vision and a set of strategic objectives to begin addressing those issues.

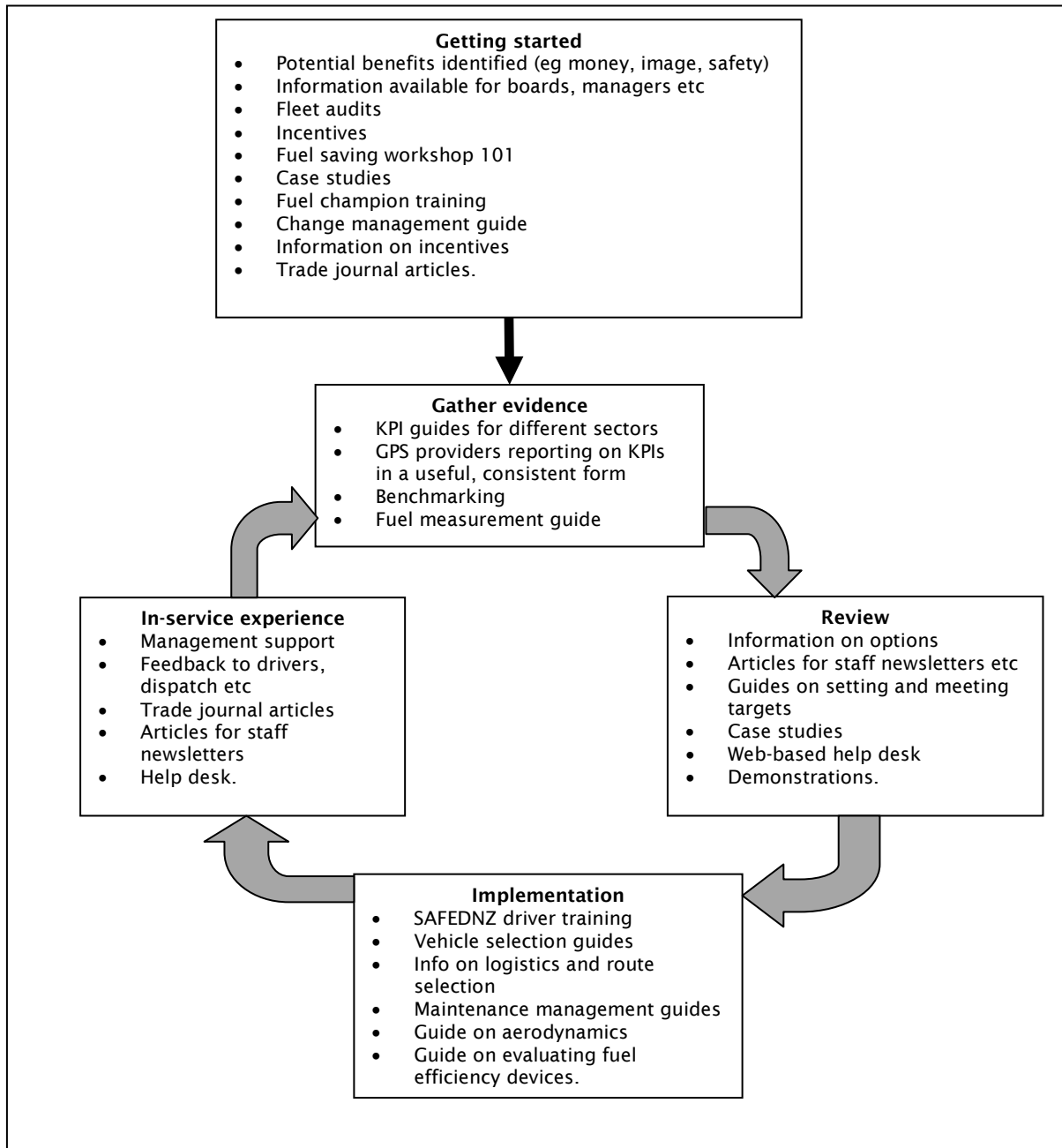
A modified version of the Logical Framework Analysis methodology has been used to analyse the barriers fleets face in implementing fuel efficiency as an integral part of their normal way of doing business. Figure 5.3 shows the negative issues superimposed onto the evidence-based practice model shown in figure 5.2. The negative issues were those summarised in table 3.4 that were identified during the interviews, industry meetings and case studies, including those fleets which made little progress.

**Figure 5.3 Evidence-based process for safe, fuel-efficient fleets**



These have been transposed in figure 5.4 to show some of the actions that can be taken.

**Figure 5.4 Possible solutions to the problems in establishing fuel efficiency programmes**



## 5.6 Options for encouraging fuel efficiency

The initiatives shown in table 5.1 are recommended as ways of encouraging fleets to adopt the evidence-based practice model shown in figure 5.2.

**Table 5.1 Initiatives for encouraging fleets to adopt the best-practice model**

Initiative	Options
Raise awareness of the potential benefits of improving fuel efficiency, safety and productivity.	<ul style="list-style-type: none"> <li>• Articles in trade journals</li> <li>• Information on a dedicated, impartial website</li> <li>• Case studies</li> <li>• Industry conference and workshop presentations</li> <li>• Fuel saving workshop 101 for fleet operators</li> <li>• Information directed to boards and chief executive officers.</li> </ul>
Provide the impetus required to adopt evidence-based practice and continuous improvement	Incentive-based accreditation scheme that includes: <ul style="list-style-type: none"> <li>• incentives to make it worthwhile (eg ACC insurance levy discounts or less frequent CoF inspections)</li> <li>• accreditation of fleets as a pre-condition to obtaining the incentives</li> <li>• assistance to help fleets prepare for the accreditation audits</li> <li>• benchmarking and feedback.</li> </ul>
Encourage high quality and useful monitoring	Standardisation and quality control of measures required to determine KPIs.
Information, training and advice	<ul style="list-style-type: none"> <li>• Information in the form of factsheets, training, case studies, common questions etc, some of which can be adapted from UK DfT freight best practice (2011)</li> <li>• Ongoing support for SAFEDNZ</li> <li>• Field advisors for fleet operators.</li> </ul>



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## Appendix A Alexander Petroleum Services Ltd

### A1 Summary

Over a two- to three-year period, Alexander Petroleum Services Ltd (APSL) reduced its fleet's fuel consumption by 17.8% and improved the recordable incident rate across all key health, safety and environmental areas by reducing the total number of incidents by over 50% from June 2005 (23 incidents) to June 2008 (10 incidents). The occurrence of >90km/h speed exception reports recorded by vehicle instrumentation was reduced by 99% from 4754 in January 2006 to 44 in January 2008.

APSL measured individual driver incident rates including lost time injuries, first aid cases, motor vehicle accidents, unavoidable truck incidents, avoidable truck incidents, equipment damage, product spills and product mixes. APSL monitored individual truck and driver performance on a monthly basis.

The improvements in safety and fuel consumption were attributed to four key factors:

- management leadership
- driver management
- journey management
- vehicle management.

The improved performance across these four areas of the business has also improved APSL's profitability and professionalism.

**Figure A1** An APSL petrol tanker operating in Christchurch



### A2 Description

In late 2005, it became apparent that the APSL fleet was exceeding the legal speed limit for trucks (90km/h) far too often. This increased the risk of vehicle rollovers, motor vehicle accidents, driver fatigue and damage to the company's reputation.

Once the number of speed exceptions was thoroughly investigated by the management team, it became apparent that one easy solution to the problem was not possible, but that multiple benefits could be achieved if APSL could improve our performance in this area. A review of what others had done, especially in the UK and Canada, highlighted the driver as having the single biggest impact on both fuel consumption and safety. The advantage of focusing on speed and fuel consumption also had the potential

to increase company profitability, improve our public and customer relations, reduce vehicle emissions, and reduce driver stress and fatigue.

## A3 Action

### A3.1 Main areas

The problem was addressed by separating the operation into four main areas which could be worked on together or independently:

- management leadership
- driver management
- journey management
- vehicle management.

### A3.2 Management leadership

Senior management developed a vision document and plan that clearly set a direction and established the foundation for the desired culture and behaviour while empowering each management team member to be responsible and accountable for their actions. The goal of the vision document was to motivate the management team towards some key beliefs:

- APSL could become a best practice transport operation.
- An individual performance review and recognition payment incentive scheme for drivers and the management team was achievable.
- The management team could make it happen.
- The management team would set the performance target for improved speed exceptions, fuel consumption, and health and safety performance.
- The management team could develop a generative behaviour culture.
- The management team could implement the plan and monitor progress monthly.
- The systems used by the management team could be developed in-house.

The management team reported monthly on safety performance down to the individual level as well as by geographical depot. Fuel management used fuel card purchases in combination with monthly odometer/hubodometer readings, which were analysed on a month-by-month basis to identify trucks or drivers that needed attention.

Safety and fuel performance were presented by the management team at monthly driver forums. These forums evolved over time from a meeting to a true forum where the initiatives for improvement were generated by both the drivers and the management team.

### A3.3 Driver management

APSL knew that driver behaviour, excessive speed and aggressive fuel-inefficient driving techniques increase fuel consumption and increase incident rates. A number of initiatives were introduced, aimed at improving driver behaviour and education.

Steps taken to improve driver management included:

- adjusting the driver workload in consultation with the customer to reduce time pressures
- developing a comprehensive prestart check sheet
- ensuring that drivers understand that they are responsible and accountable for their actions
- improving driver recruitment procedures, including the use of pre-employment external assessments
- requiring all new staff to complete a comprehensive in-house induction and training programme (new staff remained under training until being assessed as fully competent by a qualified driver trainer)
- educating and coaching drivers about vehicle standards and visual inspections
- holding regular monthly driver forums
- developing a culture where a driver can intervene in any unsafe or non-compliant act
- drivers developing their own voluntary code of compliance and policies
- implementing in-cab driver assessments (six-monthly) and additional coaching from driver trainers or senior drivers when required
- preparing monthly feedback reports on individual driver performance and vehicles related to speed and fuel consumption
- developing a culture of continuous improvement within the driver teams to focus on total fuel consumption and driving techniques, including urban operation
- all drivers participating in an individual driver recognition/incentive scheme that rewards positive behaviours and outcomes.

The level of recognition was directly related to individuals' safety behaviour, customer service and incident rates. The drivers' recognition scheme encouraged honest reporting.

### A3.4 Journey management

APSL recognised the risks and costs related to setting impossible schedules, and the impact that the time of day and week has on delivery times. The vehicles were sent, where possible, on safe, low-exposure routes, with known black spots identified and the hazard controls communicated to drivers. Deliveries were co-ordinated to maximise the cost-effectiveness of each vehicle configuration in consultation with customers.

Steps taken to improve APSL's journey management included:

- selecting the most efficient and safest route, which could be longer in distance travelled but be shorter in time and use less fuel
- avoiding city centres and major intersections
- avoiding excessive roadworks that could cause delays
- developing pre-approved journey management plans for all deliveries, with an approved alternative route in case of incidents
- avoiding known high-risk routes and intersections where possible, using historical NZTA crash data.

### A3.5 Vehicle management

APSL knew that not only are the selection and purchase criteria of a vehicle critical, but also the ongoing support from the original equipment manufacturer (OEM) and other associated service providers.

This after-sales support from all inter-related service providers is critical in enabling a transport operator to achieve the safest, most cost-efficient and fuel-efficient result from any one truck, irrelevant of its make and model. APSL worked with and included their service providers in the vision of wanting a best practice operation.

Steps taken to improve vehicle management included:

- limiting the speed of all vehicles to 88km/h
- resetting all vehicle default idle time cutoffs to three minutes
- monitoring all idle override exceptions
- maximising the use of OEM-fitted driver displays recording fuel consumption
- reprogramming the electronic transmissions to facilitate earlier upshifting
- matching engine size to the required tasks when specifying a vehicle from new, looking for the best fuel economy
- specifying automatic shifting transmissions for improved fuel economy and safety
- planning all predictive and preventative repair and maintenance schedules to minimise repair and maintenance costs, and unplanned breakdowns
- using genuine OEM parts when replacing components
- implementing a tyre management programme with service providers using KPIs based on tyre pressures, rotations and maximum tyre life
- monitoring electronic brake system interventions
- working with a GPS service provider to upgrade the vehicle management systems to include an audible alert when the vehicle speed reaches 90km/h as tracked by the GPS system.

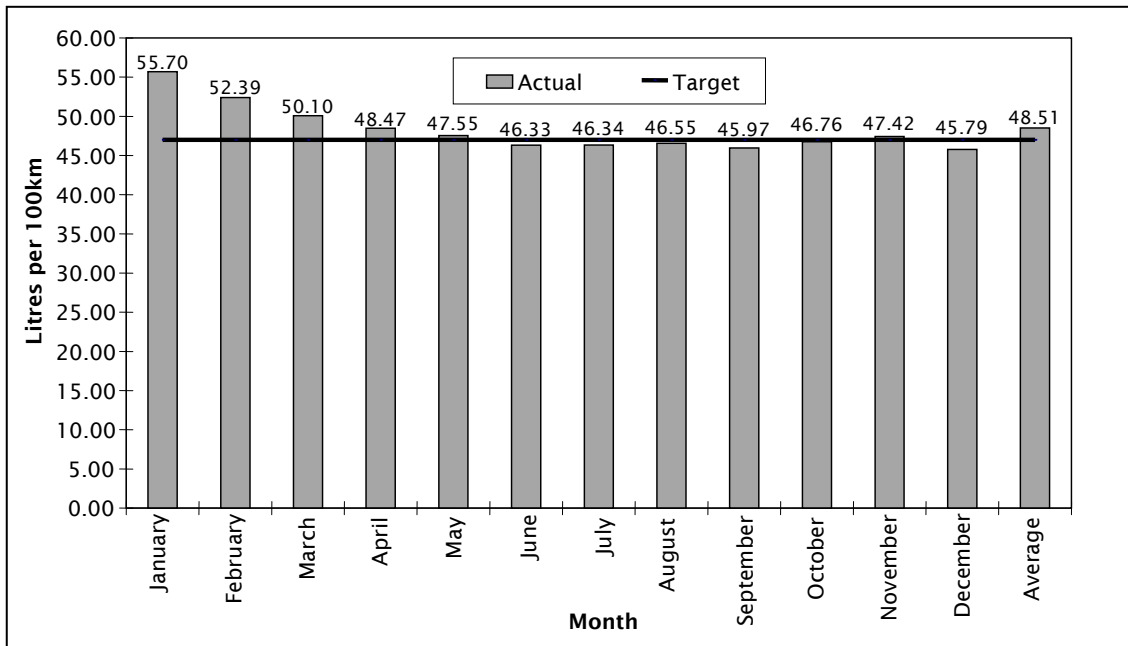
All vehicles purchased were fitted with the latest safety equipment. APSL were the first company to insist on front under-run protection, a driver's-side air bag and a roll stability programme on Century Class freightliners in New Zealand.

The accuracy of the fuel reporting was at a level where if a truck developed increased fuel consumption through a mechanical fault or driver behaviour, it was noticeable in the monthly fuel figures. The increased fuel consumption figures for June and July in 2007 were directly related to two trucks that developed fuel sensor problems. These were not immediately noticed by the driver but were picked up in the fuel consumption figures and managed.

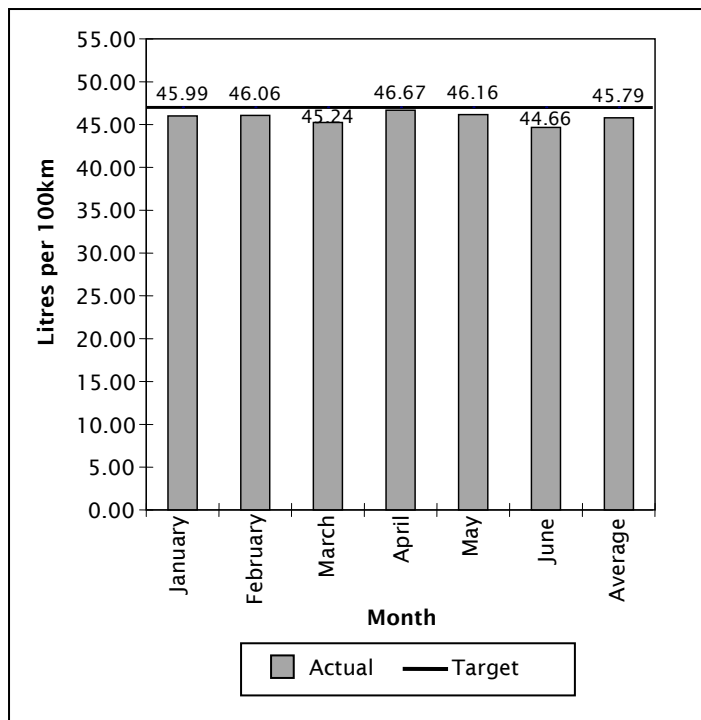
## A4 Results

APSL achieved a 17.8 % reduction in average fuel consumption over the whole fleet from 55.70L/100km to 45.79L/100km. Their target consumption rate was 47L/100km (see figures A2 and A3).

**Figure A2 APSL fuel consumption in 2006**



**Figure A3 APSL fuel consumption in the first half of 2008**



The change in individual behaviour that improved fuel consumption also resulted in fewer speed exceptions above 90km/h. In January 2006, 4754 exceptions above 90km/h were recorded. In January 2008, only 44 were recorded, which is a 99% improvement. June 2008 saw only 11 speed exceptions.

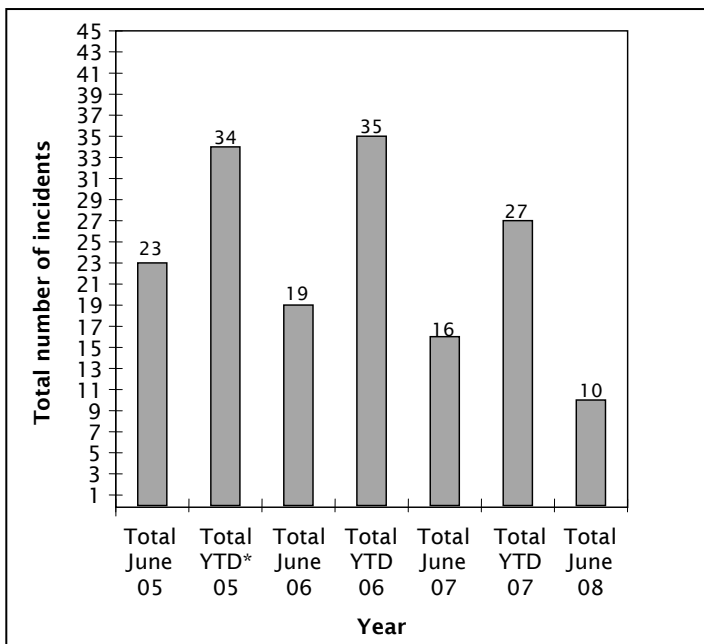
The improvements were achieved through driver education and speed limiting. Implementation was spread over six months because of the practicalities of implementing the changes and the time required to gain driver acceptance.

The ongoing gradual improvement in fuel consumption from mid-2006 to 2008 was directly related to fine-tuning the driver education process, driver techniques, slight modifications to vehicles and improved managerial leadership.

As APSL focused on driver behaviour and attitudes that were directly related to fuel consumption and speed exceptions, they realised that these same behaviours and beliefs, if negative, would also flow into their work practices and would ultimately translate into health and safety incidents.

The measuring of fuel consumption and speed exceptions allowed individuals' behaviour to be correlated with the total health and safety incident rate, including minor equipment damage (bumpers etc). The total incident rate reduced even though the level of reporting and accuracy increased at the same time (figure A4).

**Figure A4 APSL's total incident rate: 2006 to June 2008**



\*YTD = year to date

## A5 Conclusion

A focus on eliminating speeding over 90km/h and saving fuel has:

- reduced fuel consumption and costs
- improved APSL's health and safety performance
- reduced tyre wear, repair and maintenance
- reduced insurance premiums
- reduced engine emissions.

Eliminating speeding and reducing fuel consumption have been winners all-round. These practices have improved safety and company profitability, reduced the impact on the environment (through lower emissions from fuel use) and improved health and safety, and have also improved their business practices and had a positive influence on the company's reputation and image.



## Appendix B Abbreviations and acronyms

<b>ACC:</b>	Accident Compensation Corporation
<b>APSL:</b>	Alexander Petroleum Services Ltd
<b>CO<sub>2</sub>:</b>	Carbon dioxide
<b>DfT:</b>	Department for Transport (UK)
<b>EECA:</b>	Energy Efficiency and Conservation Authority
<b>EPA:</b>	Environmental Protection Agency (USA)
<b>FLEET:</b>	Fleet Logistics Energy and Environmental Tracking
<b>GPS:</b>	Global positioning system
<b>JTRC:</b>	Joint Transport Research Centre
<b>KPI:</b>	Key performance indicator
<b>MoT:</b>	Ministry of Transport
<b>NHVA:</b>	National Heavy Vehicle Accreditation
<b>NRC:</b>	National Road Carriers Inc.
<b>NZTA:</b>	NZ Transport Agency
<b>OEM:</b>	Original equipment manufacturer
<b>RTFNZ:</b>	Road Transport Forum New Zealand
<b>RUCs:</b>	Road user charges
<b>SAFED:</b>	Safe and Fuel-Efficient Driving (UK-based driver training package)
<b>TERNZ:</b>	Transport Engineering Research New Zealand
<b>UK:</b>	United Kingdom
<b>USA:</b>	United States of America