Ministry of Transport
TE MANATŪ WAKA

THE NEW ZEALAND VERSION OF
SAFE AND FUEL EFFICIENT DRIVING

SAVING FUEL

Safe and fuel efficient driving tips for trucks and buses

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This booklet can save you money ... by helping you cut your fuel costs.

Saving fuel makes sense for everyone, but having the right advice on hand can sometimes be difficult when you're out on the road. This booklet has been designed so you can carry it in your jacket pocket or cab, and includes tips from fellow professional operators on how to save fuel.

So keep it handy, use the information provided and cut down your fuel bill.

Refuelling is time-consuming and expensive. This booklet can help you increase your driving range and reduce the number of times you need to visit the pumps.

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1. Know your costs

We all want to cut our operating costs. Whether you drive a 7.5 tonne GVW rigid, a combination unit or run a fleet of mini buses, the first step is to know exactly what your costs are right now. Sounds obvious, doesn't it? You would be surprised at how many professional truck/bus operators and drivers can only guess at how much they spend per vehicle each month on maintenance, tyres, insurance and fuel.

Setting a target to cut your fuel costs by 5 percent would be a good place to start. This saving is going to be magnified in the bottom-line profit.

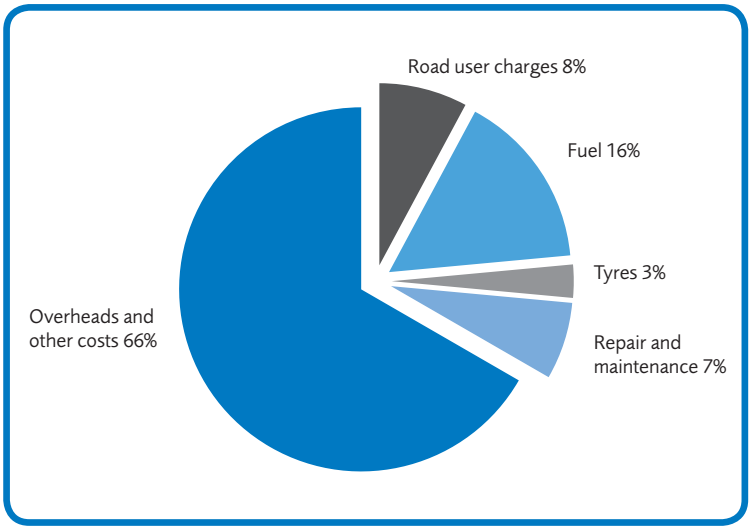
> **Tip**: Do the sums to work out exactly what your vehicles cost to run, then you'll be ready to start saving fuel and money.

Consider this example:

Table 1: Profits from fuel savings

Total fleet costs	**$500,000**
Fuel costs (30 percent of total)	$150,000
Profit	$25,000
5 percent saving in fuel costs	$7,500
Profit after fuel saving	$32,500

Figure 1: Typical operating costs



You cannot manage what you do not measure
Time spent gathering accurate information on fuel consumption will pay off later.

Be systematic - keep accurate records of all costs
Use a checklist to ensure all costs are properly accounted for (see Table 2). Useful information on truck and bus operating costs can be sourced from industry associations and your local suppliers.

Fill in your operating costs

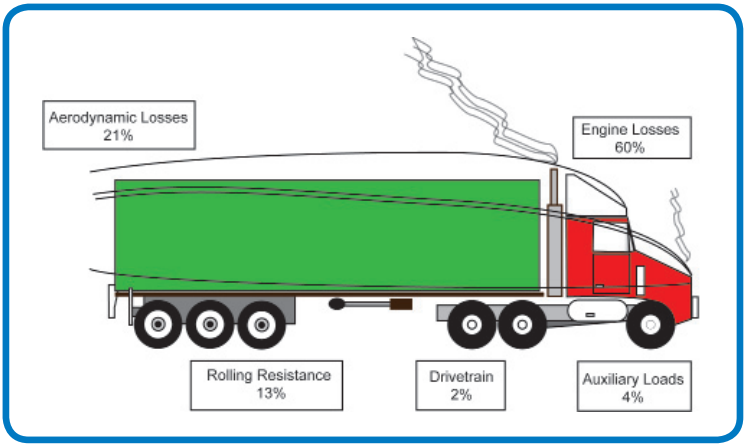
Table 2: Annual operating costs

Standing costs	**$**
Overheads	
Insurance	
Depreciation	
Finance	
Driver	
Total	**$**
Running costs	**$**
Fuel (and oil)	
Tyres	
Maintenance	
Road user charges	
Total	**$**

2. Where does the fuel go?

Do you know how much of the diesel you put into the fuel tank of your truck or bus ends up earning you money? Probably nowhere near as much as you think! About one third of the energy in a tank of fuel is translated into useful mechanical effort at the wheels. It makes sense then to do all you can to make the most out of every litre. There is not much drivers and operators can do about the actual efficiency of vehicle engines (except to ask manufacturers and dealers for fuel consumption figures and take these into account when buying vehicles), but you can save fuel in other ways.

Figure 2: Fuel losses at 105 km/h (based on UK data)



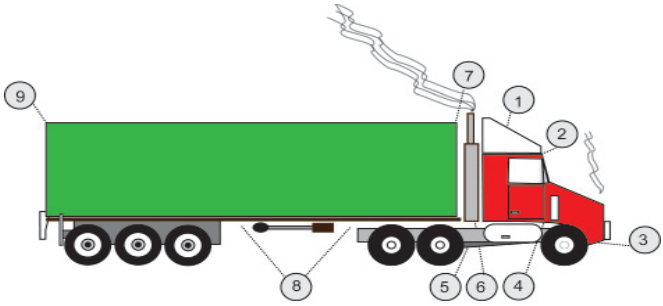
Resistance to movement

The total resistance to the forward motion of a truck or bus comes from rolling resistance, air resistance and gradient. There isn't much you can do about influencing gradient, apart from choosing less hilly routes where practical. But there is plenty you can do to keep rolling resistance and air resistance to a minimum.

Aerodynamic resistance

Aerodynamics is a complex subject, but you don't need to be an aeronautical engineer to improve the efficiency of your vehicle and make worthwhile fuel savings.

Figure 3: Some examples of aerodynamic styling



1. Cab roof deflector
2. Cab sun visor
3. Air dam
4. Cab side edge turning vanes
5. Tractor side panels
6. Cab extension panels/collar
7. Trailer front fairing
8. Side skirts/panels
9. Roof tapering

Table 3: The effects of speed on fuel consumption (heavy duty engine) over the same 22.2 km

Speed (kph)	Fuel used (litres)	Fuel consumption (litres/100 km)
0 (idling at 480 rpm)	1.0	Infinite
60	4.1	18.58
80	6.6	29.7
90	8.4	38.1

Source: UK BTAC/IRTE technical trials, June 2000

Did you know?

- As much as 80 percent of the fuel economy benefits for a combination unit tractor comes from just three parts of its aerodynamic air-management equipment: the roof-mounted air deflector, side panels at the rear of cab, and the under-bumper air dam.
- Assessment of individual aerodynamic aids by the UK University of Huddersfield has shown that nearly half the total drag reduction comes from a cab roof-mounted air deflector.
- Covering tipper bodies (even when empty) can produce significant fuel savings. Tests show that a correctly covered empty tipper body at 90 km/h can improve fuel economy by more than 8 percent (UK BTAC/IRTE technical evaluation event 2003).
- A 10 percent variation in fuel economy can be expected from one season of the year to another (eg wet roads and high winds in winter will take their toll on fuel economy).
- A typical 420hp heavy-duty idling engine consumes fuel at the rate of around two litres per hour when the truck is stationary.
- A complete set of the latest low rolling resistance tyres can improve fuel economy by up to 6 percent on line-haul work.
- Black smoke from a diesel engine is unburnt fuel. If you can see black smoke, you are wasting fuel.
- Incorrect fuel injector settings can cause increased engine wear and excessive fuel use.

Tip: Check all tyre pressures regularly (including trailers). If pressure falls below recommended figures, rolling resistance increases and fuel is wasted. A 10 psi fall in tyre pressure is likely to result in a one percent reduction in fuel economy.

Remember - avoid engine idling for more than 2-3 minutes to prevent fuel wastage.

3. Why drivers are VIPs

When it comes to making fuel savings, the driver is the most important person. The benefits of a fuel efficient driving style are not just lower fuel bills, but also lower maintenance and insurance costs.

Driving down fuel costs

The SAFED NZ course is a full day training course, which includes practical driving assessments, theory-based exercises covering accident prevention and reduction, and fuel efficient driving styles. Below are some checklists to help fleet managers and drivers improve fuel efficiency.

Checklist for fleet managers	✓
Assess fuel efficiency as part of the driver recruitment process	
Run a continuous driver development programme	
Consider a driver bonus or other incentive scheme based on fuel efficiency	
Request up-to-date training from vehicle manufacturers	
Communicate effectively with drivers	
Consider using driver league tables based on fuel economy averages	
Use on-board computers	
Appoint a fuel champion	
Apply a reliable driver training policy	

Checklist for drivers	✓
Always be ready to learn, no matter how experienced you are	
Know your average litres/100 km	
Follow vehicle manufacturer recommendations	
Read the vehicle handbook	
Skipshift (block shift) gears where it is safe to do so	
Always do systematic pre-driving and daily vehicle checks	
Report defects promptly	
Take care filling fuel tanks and avoid filling to the brim	
Park up in a way to avoid early morning manoeuvring with a cold engine - this wastes fuel	
Move off in the right gear	
Use cruise control where applicable	
Use the engine's 'green zone' (the speed at which fuel economy is at its best)	
When refuelling, never leave a fuel nozzle unattended	

4. Who cares wins

Where does vehicle maintenance fit in? It is obvious that a well-maintained truck or bus will be more fuel efficient than a neglected one. There is much more to this than simply booking your vehicles in for routine maintenance and safety inspections.

Once again, drivers play a crucial role. They are likely to be the first to spot tell-tale signs of trouble and costs ahead. For example, a driver is likely to be the first to notice dragging brakes because of their immediate effect on vehicle performance.

Use the maintenance checklist (by no means exhaustive) to help monitor your vehicle. If you identify any of the tell-tale signs then your vehicle needs workshop attention to stop it wasting fuel.

Anyone involved in the operation of the vehicle (including workshop and office staff) should also be watching out for these signs and alerting the person responsible for vehicle maintenance.

Maintenance checklist	✓
Any fuel or oil leaks	
Missing seal in fuel tank cap or signs of fuel spills around filler neck	
Low tyre pressure (twinned tyres 'kissing')	
Tyre wear suggesting faulty steering or axle alignment (such as feathering of tread in tyre shoulder area)	
Missing tyre valve caps	
Tyre caps - steel caps are better than plastic ones. They provide an effective second line defence against leaking valves	
Maintenance records showing rapid wear of clutch or brake friction material	
Traces of black smoke in exhaust suggesting fault with engine's air intake and/or fuel injection system	
Tears in body curtains	
Any body damage	
Missing or damaged air-management equipment	
Excessive engine oil consumption (no leaks) suggesting oil is being burnt as a result of internal wear	
Excessive smoke under acceleration	

Remember - effective preventative maintenance procedures don't cost you, they pay you in the long run.

5. Vehicle specification

Get it right first time

It's been said there is no such thing as a bad truck or bus anymore. But it's not hard to find examples of badly-specified trucks and buses that are wasting fuel and costing more to operate than they should. Time and effort spent upfront deciding on the right vehicle and body specification will pay off handsomely throughout the vehicle's life.

No operator should simply accept an off-the-shelf truck or bus body without first checking that the specification really does suit their type of operation.

Smarter loading and better bodies

Giving a little more thought to the specification and use of truck and bus bodywork by operators and drivers can make a big difference to fuel consumption.

Flat deck bodies for loads that require roping and tarping are no longer common, but are still needed from time to time on some operations. Some loose cargo lends itself to neat, low-profile loading on a flat rigid body or semi-trailer. It is definitely worth putting effort into arranging the load so that aerodynamic drag is kept to a minimum, especially before setting out on a long highway journey.

Do not just accept the body or trailer specification without first questioning whether alternative specifications could be made to improve fuel economy, without compromising operational and load-carrying requirements. Check what height of body you really need.

Vehicle specification checklist	✓
Is your vehicle choice based on whole-life costs, rather then simply initial cost?	
Have you considered all available cab, engine and driveline options?	
Is the fuel tank size and position right for your operation?	
Have you asked the dealer and/or manufacturer to advise on gearing, based on computer simulation of your operation? (This includes type of load, terrain etc.)	
Have you and/or your drivers tried demonstrator vehicles?	
Have you thought carefully enough about tyre specification, including tread patterns, aspect ratio and low rolling resistance options?	
Have you considered self-steering / lifting axles?	
As a bus operator, have you carefully thought about rolling resistance, aerodynamic drag, ventilation and air-conditioning systems, and type of body construction? Even distribution of load should also be considered so that the vehicle sits level on the road.	

Tip: Take care when specifying vehicle and body dimensions, gross weights and load-handling equipment. You will be rewarded with better fuel efficiency and bigger profit margins.

Careful loading will improve utilisation and help reduce costs

Dos and don'ts

Do:

- think about aerodynamics when specifying bodywork
- keep overall body height as low as possible
- fit air-management equipment where it is cost effective (see Aerodynamic styling - Figure 3)
- tarp empty tipper bodies
- ensure that curtain straps and buckles are kept taut
- have any body damage, especially nicks and tears in curtains, repaired promptly
- where applicable, adjust sliding fifth-wheel couplings to keep the tractor/trailer gap as small as possible (ensure that axle weight limits are not exceeded)
- adjust a cab's roof-mounted air deflectors to suit the particular trailer being pulled
- consider the overall design to allow for greater air flow.

Don't:

- specify a taller body than is really needed
- fit additional lights, air horns or other ornamental accessories where they will spoil smooth airflow over the cab and body (and add to fuel consumption)
- ignore small tears in curtains
- specify heavily-ribbed bodywork where it can be avoided.

6. Make every drop count

Fuel management systems

What exactly is a fuel management system? You may be surprised to hear it can be anything from manual records to sophisticated computer software. It doesn't have to be an expensive computer system that only the biggest fleets can afford.

> **Tip**: A good fuel management system will allow you to monitor fuel consumption effectively in less than one minute a day per vehicle.

In every case, accurate data is essential. Recording odometer/hubometer readings and litres of fuel purchased is a good starting point which only requires pen and paper. Accurately recording this information straight away is always much easier than trying to find and correct inaccurate basic information later on.

Did you know that:

- being alert to the risks of leaks, fraud, theft and fuel spillage can result in worthwhile savings
- a small leak around the fuel filler neck of a truck's fuel tank could easily result in the loss of a litre a day, or about $400 worth of fuel a year wasted
- diesel leaking from tanks onto the road poses a serious road safety risk to other road users, particularly cyclists and motorcyclists.

One fundamental decision with any fuel management system is whether to hold your own bulk stocks, rely on fuel cards, or perhaps make a simple arrangement with a local filling station.

Before deciding on a system, you'll need to think about:

- convenience of refuelling the fleet at its home base
- supply availability
- reliability and quality of supply
- cost per litre of bulk supplies
- cost of on-site equipment
- environmental and security management.

Dos and Don'ts

Do:

- collect and retain actual data, such as total kms travelled and total fuel used, in a computer database or spreadsheet
- think about better ways of collecting this information
- check the accuracy of odometer/hubometer readings
- take tyre wear into account to improve the accuracy of your fuel consumption calculations. For example, abnormal tyre wear may mean the vehicle tracking is out of alignment. This will increase rolling resistance and fuel consumption
- encourage drivers to calculate litres/100 km figures for their vehicles, and make use of any on-board computers
- think about using fuel cards and management systems provided by oil companies and others.

Don't:

- average out litres/100 km figures instead of basing your calculations on overall fuel used and distance travelled
- over fill tanks on vehicles or bulk tanks at refuelling sites (fuel needs room to expand as it warms up)
- rush into buying a fuel management system without doing some research
- forget to change fuel filters (on vehicles and bulk tanks) at recommended intervals
- make the excuse that there isn't time to monitor fuel consumption effectively, as it should take less than one minute a day per vehicle.

7. Chips with everything

On-board computers, telematics and fleet management systems

Don't be put off by all the fancy acronyms and high-tech terminology littering the world of on-board computers. There are many ways in which information technology can help you save fuel.

Satellite navigation can keep drivers on route, saving time and money whilst ensuring customer service is not compromised.

Dos and Don'ts

Do:

- try to use the latest computer technology and electronic navigation systems to run your vehicles as fuel efficiently as possible
- ask vehicle manufacturers and independent suppliers to demonstrate what their systems can do for the fuel economy of your truck or bus
- make sure the equipment is set up properly and calibrated.

Don't:

- develop technophobia when presented with an on-board computer system or telematics–take time to understand the information it can provide
- assume that simply fitting the latest satellite tracking or remote condition-monitoring system will automatically result in lower litres/100km. You have to actually use the data provided by such systems
- ignore what on-board computers can tell you about fuel economy. Check them out when the vehicle is not in motion. While you are driving, remember not to be distracted by the equipment.

8. What's next?

The fuel champion

Establish a fuel champion. This is someone who is chosen to take responsibility for tracking the progress of the fuel management programme to ensure it is implemented correctly and successfully.

The best of intentions on fuel saving can get forgotten when drivers and fleet operators are under pressure. No matter what size your company, without a fuel champion to act as a focal point, your fuel-saving programme will stand less chance of succeeding.

A good fuel champion is someone who:

- understands how fuel consumption figures are generated, how errors occur and how to correct them
- recognises the potential for fuel saving and how to fulfil it
- understands how on-board fuel-monitoring equipment can be used to encourage fuel saving
- communicates frequently and effectively with everyone involved in the fuel-saving programme, which probably means everyone in the company.

When the fuel champion's job is done well, everyone shares in the success of saving fuel and money.

Ongoing evaluation

To make the most of the SAFED NZ programme, you need to ensure you regularly evaluate your fuel savings and overall operational performance.

Do this, and you will achieve your long-term cost savings objectives.

Fuel consumption conversion table

L/100km	km/L	mpg UK	mpg US	grams of CO_2/km	tonnes of CO_2 1000km
8	12.5	35.31	29.4	208	2.1
9	11.11	31.39	26.13	234	2.3
10	10	28.25	23.52	261	2.6
11	9.09	25.68	21.38	287	2.9
12	8.33	23.54	19.6	313	3.1
13	7.69	21.73	18.09	339	3.4
14	7.14	20.18	16.8	365	3.6
15	6.67	18.83	15.68	391	3.9
16	6.25	17.66	14.7	417	4.2
17	5.88	16.62	13.83	443	4.4
18	5.56	15.69	13.07	469	4.7
19	5.26	14.87	12.38	495	4.9
20	5	14.12	11.76	521	5.2
21	4.76	13.45	11.2	547	5.5
22	4.55	12.84	10.69	573	5.7
23	4.35	12.28	10.23	599	6.0
24	4.17	11.77	9.8	625	6.3
25	4	11.3	9.41	651	6.5
26	3.85	10.86	9.05	677	6.8
27	3.7	10.46	8.71	703	7.0
28	3.57	10.09	8.4	729	7.3
29	3.45	9.74	8.11	755	7.6
30	3.33	9.42	7.84	782	7.8
31	3.23	9.11	7.59	808	8.1
32	3.13	8.83	7.35	834	8.3

To convert km/litre to litres/100km

1/ [ ] x 100 = [ ]

Enter km/litre here

Notes