



# TRUCKING INDUSTRY

ENVIRONMENTAL BEST PRACTICE GUIDE



Australian Government

Department of the Environment, Water, Heritage and the Arts



## // CONTENTS

FOREWORD	6
INTRODUCTION	8
<b>SECTION 1 //</b> GETTING STARTED	12
<b>SECTION 2 //</b> GUIDELINES	15
<b>SECTION 3 //</b> POLICIES AND PROCEDURES	23
<b>SECTION 4 //</b> WASTE MANAGEMENT AND DISPOSAL GUIDELINES	31
<b>APPENDIX A //</b> FUEL AND ENGINE EFFICIENCY, CHOICE OF FUEL, DESIGN CHANGES, DRIVER TIPS	35
<b>APPENDIX B //</b> IMPROVING FLEET MANAGEMENT AND VEHICLE ROUTING	47

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## // FOREWORD



Environmental best practice can and should be synonymous with good business practice. There are costs incurred by businesses in minimising waste and pollution and using resources more efficiently. But there are advantages also. The Australian trucking industry is aware of its responsibility to reduce negative environmental impacts. It uses new technologies and new ways of doing things to remain competitive and profitable.

As this Guide explains, environmental incidents can be costly, so by developing a set of environmental guidelines a trucking organisation can prevent environmental incidents from occurring. The Guide can be used to improve an organisation's current environmental behaviours and performance.

Environmental case studies later in this Guide show how a sample of innovative companies have pursued environmental objectives that aligned with finding ways to lower their overheads and operating costs. Borrow from these ideas and perhaps improve on them in your business.

Today's environmental best practice can be outpaced by innovations and changing community expectations. So, best practice is about continuous improvement and not a particular destination.

**Trevor Martyn**  
Chairman  
Australian Trucking Association



### THE AUSTRALIAN TRUCKING ASSOCIATION

The Australian Trucking Association (ATA) is the national peak body that unites the entire trucking industry to provide a single, authoritative voice on relevant issues of national importance.

The ATA is comprised of state and sector-based trucking associations, many of the nation's largest transport enterprises and the Transport Workers Union. Membership also includes companies that provide goods and services to the trucking industry.

The ATA undertakes research, consults and informs, and develops and advocates policy that aims to improve the safety, environmental sustainability and viability of the industry. Its activities are focused in key strategic areas: the environment, safety, technical issues, taxes, charges and roads, and careers.

### ENVIRONMENTAL STRATEGIES

The community expects the trucking industry to reduce its greenhouse gas emissions. The ATA works closely with all levels of government to ensure that emissions regulations and targets are realistic and effective, without undermining the viability of the industry.

The future is in new, high-productivity trucks equipped with state-of-the-art safety features, powered by fuel-efficient engines and more efficient fuel. Governments can aid enhanced efficiency (and safety) by constructing higher quality, lower gradient roads. The ATA's website is at [www.atatruck.net.au](http://www.atatruck.net.au)



An environmental issue is one that relates to any part of your business that can impact either positively or negatively on the environment.

The Australian Trucking Association, in conjunction with the Department of Environment, Water, Heritage and the Arts, has developed this Trucking Industry Environmental Best Practice Guide to assist trucking operators to develop a set of environmental guidelines for their business. Its emphasis is on preventing environmental incidents in the depot, while moving goods, and while storing, handling and disposing of waste. It is not a legislative compliance tool.

State and federal rules, regulations and legislation are regularly updated to meet changing circumstances. An integral part of your environmental guidelines should be to establish a process of continual review.

### WHY IMPLEMENT ENVIRONMENTAL GUIDELINES?

Environmental incidents can be costly, with fines of \$1,000,000 applied under Australian environmental law. Most environmental offences assign strict liability to the polluter. Strict liability effectively reverses the presumption of innocence by making it sufficient for the prosecutor to prove beyond reasonable doubt that the offence occurred. By developing a set of environmental guidelines a trucking organisation can prevent environmental incidents from occurring.

This Best Practice Guide can be used to improve your existing system or identify any areas of environmental performance your organisation could improve on in meeting increasingly stringent environmental regulation in the future.

Environmental guidelines can assist your organisation by:

- identifying and minimising the impact of your operation;
- identifying and minimising environmental risks;
- avoiding environmental incidents and penalties;

- ensuring fault reports and corrective procedures are recorded;
- identifying and fulfilling staff training needs;
- ensuring your organisation adheres to the relevant environmental laws and guidelines;
- enhancing your corporate reputation; and
- enhancing your environmental performance and bottom line by improving maintenance procedures and outlining ways to save fuel and minimise waste.

### MANAGING WASTES

Waste disposal is an area of high risk for trucking operators, with severe penalties for disposing of waste irresponsibly or failing to meet regulatory requirements. To avoid prosecution, accurate records of evidentiary standards should always be kept in secure storage.

Waste disposal checks should be undertaken regularly and responsibility for waste disposal assigned to a dedicated position with a predetermined set of duties.

All aspects of waste disposal should be recorded including the identification and resolution of any faults or problems that arise.

Much of the waste generated by trucking operators can be recycled. It may take time to identify reliable, reputable recyclers for some materials, but the effort will usually pay off in the long run. The potential for reducing disposal costs and future liabilities is significant.

For example:

- scrap metal should be taken to a metal recycler;
- freon gas should be properly handled and recycled—even small amounts released into the atmosphere pose a serious environmental threat because of their potential for destruction of ozone;
- waste antifreeze should be picked up by a recycler;

- scrap tyres can be taken to tyre re-treaders or recyclers rather than sending them to a landfill;
- wet cell batteries are classified as dangerous goods and must be sent to recyclers; and
- brake and clutch components containing asbestos must not be handled without proper de-dusting.

### DRIVING YOUR FUEL DOLLARS FURTHER

Since the late 1980s there has been widespread concern about possible long-term global warming effects of greenhouse gas emissions in the atmosphere. While there are many gases which contribute to the greenhouse effect, one of the major contributors is carbon dioxide, which results from burning fossil fuels like coal and oil.

The main ways to reduce these emissions are to use less fuel and/or use fuel more efficiently.

While road transport is not the major source of greenhouse gases, it is an important source of carbon dioxide emission, and its impact will grow as road traffic increases over time. Fuel economy is a significant area of interest for the road transport sector. More efficient fuel consumption will not only reduce greenhouse gas emissions, but will also increase the profitability of the transport industry by driving operation costs down.

### FACTORS AFFECTING FUEL ECONOMY

As saving fuel leads to lower operating costs, it is important that both fleet managers and drivers understand the factors affecting fuel economy. See the case studies in Appendix A for examples of such factors, and examples of low-emission fuels in use today.

### ROADS AND TRAFFIC

There is a considerable difference between the fuel consumed in a vehicle travelling freely and the consumption of the same vehicle in a traffic

stream. Estimates suggest that if peak traffic conditions can be avoided, a potential fuel saving of up to 6% is achievable.

Research conducted by Shell (UK) found that significant savings can be made by limiting the top speed of commercial vehicles. Increasing speed from 100 to 110 km/h can increase fuel consumption by 14%. Reducing speed from 100 to 90 km/h can reduce fuel consumption by 12%.

Another way to achieve greater fuel economy is to provide better route planning for drivers on a road network. Some tests suggest that 4% of route kilometres are unnecessary. The case studies in Appendix B provide examples of route planning and fleet management improvements.

### IMPROVING DRIVER BEHAVIOUR

Improved driver techniques will also yield dividends for your company, as illustrated below and in some of the case studies in Appendix A. Different drivers can obtain substantially different fuel consumption in the same model vehicle. Trials undertaken in Sydney by two large transport companies showed 'smooth' drivers used 27% less fuel than 'lead footers' in an empty Kenworth, with only three minutes added to a 70 km run. Research in the United States found that driving aggressively increased fuel consumption by nearly 30%, with only a 10% increase in average speed. The researchers offered the following advice:

- anticipate conditions ahead so that braking is minimised;
- do not accelerate to a higher speed than required if you must later slow or stop—every time brakes are applied, energy extracted from the fuel is dissipated; and
- avoid stopped delays—fuel used idling is unproductive and, when accelerating after stopping, increased energy must be extracted from the fuel.

Other research shows that performance improvements can come from:

- starting up/warming up—start with no throttle, idle until full oil pressure is indicated, maintain low engine speed until water temperature begins to rise;



## // INTRODUCTION

- easing up to full speed—use only enough revs to keep the truck moving and to reach the next gear smoothly;
- watching the tachometer—fuel efficiency is greater when engine speed (rpm) is slightly above where maximum torque is produced;
- downshifting—let the engine pull down to torque speed before selecting lower gear, because lower rpm means lower fuel consumption; and
- avoiding jerky patterns of acceleration and deceleration—sudden acceleration results in incomplete fuel combustion and heavy exhaust smoke.

### SMOKE

Reducing smoke emissions improves the environment and enhances the image of the trucking industry. Even though new engines have low or virtually no visible emissions during normal operations, smoke from older truck engines is a significant concern. A smoking truck is one that is inefficient and poorly maintained.

Smoke emissions are unburnt fuel and mean:

- higher vehicle operating costs;
- lower fuel economy;
- higher maintenance costs; and
- shorter engine life.

Smoke comes in several different forms, including dark black, blue, and white:

- black smoke is caused by incomplete combustion;
- blue smoke is caused by unburnt engine oil mixed in the exhaust and is usually due to worn piston rings, cylinder liners, valve guides or other components; and
- white smoke is caused by droplets of unburnt liquid fuel mixing with water vapour—it usually occurs at start-up or idle.

### WHAT CAN YOU DO TO REDUCE SMOKE?

Excessive smoke emissions can be caused by poor driving technique. To minimise smoke you should:

- practise good driving habits;
- go easy on the accelerator;
- down shift to a lower gear when the engine is under load;
- avoid full throttle on steep inclines, especially under loaded conditions;
- maintain your vehicles within manufacturers' specifications;
- use proper replacement parts that meet or exceed manufacturers' specifications.

Higher smoke levels can be caused by a number of maintenance problems, so check for:

- restricted air filter;
- clogged, worn or mismatched fuel injectors;
- faulty fuel injection pump;
- defective or poorly adjusted puff limiter;
- low airbox pressure;
- improperly adjusted valve lash or governor;
- air manifold leaks;
- malfunctioning turbocharger;
- malfunctioning after-coolers;
- poorly adjusted fuel rack;
- defective air fuel controller; and
- improper driving gear.

Proper maintenance as recommended by the manufacturer should easily detect, repair, and prevent these problems, while ensuring that your trucks are in the best operating condition.

### DON'T TAMPER

There are some common misconceptions about smoke and power. Tweaking-up fuel flow, changing timing or disabling air/fuel controls

can rob your engine of durability and increase its emissions. Tampering with or disabling an emissions control system is against the law and could result in heavy fines.

Examples of tampering include:

- raising fuel pump rates;
- disabling puff limiters;
- disabling exhaust gas recirculation systems;
- disabling or removing catalytic converters;
- installing wrong injectors; and
- changing injection timing.

### HOW CAN YOU GET ON THE ROAD TO CLEAN AIR?

Drivers can help clean up the air every time they climb into their rig, by following these simple steps:

- DO be aware of the appearance of your exhaust, and overall engine and vehicle condition and performance;
- DO use only high quality fuel;
- DO report performance problems as soon as possible;
- DON'T lug the engine under load (down-shift instead); and
- DON'T tamper with engine settings or remove or disable engine emission controls.

Mechanics can contribute to cleaner air by:

- professionally maintaining the truck fleet;
- familiarising themselves with diagnostic changes in engine performance and excessive smoke emissions;
- replacing or repairing worn components according to manufacturers' recommendations; and
- learning how to determine when an engine needs rebuilding.



## SECTION 1 // GETTING STARTED

### 1.1 PURPOSE

This guide will provide you with:

- an outline of general environmental responsibilities;
- advice on how to achieve environmental best practice in trucking operations;
- advice on how to develop a set of environmental guidelines for trucking operations; and
- guidelines for incorporating environmentally responsible practices into existing maintenance and business practices.

The guide provides trucking businesses with a comprehensive list of ways to observe environmental best practice in their day-to-day operations and is applicable to all sizes and types of trucking operations.

The aim of this guide is to provide your trucking operation with the necessary tools to:

- identify and meet a pre-established set of minimum environmental responsibilities and standards;
- identify where and if improvements in performance are needed;
- implement corrective and preventative actions;
- achieve environmental targets;
- achieve an advantage over competitors and improve business through a demonstrably high standard of environmental performance;
- regularly measure environmental performance against pre-existing policies, objectives and targets; and
- cultivate effective industry/government relations.

While this guide is intended to assist operators to adopt environmentally sound practice, it does not guarantee that environmental legislation and other environmental accreditation requirements are covered. All users of this guide should familiarise themselves with the relevant environmental legislation applying to their operation.

Neither does this guide provide exhaustive guidance on the ISO 14000 series of environmental management standards, in particular ISO 14001 which relates to developing an Environmental Management System for an organisation. Rather, the intention of this guide is to highlight the benefits of integrating best practice environmental management into company operations, with an emphasis on preventing environmental incidents in the depot.

This guide can be used as a foundation for developing an ISO 14001 compliant Environmental Management System, once staff within the organisation have familiarised themselves with the processes and responsibilities of developing and implementing environmental guidelines.

### 1.2 DEVELOPING YOUR ENVIRONMENTAL GUIDELINES

A good starting point for developing a set of environmental guidelines is to thoroughly review your current environmental arrangements against relevant legislation and industry standards.

Your organisation should specifically focus on:

- identifying risks;
- encouraging environmentally aware and responsible staff;
- developing management strategies that promote employee commitment and ownership;
- determining the most efficient use of materials;
- enhancing profitability by reducing waste and fuel consumption; and
- limiting sources of liability.

The amount of time and effort you will need to achieve environmentally responsible performance depends on:

- the size of your organisation;
- the skills and capability of your staff;

- any changes required after initially reviewing your organisation's environmental performance; and
- the commitment of management to implementing the necessary changes.

### 1.3 TAKING RESPONSIBILITY

We recommend that your organisation nominate a staff member that will be responsible for managing the process involved in developing and implementing your environmental guidelines. The nominated staff member should be the primary contact point for staff, and monitor progress as the guidelines develop.

### 1.4 LETTING STAFF KNOW

The environmental guidelines should be developed in full consultation with staff.

To this end, the nominated staff member responsible for developing and implementing the guidelines should convene a general staff meeting to outline the process and seek comments at the initial planning stage.

To gain optimum feedback on the plan, all affected parties should be consulted including any contractors and suppliers who are likely to play a part in implementing the guidelines.

The meeting should specifically seek:

- staff and contractor views on environmental issues;
- ideas on how to recognise and reward good environmental performance;
- feedback on potential areas for improvement;
- views on the adequacy of existing emergency and preventative procedures in place to deal with environmental incidents;
- information on vehicle maintenance and its impact on environmental performance;
- opinion on how environmental performance is currently defined within the organisation and how this might change once guidelines are introduced;

- information on how waste is currently stored, handled and disposed of;
- views on the most effective feedback, consultation and information mechanisms for keeping staff informed.

Given that staff often work conflicting shifts and are spread across diverse locations, a single meeting might not be feasible. An alternative option is to conduct a series of meetings so that all staff are given a chance to contribute.

An internal staff newsletter, bulletin boards, on-line feedback and discussion forums, and emails are some other effective ways to ensure all staff have an opportunity to become informed and input into the process.

It is important that staff at all levels are consulted on designing a set of principles that are applicable to the organisation.

The environmental guidelines should be easily understood and in a format that can be readily applied by all staff, including:

- workshop staff;
- drivers;
- administrative staff;
- management;
- waste disposal providers; and
- any contractors.

### 1.5 LEGAL REQUIREMENTS

A key to meeting environmental performance is that all operations comply with the relevant legislation.

A vital initial step in developing a set of environmental guidelines is for your operation to establish a process of identifying current legal, regulatory, legislative and other requirements relevant to your operation's obligations.

A regular method of updating your understanding of the operation's legal requirements should also be added to this process.



### 1.6 RECORD KEEPING

In order to monitor and measure environmental performance it is essential that your operation create and keep up-to-date, detailed records on:

- identification of issues in environmental performance;
- implementation of actions to redress identified issues;
- establishment of environmental policies, procedures and standards;
- maintenance of environmental policies, procedures and standards; and
- staff induction and training.

Records of environmental maintenance and performance are important in the case of an incident. Records of evidentiary standards can be vitally important in the event of potential prosecution stemming from environmental non-compliance or incidents.

Records should be kept to verify that each environmental guideline is being observed. The records must be readily accessible, easy to understand and stored securely.

Your organisation's records should include:

- environmental issues arising from pre-trip records and regular depot/facility reviews;
- fault report and repair records;
- changes to fuel type, composition or supplier;
- regular noise emissions, gas emissions and waste disposal, handling and storage inspections;
- a register of third party air-conditioning, maintenance and waste disposal;
- a register of all third party contractors and suppliers;
- training records, including staff induction, needs analysis and signoff;
- information on applicable environmental legislation, regulations and standards;
- incident reports;
- complaint records;
- information on emergency preparedness and response; and
- management reviews including the consideration of new technology and alternative fuels.

It is also vital to document your organisation's procedures for collecting and storing records.



### 2.1 YOUR CURRENT ENVIRONMENTAL GUIDELINES AND PRACTICES

Trucking operations may already have environmental guidelines and policies in place. A formalised set of guidelines drafted according to this Best Practice Guide does not necessarily need to replace or override your existing environmental practices.

This Best Practice Guide can be used to improve on your existing system or be used as a comparison with your existing system to determine if there are areas of environmental performance your organisation can review with an eye to increasingly stringent environmental regulation in the future.

### 2.2 WHAT SHOULD BE INCLUDED IN YOUR ENVIRONMENTAL GUIDELINES?

Your environmental guidelines should:

- define your organisation's environmental policy;
- establish procedures for ensuring compliance and keeping up to date with changes in ruled legislation;
- identify environmental issues and impacts;
- outline environmental performance targets;
- outline procedures for pre-trip checks and depot/facility inspections;
- cover processes for correcting and preventing environmental performance problems;
- schedule maintenance and waste disposal;
- establish procedures for monitoring and evaluation;
- include a commitment statement from the management and staff;

- establish a protocol for fault recording and reporting;
- develop a set of easy to understand and reproduce records;
- train staff in environmental principles and according to established procedures for compliance with your organisation's environmental guidelines;
- establish a procedure for review and improvement; and
- establish procedures for implementation of any actions arising from the review process.

#### 2.2.1 DEFINING ENVIRONMENTAL POLICY

An environmental policy sets the guidelines for management to develop a direction for your organisation's environmental responsibility and performance.

The policy will equip your organisation with a foundation of common environmental values on which to build a set of environmental guidelines and measure performance.

The policy should state your organisation's commitment to:

- complying with environmental legislation, rules and regulations;
- minimising any environmental impacts;
- developing environmental performance evaluation procedures;
- developing a process for achieving performance targets;
- minimising emissions;
- minimising consumption of resources;
- minimising production of waste;
- educating and training staff;

- regularly reviewing the guidelines to determine areas for improvement and maintain relevance with changes in technology and regulation;
- maintaining an environmentally safe workplace; and
- reviewing the environmental impact of any new or proposed projects before implementation.

#### 2.2.2.2 STAYING AHEAD OF THE LAW

State and federal rules, regulations and legislation are regularly updated to meet changing circumstances.

Establishing a process for continually keeping abreast of changes to environmental regulations and your organisation's requirements for compliance under them should form an integral part of your environmental guidelines.

Several valuable sources of information exist for identifying existing environmental regulations governing your organisation and for staying ahead of any changes to the law. These include:

- environmental protection agencies on a state and federal level;
- government departments covering environmental issues on state and federal levels;
- online legal resources such as [www.austlii.edu.au](http://www.austlii.edu.au) and LexisNexus; and
- professional services such as lawyers and industry consultants.

The following is a state-by-state list of relevant environmental legislation for trucking operations. This list is by no means exhaustive and may be subject to change. All organisations establishing environmental guidelines are recommended to form their understanding of environmental legislation affecting their business using the methods described above.

## SECTION 2 // GUIDELINES

### AUSTRALIAN CAPITAL TERRITORY

Ozone Protection Act 1991  
 Environment Protection Act 1997  
 Land Planning and Environment Act 1991

### NEW SOUTH WALES

Protection of the Environment Operations Act 1997  
 Protection of Environment Operations (Noise Control) Regulation 2000  
 Road and Rail Transport (Dangerous Goods) Act 1997  
 Environmental Planning and Assessment Act 1979  
 Protection of Environment Administration Act 1991  
 Environmental Hazardous Chemicals Act 1985  
 Ozone Protection Act 1989  
 Waste Avoidance & Resource Recovery Act 2001  
 Waste Recycling and Processing Corporation Act 2001

### NORTHERN TERRITORY

Environmental Assessment Act 1982  
 Planning Act 1993  
 Waste Management and Pollution Control Act  
 Water supply and Sewerage Service Act  
 Water Act 1992  
 Dangerous Goods (Road & Rail Transport) Act  
 Public Health Act

### QUEENSLAND

Environmental Protection Act 1994  
 Environmental Protection Policies  
 Sewerage and Water Supply Act 1949  
 Contaminated Land Act 1991  
 Land Act 1994  
 State Development and Public Works Organisation Act 1971  
 Pollution of Waters by Oil Act 1973  
 Water Act 2000

### SOUTH AUSTRALIA

Dangerous Substance Act 1979  
 Development Act 1993  
 Environment Protection Act 1994  
 Local Government Act 1934  
 Public and Environmental Health Act 1987  
 Water Conservation Act 1936  
 Soil Conservation and Landcare Act 1989  
 Water Resources Act 1997

### TASMANIA

Environment Management and Pollution Control Act 1994  
 Dangerous Goods Act 1998  
 Local Government Act 1993  
 Pollution of Waters by Oil and Noxious Substances Act 1987  
 Water Management Act 1999

### VICTORIA

Environment Effects Act 1978  
 Environment Protection Act 1970  
 State Environment Protection Policies  
 Pollution of Waters by Oil and Noxious Substances Act 1986  
 Land Act 1958  
 Water Act 1989  
 Water Industry Act 1994  
 Dangerous Goods Act 1985

### WESTERN AUSTRALIA

Conservation and Land Management Act 1984  
 Environment Protection Act 1986  
 Pollution of Water by Oil and Noxious Substances Act 1987  
 Soil and Land Conservation Act 1988  
 Wildlife Conservation Act 1950

### 2.2.3 IDENTIFYING ENVIRONMENTAL ISSUES AND IMPACTS

An environmental issue relates to any part of your business that can impact either positively or negatively on the environment. Subsequently an environmental impact is the identifiable change to the environment that results from each environmental issue encountered.

A simple table or matrix format can be used to classify environmental issues and impacts. The following is an example:

ENVIRONMENTAL ISSUE	ENVIRONMENTAL IMPACT
Vehicle Emissions— Local Emissions, Toxic Emissions and Climate-Change Emissions	Contribution to Toxic Emissions and Greenhouse Gas Production

### 2.2.4 DEVELOPING ENVIRONMENTAL OBJECTIVES AND TARGETS

Your environmental objectives and targets need, in measurable terms, to address:

- the quantity and type of waste disposed of;
- the amount of fuel consumed per tonne;
- the amount of emissions by pollutant type;
- exhaust noise levels per vehicle;
- number of environmental incidents including corrective actions taken and review of outcomes;
- percentage of waste recycled;
- number of prosecutions and notices;
- investment in environmental management;
- investment in vehicle technology and infrastructure; and
- use of environmentally-friendly operations.



Other objectives and targets that may not be easily measurable, but should nonetheless be monitored by staff members responsible for overseeing the guidelines, include:

- compliance with environmental rules, regulations, statutes and legislation;
- reduction of waste, gaseous emissions and noise emissions from activities;
- improvements to storage, handling, preservation, packaging and disposal of hazardous materials and waste matter;
- readiness for environmental emergency or emergencies that may impact on the environment; and
- improvement in work practices.

### 2.2.5 PRE-TRIP CHECKS AND DEPOT/FACILITY INSPECTIONS

Adherence to the standards of industry accreditation schemes will provide training for drivers and other staff in satisfying the requirements for pre-trip checks and inspections. Participation in an accreditation scheme can satisfy many requirements of an environmental guideline.

It is important that any requirements for pre-trip and depot checks in your environmental guidelines refer specifically to procedures relating to the monitoring of environmental performance.

For example, a vehicle check protocol should include instructions for staff checking the vehicle to monitor exhaust emissions, tyre wear, fuel or oil leaks and any other fault in vehicle operation that may impact on the environment.

Suggested formats for pre-trip inspections include:

- a checklist format;
- a mandatory sign-off by the person conducting the check; and
- assigning an officer responsible for vehicle checks and waste disposal checks.

### 2.2.6 WASTE DISPOSAL CHECKS

Waste disposal is an environmental high-risk area for trucking operations, with severe prosecutions and fines imposed on businesses that dispose of waste irresponsibly or fail to satisfy regulatory requirements. It is vital that accurate records of evidentiary standards are kept in secure storage. While this Best Practice Guide does not guarantee compliance with the law, adhering to the principles for developing environmental guidelines may help your organisation avoid environmental incidents and breaches of environmental regulations.

Waste disposal checks should be undertaken regularly and the responsibility for waste disposal checks should be assigned to a specific individual according to a pre-determined list of actions.

All measures for waste disposal should be recorded including the identification of any faults or problems and a further record of actions taken to correct faults should also be kept.

Suggested formats for waste disposal checks include:

- a checklist format;
- a mandatory sign-off document for the person conducting the check; and
- a regular check by a trained member of staff, assigned the responsibility of conducting checks for your organisation.

### 2.2.7 RECORDING, MONITORING AND EVALUATION

Procedures for verifying, reporting, monitoring and evaluating progress and environmental achievements within an organisation are vital for effective environmental management. For this reason they should be included in your company's environmental guidelines. Such procedures will not only provide your company with an effective planning tool that reflects your true environmental footprint, but will enable you to establish incentive schemes, emissions targets and clear evidence of your organisation's good environmental record. Methods for recording this process of verification as well as for the processes of reporting, monitoring and evaluating should



## SECTION 2 // GUIDELINES

be standardised in an easy to understand and store format.

Templates should be set for the following processes:

- verification of regular monitoring;
- measurement of the organisation's environmental performance against environmental objectives and strategies, including issues and impacts;
- reporting of waste disposal;
- reporting of vehicle checks;
- reporting of noise emissions evaluation; and
- reporting gas emissions evaluation.

### 2.2.8 MANAGEMENT AND STAFF COMMITMENT

The commitment of management and staff to observing and implementing environmental guidelines should be reflected in the commitment statement. The board of your organisation should be included in any statement, with an indication that the staff and leadership have a mandate to carry out any required changes identified during the review process.

Once the development and implementation of the guidelines have been approved by management and the board, it is crucial that staff members are informed why the guidelines are being developed.

Your staff need to understand:

- what the guidelines are;
- why they are being developed;
- how the guidelines affect them;
- what duties are expected of them as a result of the guidelines;
- what sort of input into the development of the guidelines is expected from them; and
- why the organisation and the industry are moving towards more environmentally responsible practices.

Suggested methods for informing staff of the guidelines and preparing them for implementing any changes to operational practice include meetings, internal communications and the availability of training sessions and information for all staff.

### 2.2.9 FAULT RECORDING AND REPORTING

Identifying vehicle faults, reporting them and taking corrective action is an application of environmental guidelines that has the added benefit of reducing your organisation's maintenance costs through early fault detection and repair.

The recording of faults should fall under the duties of the nominated staff member to oversee the environmental guidelines. Staff directly involved with vehicles or machinery may also be assigned the task of logging faults.

Fault reports should be kept in:

- vehicle maintenance logs or similar journals; or
- any other suitable recording mechanism that will provide evidence of the actions taken following the fault report.

The process of the recording and reporting faults should also be documented.

### 2.2.10 CORRECTIVE AND PREVENTATIVE ACTION

Procedures should be established to:

- provide mechanisms to identify, record, action and review;
- correct faults and problems;
- ensure that environmental legislation, rules, regulations and standards are complied with;
- prevent a recurrence of faults and problems; and
- review findings.

The person or persons responsible for identifying and responding to environmental faults, problems and non-compliance must be clearly identified and provided with the information and documentation necessary to carry out their task. It is suggested that:

- drivers check vehicles for faults during scheduled pre-trip inspections;
- workshop managers check for faults in the workshop;
- maintenance and waste disposal contractors identify waste disposal and storage faults;
- your organisation's legal representative checks for regulatory non-compliance and other possible violations of environmental law;
- your organisation's environmental manager maintains vigilance over all environmental aspects of the business and cross-checks all designated inspections from drivers, contractors and other responsible persons; and
- senior management grants final approval of all procedures.

Procedures and records for correcting faults should be standardised throughout your organisation. They should include:

- who identified the fault;
- the fault to be corrected;
- when the fault is scheduled to be corrected;
- who is to correct it;
- what alternative approaches to compliance can be tested; and
- the review period.

While most faults should be dealt with immediately, ones that are considered to be at a lower level of urgency should be dealt with by:

- nominating a staff member to investigate the matter;
- communicating with the parties who may be affected by the fault;
- monitoring the problem; and
- determining whether the problem needs to be addressed and receiving authorisation from management to that effect.

Any legislative or regulatory non-compliance issues that are discovered during a review process should be addressed by your organisation immediately.

### 2.2.11 TRAINING STAFF

Environmental training should equip trained staff members to conduct in-house training in environmental principles and procedures. These skills can then be passed on to other staff.

A great deal of the environmental staff training required to maintain environmental guidelines is covered in industry accreditation programs.

The formal training that nominated staff members receive should include the following:

- scheduled vehicle checks;
- regular waste storage, handling and disposal checks;
- fault reporting;
- fault assessment;
- fuel quality;
- documentation;
- driver training;
- corrective action identification and review procedures;
- handling, storage, preservation, packaging and disposal, emergency procedures and documentation of hazardous waste;
- emergency preparedness and response requirements;



- vehicle inspection and routine maintenance;
- fault diagnosis and repair;
- EPA and statutory/regulatory requirements;
- engine and tyre maintenance;
- workshops, seminars and conventions;
- educational materials including video, audio and software;
- education on the impact of the organisation's activities on the environment; and
- on-board driver and vehicle performance systems.

The outcome of reviews should be documented and include an assessment of:

- the suitability of objectives, targets and performance;
- audit findings; and
- the suitability of your organisation's environmental guidelines given:
  - changes to legislation, regulation and standards;
  - changing business activities and products;
  - advances in emission and waste technology;
  - lessons from environmental incidents;
  - market preferences; and
  - reporting and communication.

### 2.2.12 REVIEW AND IMPROVEMENT

Your organisation's environmental guidelines should regularly undergo a process of review to determine if they are still valid, up-to-date and in accordance with environmental legislation and regulations.





## SECTION 3 // POLICIES AND PROCEDURES

### 3.1 INTRODUCTION

This section of the guide provides a template to use when developing policies for vehicle maintenance, the depot and the workshop. The examples outlined are intended as a guide only, and allowances should be made for the differences in conditions experienced at your workplace and for the needs of staff.

A company policy statement can appear at the front of your policies and procedures. This represents a broad statement of commitment and a brief outline of the areas that your organisation's policies apply to.

They should address the following areas

- environmental policy;
- responsibilities;
- vehicle inspection;
- workshop and depot inspection;
- service schedules;
- waste storage, handling, disposal and disposal recording;
- fault recording, reporting and repairs;
- record keeping; and
- staff training.

### 3.2 ENVIRONMENTAL POLICY STATEMENT

Under the actions outlined in this guide and with the aim of continually improving environmental performance, [Company Name] is committed to:

- maintaining an environmentally secure and safe workplace;
- providing staff with training and education on environmental management and issues;
- continually improving environmental performance;

- monitoring the environmental performance of suppliers and clients;
- evaluating the environmental impacts of new projects and materials where possible;
- reducing toxic waste production and minimising the exposure of staff, clients and the surrounding environment to toxic substances; and
- satisfying and building on compliance with government regulations relating to gas emissions, noise emissions, and waste storage, handling and disposal.

### 3.3 RESPONSIBILITIES

This section outlines the responsibilities required under the environmental guidelines and the person/s assigned to monitor and perform the tasks.

#### 3.3.1 ENVIRONMENTAL SPOKESPEOPLE

[Employee Name/s] is/are responsible for the environmental performance of [Company Name]. [Employee Name/s] is/are the spokesperson/spokespeople for [Company Name] on all environmental matters.

#### 3.3.2 RESPONSIBLE STAFF

[Employee Name/s] is/are responsible for:

- ensuring compliance with all elements of this guide;
- conducting induction and other training on system requirements for existing and future employees;
- maintaining [Company Name's] environmental objectives and targets;
- regularly reviewing and measuring the key environmental indicators for the organisation;

- ensuring vehicles and waste disposal mechanisms are regularly maintained according to the requirements of manufacturers, Australian Design Rules, government regulation and legislation;
- ensuring waste materials are properly stored, handled and disposed;
- ensuring waste is recycled when practicable;
- maintaining records of maintenance and repairs to vehicles and the condition of waste infrastructure;
- completing weekly inspections and review of premises;
- maintaining all record keeping as outlined in this guide;
- ensuring [Company Name] has access to manufacturers' manuals, warranty conditions and part replacement information, and EPA and other legislative/statutory/regulatory requirements for compliance inspection; and
- ensuring all staff given environmental responsibilities have access to all legislative, statutory or regulatory requirements and are selected to perform these duties based on qualifications and experience.

#### 3.3.3 DRIVERS' RESPONSIBILITIES

Drivers are responsible for:

- effectively completing the scheduled vehicle inspection and signing it off before departure at intervals determined by management;
- reporting all vehicle faults relating to roadworthiness, gas emissions and noise emissions; and
- disposing of vehicle waste (in transit) in accordance with the procedures in this system.

## SECTION 3 // POLICIES AND PROCEDURES

### 3.3.4 CONTRACTORS' RESPONSIBILITIES

Contracted tradespeople are responsible for:

- completing all maintenance requirements of [Company Name's] vehicles according to the manufacturers' specifications;
- completing all maintenance requirements associated with waste disposal infrastructure according to manufacturers' specifications and applicable Australian Design Rules for vehicles used for this purpose;
- ensuring all repairs are tested before a vehicle is returned for duty;
- ensuring all repairs are tested before waste disposal equipment is returned to use; and
- notifying [Company Name] if:
  - the environmental performances of the repaired vehicles are unsatisfactory, requiring further repairs or inspection;
  - the performance of waste storage, handling and disposal infrastructure is unsatisfactory or unserviceable, requiring further maintenance or inspection;
  - the vehicles or waste disposal equipment are unavailable due to outstanding repairs, parts or testing; and
  - follow-up, remedial or other work or monitoring is required.

### 3.3.5 CONTRACTED SUPPLIERS' RESPONSIBILITIES

Contracted suppliers are responsible for:

- ensuring hazardous materials are handled and delivered according to regulations and statutory requirements;
- maintaining licenses and waste transport permits;

- ensuring waste products are delivered to licensed waste disposal facilities; and
- notifying [Employee/s Name/s] if they no longer hold required licenses and permits.

## 3.4 SCHEDULED VEHICLE INSPECTIONS

### 3.4.1 DRIVERS' RESPONSIBILITIES

All drivers are responsible for completing scheduled vehicle inspections relating to any environmental matters and roadworthiness matters that relate to the environmental performance of vehicles.

The driver will report any fault found that they consider may compromise the environmental performance or status of the vehicle to [Employee/s Name/s] immediately. The driver should then follow instructions from [Employee/s Name/s] to ensure the fault is promptly repaired.

The types of faults that should be assessed may include:

- tyre inflation pressures;
- tyre wear;
- worn, modified or inappropriate muffler systems;
- status of the exhaust system;
- corroded or damaged muffler systems;
- leaks from the intake and exhaust systems;
- performance of temperature-controlled cooling fans;
- engine or component oil leaks;
- speed limiters;
- braking system;
- fuel lines;

- fluid leaks and levels;
- air leaks; and
- general roadworthiness.

### 3.4.2 INSPECTION FORM

The company should develop a form for drivers to complete when conducting a vehicle inspection. The inspection form should be dated and signed in the appropriate space in the vehicle's 'Vehicle Inspection Log'.

## 3.5 DEPOT INSPECTIONS (RECOMMENDED ONCE A WEEK)

### 3.5.1 EMPLOYEE RESPONSIBLE

[Employee/s Name/s] or a staff member/inspector appointed by [Company Name] is responsible for completing the regular depot inspection and review.

Any failures should be reported by staff and remedied according to the report. All instances of non-compliance should be documented and reviewed to ensure repairs or remedial actions will minimise the possibility of a recurrence.

Any fault that compromises the environmental performance of [Company Name] or vehicle operated by [Company Name] should be reported to [Employee/s Name/s].

The type of faults that should be identified include:

- approaches to driveways not flat and manoeuvrable;
- labelling of storage receptacles inaccurate or incomplete;
- excessive noise levels from depot activities or vehicles;
- out-of-date list of hazardous materials;



- leaks from storage receptacles, refuelling areas and batteries;
- damaged or rusted containers;
- oil spills from vehicles;
- hazardous materials stored close to heat, naked flames, direct sunlight or other flammable goods; and
- materials for collection not quarantined in a nominated or readily accessible area.

### 3.5.2 RECORDING FAULTS

Faults or problems found during the inspection that are not addressed immediately should be recorded and reported according to the procedures outlined for fault reporting in this guide.

## 3.6 VEHICLE ENVIRONMENTAL COMPLIANCE INSPECTIONS

Inspections for environmental compliance should be undertaken for all vehicles at intervals close to 200,000 kilometres or every 12 months. If the inspection is large-scale, an accredited officer from the relevant state authority should undertake the inspection in conjunction with [Employee/s Name/s].

[Employee/s Name/s], a qualified and experienced mechanic or the relevant state environment authority is authorised to undertake this inspection.

Any faults or issues detected during the inspection that affect and/or jeopardise the environmental performance of the vehicle

or vehicles in a fleet are to be recorded and repaired in consultation with [Employee/s Name/s] from [Company Name].

## 3.7 DEPOT AND VEHICLE SERVICE SCHEDULING

### 3.7.1 EMPLOYEE/S RESPONSIBLE

[Employee/s Name/s] is/are to ensure that all vehicles are routinely serviced at the appropriate times with reference to the part of the service that influences the environmental performance of the vehicles.

[Employee/s Name/s] is/are responsible for completing routine vehicle services and for the standard of the services performed.

## SECTION 3 // POLICIES AND PROCEDURES

### 3.7.2 CONTRACTED REPAIRERS' RESPONSIBILITIES

The contracted repairer is to provide details of repairs or services conducted in writing to [Company Name]. [Employee/s Name/s] is/are responsible for recording and storing any invoices and proof of services or repairs.

Maintenance schedules should reflect the manufacturers' recommendations, operational requirements and any recommendations from contracted repairers and contracted suppliers.

### 3.7.3 MANAGEMENT RESPONSIBILITIES

The management of [Company Name] will ensure the depot is available and accessible for routine maintenance with regard to noise emissions, waste disposal and storing/handling hazardous products.

The management of [Company Name] and [Employee/s Name/s] are responsible for meeting service schedules and for the standard of work performed. Work undertaken to enhance the environmental performance of a vehicle or depot will be recorded according to the recording processes in [Company Name's] environmental guidelines.

### 3.8 WASTE DISPOSAL REPORTING

[Company Name] should report on the following with regard to waste disposal:

- storage areas;
- inspection reports;
- details of any spills;
- status of spill kits;
- potential leaks from storage areas;
- condition of waste storage devices;

- potential leaks from underground storage; and
- progress in rectifying instances of non-compliance.

Reporting will be conducted on a regular basis, with a minimum monthly reporting requirement.

### 3.9 FAULT RECORDING, REPORTING AND REPAIRS

All vehicles operated by [Company Name] should include the ability to record environmental matters within their fault reporting systems.

Any driver detecting a fault that has the potential to compromise the environmental performance of a vehicle must record the fault in the Vehicle Maintenance Log or comparable journal.

Faults can be classified in the following way:

- **Minor fault**—non-environmental or safety-related faults are to be recorded in a book for assessment at the next service or other specified time. Records should show alternatives for maintaining compliance until the repair is made.
- **Major fault**—when environmentally or safety significant, advise [Company Name], the workshop manager or person responsible for maintenance.

Details of the repair should be recorded in the Vehicle Maintenance Log or comparable reporting document including:

- the type of repair;
- when it is to be repaired;
- who is responsible for the repair;
- when the repair is likely to result in compliance; and
- condition to be monitored.

### 3.9.1 ACTIONS

[Company Name] must nominate a responsible person to assess all faults. Records should show what action was undertaken for each reported fault.

Typical actions in response to reported faults would include:

- fault fixed;
- repair deferred to another time;
- fault to be monitored; or
- no repairs required.

### 3.9.2 REPAIRS AND REPAIR RECORDS

Where an environment-related fault has been repaired, records need to show who performed the repair, what was done and when. The record is typically kept as part of the repairer's invoice.

If the fault is fixed in-house, a record of the repair and parts fitted should be recorded in the Vehicle Maintenance Log.

Repairs are to be tested for their environmental compliance.

If the repair of a fault is delayed or deferred to another time, this should be recorded. If a fault is identified, but assessed as not needing repair, this should be recorded in the Vehicle Maintenance Log.

All environmental-related repairs must be accepted and approved by the workshop manager or a staff member assigned to inspect or test the repairs to ensure they conform to environmental standards.

### 3.9.3 DEPOT MAINTENANCE LOG

Every depot operated by [Company Name] should contain a Depot Maintenance Log or comparable journal for environmental matters.

Where an environment-related fault has been addressed, a record of all work done to correct the problem should be kept. [Employee/s Name/s] must sign off and date the appropriate column in the Depot Maintenance Log.

### 3.9.4 WASTE AND HAZARDOUS GOODS

Any employee who notices a problem with the storage, handling and disposal of waste or hazardous goods that compromises the environment must notify responsible staff within [Company Name] and record the fault.

Faults can be classified in the following way:

- **Minor problem**—record in book for assessment at the next workplace inspection. Records should show what alternative if any can be used to maintain compliance until the action is effective.
- **Major problem**—advise [Employee/s Name/s] who should address the problem immediately.

### 3.10 RECORDS MANAGEMENT

#### 3.10.1 RESPONSIBILITY FOR RECORDS

[Company Name] management is responsible for ensuring records are kept current and maintained according to the processes outlined in the policies/procedures section of the environmental guidelines.

[Employee/s Name/s] is/are responsible for documenting and signing off the weekly depot/terminal maintenance inspection in the appropriate record.



## SECTION 3 // POLICIES AND PROCEDURES

### 3.10.2 INFORMATION TO BE KEPT ON RECORD

The following information should be kept by [Company Name] in relation to environmental issues:

- vehicle identification (registration details);
- scheduled maintenance undertaken;
- unscheduled maintenance;
- incident reports;
- fault/s identification and rectification reports;
- compliance records;
- date that fault/s are rectified;
- contractor and supplier information (including invoices);
- inspection and maintenance records; and
- deferred and re-work repair reports.

The maintenance record for depots should contain the following information:

- location of the terminal;
- scheduled maintenance undertaken;
- unscheduled maintenance undertaken;
- incident reports;
- fault/s identification and rectification reports;
- compliance records;
- date that the faults were repaired/rectified;
- contractor and supplier information (including invoices);
- inspection and maintenance records; and
- deferred and re-work repair reports.

Other records that should be maintained include:

- induction and proof of training undertaken or conducted by staff;
- results of audits conducted on the business;
- any vehicle calibrations;
- all information on applicable environmental laws, legislation and regulation;
- vehicle specifications;
- emergency preparedness and response;
- management reviews; and
- environmental compliance inspections either taken periodically or annually.

### 3.10.3 DRIVER'S RESPONSIBILITY

The driver of the vehicle would be responsible for documenting and signing off on vehicle inspections in the appropriate manner as outlined in the record-keeping requirements of the environmental guidelines.

## 3.11 TRAINING AND EDUCATION

### 3.11.1 RESPONSIBILITY FOR TRAINING

[Employee/s Name/s] is/are responsible for organising and/or conducting appropriate training for all personnel at [Company Name] whose work may impact on the environment.

### 3.11.2 TRAINING PROGRAM

Training must be established, implemented and maintained to encompass the:

- importance of conforming with the company's environmental performance goals as outlined in the environmental guidelines;
- environmental impacts of employees' work activities;

- requirements of the EMS including emergency preparedness and response requirements; and
- consequences of departing from the EMS.

The training program must include the following:

- identifying the organisation's requirements and employees' roles and responsibilities;
- developing a training plan;
- confirming that the personnel training plan satisfies regulatory and legislative requirements;
- target employee groups;
- documenting and evaluating the personnel training plan; and
- a review process to ensure that employees' knowledge of legal requirements, company standards, policies and objectives are up to date.

### 3.11.3 MINIMUM TRAINING REQUIREMENTS FOR STAFF

The minimum training requirements for staff are as follows:

- Drivers should be trained in scheduled vehicle inspections and fault reporting requirements and procedures as outlined in the environmental guidelines.
- Contractors should be provided with a copy of the environmental guidelines.
- A meeting outlining the environmental guidelines should be held for contractors and suppliers.
- Depot staff should be provided with a copy of the environmental guidelines and provided with training on their requirements under the guidelines.
- Vehicle repairers and maintenance providers should be provided with a copy of the guidelines and training regarding their requirements under the guidelines.



### 3.11.4 TRAINING LOG

At completion of each training session, all staff members are to sign off and date a training form or training log that recognises they have successfully completed the training program.

## 3.12 INSPECTIONS

### 3.12.1 VEHICLE INSPECTIONS

The following vehicle functions should be included for inspection in the environmental guidelines:

- tyre pressures;
- rusting and damage to the muffler and exhaust system;
- temporary mufflers or exhaust system components have not been fitted;

- mufflers or the exhaust system have not been altered;
- condition and position of intake and exhaust system seals;
- function of temperature-controlled cooling fans; and
- valve covers and oil sumps are not damaged, leaking or displaced.

### 3.12.2 DEPOT INSPECTIONS

When conducting depot inspections the following should be included for inspection in the environmental guidelines:

- only clean rainwater enters stormwater drains;
- stormwater drains and areas near stormwater drains are kept clean and free from debris;
- all hazardous and waste materials are kept separate from other materials and are stored and labelled correctly and clearly;

- containers are not damaged or leaking;
- batteries are stored upright; on acid-resistant spill trays and are not leaking;
- recyclable products are separated from general rubbish;
- glass, plastic and aluminium containers are stored for recycling;
- spill kits and other spill response equipment is available and in a fit and operable state;
- all used rags, cloths and materials containing oil, fuel and solvents are stored in closed, labelled containers;
- spare vehicle parts are drained of liquids and stored in labelled containers; and
- all waste materials are readily accessible to waste collectors.

## SECTION 4 // WASTE MANAGEMENT AND DISPOSAL GUIDELINES

### 4.1 WASTE MANAGEMENT REQUIREMENTS

Waste management allows your business to:

- demonstrate environmental responsibility;
- minimise the risk of environmental damage or incidents; and
- address OH&S concerns from the handling of waste by employees.

### 4.2 LEGAL REQUIREMENTS

State legislation and state environmental protection agencies may vary in their waste management and disposal requirements of trucking businesses so it is important to make your staff aware of their legal responsibilities in the area.

Some general rules to observe in waste disposal and management include:

- taking all reasonable steps to prevent waste pollution;
- promoting action to minimise environmental damage;
- showing, to an evidentiary standard, that reasonable steps have been taken to prevent pollution and pollution accidents; and
- maintaining all precautionary measures.

### 4.3 GENERAL REQUIREMENTS

General requirements can be separated according to:

- water and air pollution;
- hazardous materials; and
- non-hazardous materials.

#### 4.3.1 WATER AND AIR POLLUTION

Water quality management is predominantly focused on managing stormwater and wastewater.

#### 4.3.2 STORMWATER

It is an offence to allow stormwater to become polluted.

Your organisation should:

- prevent any water from vehicle washes entering stormwater drains at or near your premises;
- sweep, vacuum or use absorbent material to remove grime;
- prevent stormwater from flowing through areas where waste is stored; and
- designate parking areas and parking area drainage according to legal requirements.

#### 4.3.3 WASTEWATER FROM TRUCK WASHING

If the engine, parts and trucks are washed with cold detergent:

- the vehicles should be washed in a sealed area with an outlet that satisfies the requirements outlined in the guide and according to legal requirements;
- the wastewater should be passed through a separator; and
- the water from the separator should be disposed according to relevant legislation and permit requirements.

If the engine parts and trucks are washed with solvents, hot detergents or degreasers:

- the vehicles should be washed in a sealed area with an outlet that satisfies the requirements outlined in the guide and according to legal requirements;
- all waste fluids should be drained from any parts and poured into labelled storage containers for disposal;

- the effluent should be transferred to an interceptor for treatment prior to disposal;
- oils, solvents and water should be transferred to a separator prior to disposal according to legal requirements and guidelines;
- the interceptor and/or separator should be cleaned following the processing of the wastewater; and
- the water from the separator should be disposed according to relevant legislation and permit requirements.

#### 4.3.4 WASTEWATER FROM HAND WASHING

Hand washing should take place over a sink that is connected to the sewer or wastewater must be poured into a clearly labelled container for disposal according to legal requirements and environmental guidelines.

### 4.4 HAZARDOUS MATERIALS

The following are classified as hazardous waste:

- used oil;
- used batteries;
- damaged and used tyres;
- used rags, cloth and material;
- anti-freeze, radiator cleaner, inhibitor and coolants;
- air-conditioner and refrigerant gases;
- paints and thinners;
- paint drums, oil drums and aerosol cans; and
- vehicles, vehicle parts and engine parts.

## SECTION 4 // WASTE MANAGEMENT AND DISPOSAL GUIDELINES

### 4.4.1 USED OIL

Used oil should not be:

- dumped on land, into sewage system, waterways or general refuse;
- used for dust absorption or as a timber preservative;
- burned or incinerated; or
- tipped into stormwater drains.

### 4.4.2 BATTERIES

Used batteries should be:

- stored upright, under cover and on an acid-resistant spill tray;
- inspected weekly for leaks;
- disposed in one of the following ways:
  - handled by a licensed battery contractor;
  - left with the sales outlet where the replacement battery is bought; or
  - delivered to a metal recycling collection depot.

### 4.4.3 DAMAGED AND USED TYRES

Stocks of damaged tyres should not be allowed to build up. Tyres should be disposed of through the supplier.

### 4.4.4 OIL AND FUEL FILTERS

Oil and fuel filters should:

- be drained for 24 hours after removal into waste oil or fuel tanks/drums;
- be removed by licensed contractors who hold relevant permits; or
- use re-usable filter cartridges.

### 4.4.5 USED RAGS, CLOTH AND MATERIAL

Rather than burning or incinerating used rags, cloth and material, a licensed contractor should remove them. Until their removal these hazardous materials should be stored in closed containers and kept away from fire hazards.

### 4.4.6 ANTI-FREEZE, RADIATOR CLEANER, INHIBITOR AND COOLANTS

Anti-freeze, radiator coolants and cleaners are required under law to be disposed of by a licensed waste company. Until removal these hazardous materials should be:

- stored away from heat, naked flames, direct sunlight or other flammable liquids;
- stored off the floor and away from drains—for small containers of new and used coolants (less than 25 litres); and
- stored in a sealed area—for larger drums.

### 4.4.7 AIR-CONDITIONER AND REFRIGERANT GASES

Removal and disposal of refrigerant gases by law can only be conducted by personnel accredited by the Australian Refrigeration Council ([www.arctick.org](http://www.arctick.org)) and records should be kept of all gas purchases.

### 4.4.8 WET PAINT, DRIED PAINT, PAINT FLAKES, SOLVENTS, PAINT ABRASIVE AND THINNERS

Paints, solvents and thinners are categorised as hazardous and should not be:

- disposed of in stormwater or sewage systems;
- disposed of in a landfill;
- evaporated or separated; or
- mixed with waste oil.

The following measures should be taken when storing or handling paints:

- separate paints and thinners and ensure that these are not mixed with other contaminants;
- securely store in quality bulk tanks or drums;
- store tanks or drums in impervious sealed areas under cover;
- locate storage areas for easy access by collectors;
- minimise the time that used paints and thinners are stored; and
- ensure that all solvents and paints are removed from spray guns (or brushes) and transferred to the storage tanks and drums.

### 4.4.9 PAINT DRUMS, OIL DRUMS AND AEROSOL CANS

If the drum or can contained non-solvent products, then allow them to dry out before disposing. However, if the drum or can contains lead, solvents, chromium-based paint or oil, then label the drums/cans as hazardous waste and dispose of in a manner similar to wet paints, used oil and other hazardous wastes.

### 4.4.10 VEHICLES, VEHICLE PARTS OR ENGINE PARTS

If the vehicle, vehicle parts or engine parts contain any liquid, drain the liquid from the parts and store the liquids in separate, labelled containers. The vehicle parts should then be placed in bins provided by waste metal or auto parts recyclers. Entire vehicles should be transported to a licensed auto parts recycler.

### 4.4.11 TONER AND INK CARTRIDGES

Toner (for laser printers and photocopy machines) and ink cartridges can be toxic. Recycle and reuse cartridges or dispose of them as per manufacturers' recommendations.



## 4.5 NON-HAZARDOUS MATERIALS

### 4.5.1 CARDBOARD, PAPER AND PLASTICS

Cardboard and paper should be separated from general refuse for recycling purposes. Authorised disposal is not necessary. However, consideration should be given to contracting paper recyclers who provide mobile bins (free of charge) and collect refuse at agreed intervals. By introducing a cardboard and paper recycling system, cardboard and paper disposal costs could be halved (NSW EPA, 1998).

### 4.5.2 GLASS, PLASTIC CONTAINERS AND ALUMINIUM

Old plastic containers are not generally accepted in all recycling programs. Glass and plastic containers should be collected, separated and stored for council kerbside collection where this service is available.

### 4.5.3 BUILDING AND MAINTENANCE MATERIALS AND GENERAL WASTE

These are regarded as inert and can be disposed to landfill.

### 4.5.4 ELECTRONIC CIRCUIT BOARDS

Electronic boards should be placed in labelled containers and forwarded to metal recyclers.

## 4.6 RESPONSE TO SPILLS

In the event of a spill, the following should be undertaken:

- temporarily cease operations in the affected area(s);
- block all adjacent drains unless they can be used to contain the spill in a defined area;
- recover the product from the containment area or absorb the spill using rags, absorbents, brooms, mops or booms;
- spot clean the area with quick break detergents and direct the waste to effluent separator treatment;
- if hosing, direct the waste to an approved treatment system—do not direct the effluent to drains;
- advise the EPA or the local council if there is a pollution risk; and
- for large scale spills, advise the fire brigade. For smaller spills, follow the Material Safety Data Sheets (MSDS).

In the event of spillage from fuel vehicles the following should be undertaken:

- close all vehicle valves;
- shut down all ignition sources, evacuate personnel and isolate all electrics;
- isolate the spill area;
- block all drains to areas extending beyond the refuelling region;
- if petrol is spilled, institute controls for vapour generation. If diesel is spilled, vapour evaporation may not be as critical as that for petrol. In any event absorb or dispose of the fuel as outlined above; and/or
- seek advice from the relevant authorities and recovery experts.

Spillage in workshops should be recovered using absorbents or rags and cleaned using quick break detergents and washing. The waste should not be directed to drains but rather to a separator.

If the spills are relatively minor, then rags, absorbents and quick break detergents should be sufficient. Larger spills should be handled in a manner similar to that outlined in the fuel deliveries section, above.





# APPENDIX A

FUEL AND ENGINE EFFICIENCY, CHOICE  
OF FUEL, DESIGN CHANGES, DRIVER TIPS



## BUNKER FREIGHT LINES: FUEL FOR THOUGHT



Bunker Freight Lines' (BFL) operates exclusively as a subcontractor to the major multinational freight forwarders that specialise in time sensitive road freight. The company has provided inter-capital road freight transport service for more than 40 years.

BFL trucks consume 25 million litres of fuel each year. Fuel is by far its greatest running cost. The latest energy-saving initiative undertaken by the company has been the introduction of Liquefied Petroleum Gas (LPG) to their diesel engines. Testing for reliability, fuel economy and driver acceptance began in earnest in October 2007. The introduction of LPG creates a slower, cooler fuel burn that uses more of the fuel, improving fuel efficiency, creating greater power and producing less noise and fewer emissions. Expected fuel savings from the introduction of LPG are around 10-15 per cent.

Continuous upgrading of the BFL fleet maintains or improves productivity and efficiency. But as engines with lower emissions were progressively introduced, actual fuel use increased, so BFL set about looking at other solutions. Emission and fuel consumption savings were sought by improving the aerodynamic performance of trailer design and through a tyre maintenance and design program. It was difficult for the company to put a percentage gain on these innovations; it was limited by government regulation. For instance, under the present 34 pallet B-Double combination guidelines it was unable to use aerodynamic bonneted vehicles with sleeper bunks on B-doubles.

Air turbulence is a major cause of extra fuel use and BFL's trials with side skirts show promise for improvements. Innovative trailer design will lower fuel consumption and, although difficult to predict, design construction innovations will bring about efficiencies. There has been little development in trailer design, but it is an area the company is targeting in conjunction with trailer manufacturers to bring about innovative design enhancements. There is no doubt that as fossil fuels continue to deplete aerodynamic development will ramp up and further contribute to fuel savings.

Something as simple as poorly inflated tyres can increase the amount of fuel used every kilometre. BFL has a strict policy of checking tyres at every service to ensure they are running at optimum pressure. Tyre pattern affects tyre drag: the more aggressive the pattern, the more drag it is likely to cause on the pavement, resulting in higher fuel consumption. A pattern change for drive tyres will be trialed to measure for fuel improvements. BFL is also working with its supplier, Bridgestone in a country-wide test using nitrogen in their tyres in place of air. Nitrogen is denser than air and less prone to leak through the rubber tyre walls. It also keeps tyres cooler. Both factors contribute to better maintained tyre inflation, longer tyre life and improved fuel economy. Reduced tyre drag also creates less pavement wear and prevents blowouts, reducing tyre waste on the roads.

BFL has introduced proactive management across its business. The challenge is to get the logistics of shuttling drivers and trucks across the country

right; to organise legal runs and legal breaks in a fast, efficient manner. Interstate drivers are sourced from all capital cities and from remote changeover locations at Mundrabilla in Western Australia, Port Augusta in South Australia and Moree, Boggabilla, Dubbo, Broken Hill, Wagga Wagga and Gundagai in New South Wales.

The company was an early adopter of Global Positioning Systems (GPS) technologies used for monitoring truck movements. A state-of-the-art operations centre at the Derrimut headquarters tracks each of the 140 trucks and 450 trailers every step of the way around the continent. The proactive management system relies on setting performance parameters for each truck and monitoring them on every trip. The parameters cover optimum time between key points on the route, fuel use and engine health. A complete pre-trip analysis of the driver, the truck and the route criteria is loaded into the vehicle. It has a destination map and designated break points every five hours. All the way points are GPS driven.

A drive to reduce waste in all parts of the operation has also been implemented. In the first two years of the Greenhouse Challenge program, engine oil waste was reduced by almost 50 per cent by fitting devices to the engines that recirculated the waste oil back into the engine at a pre-determined setting. This approach added to engine durability because the engine always had good oil in the sump. As a result, oil and fuel filters were able to be changed at intervals of 40,000 kilometres instead of 20,000 kilometres. Due to the introduction of low sulphur fuels this initiative had to be abandoned.

BFL joined the BP Global Choice Program in 2004. That year, it saved 3.5 tonnes of sulphur dioxide and 617.6 kilograms of sulphate particulates. These savings continued to grow as fuel use grew. The company has been recognised for its leadership in greenhouse gas savings in the transport industry through the international BP Global Choice Award.

As the freight task continues to grow the challenge will be to lift or equal existing fuel economies by developing not only bigger load carrying capacity but smarter vehicles.

## ROADMASTER: SUPER SINGLE TYRES

Denis Robertson founded Roadmaster in 1972. Robertson began his career in the meat industry and realised the need for reliable meat carriers. Roadmaster operates refrigerated transport services throughout Australia. It has 250 employees at seven depots on the eastern seaboard and a fleet of 120 prime movers and 180 vans.

The idea of replacing dual tyres with so called 'super single' tyres was first tested by Roadmaster in 1982. Three trucks were used to determine the feasibility of a fleet application. This trial saw the start of something new and progressive for the traditional transport industry.

The introduction of super single tyres on Roadmaster vans created ongoing cost, safety and efficiency benefits. Super single tyres:

- reduce the rolling resistance, which gives Roadmaster a fuel saving of approximately 8 per cent;
- lower the centre of gravity on the trailer providing increased safety;
- reduce the tare weight of the trailer;

- improve trailer handling due to the decreased weight in the unsprung section of the trailer suspension; and
- give brake drums greater exposure to air flow which improves cooling.

Roadmaster's fleet maintenance policy underpins a safe and reliable transport service through a well planned and executed maintenance program that is well understood and followed by all responsible parties.

The fleet manager ensures that vehicles are made available at the correct service intervals; that any non-roadworthy vehicle is not used until correctly repaired; and maintains full and complete vehicle records and records of repairs carried out. A Roadmaster driver is responsible for conducting daily vehicle

inspections and attending to the driver's log to report all vehicle faults to the fleet manager via the completion of the DVR. The workshop manager is responsible for all R & M requirements of the fleet—to coordinate and ensure the prompt repair of faults found or reported; ensure all repairs are tested (if appropriate) before returning vehicles to service; and to advise the fleet manager if a vehicle requires further R & M or inspection.

Roadmaster applies high industry standards of safety and quality to its operation. The company is the foundation member of TruckSafe and maintains currency with the National Heavy Vehicle Accreditation Scheme.

*... which gives Roadmaster a fuel saving of approximately 8 per cent;*



## THE WA FREIGHT GROUP: BP GLOBAL CHOICE



The WA Freight Group was formed by the integration of WA Freightlines, Jetstyle Express and Jolly's Transport in 2004. The West Australian owned company has grown from humble beginnings in 1991 to a national logistic operation with depots in Perth, Adelaide, Melbourne, Sydney, Brisbane and Darwin. It offers warehouse, local distribution and linehaul services to a local and national business customer base. Its business model is based on providing a quality and reliable three-day freight service between the western and eastern states.

The WA Freight Group joined the BP Global Choice program in 2005 and received an award for making the greatest contribution to offsetting greenhouse emissions by a Western Australian company. The BP Global Choice program enables the company to partner organisations and support projects that directly reduce emissions at the source such as fuel switching, capturing landfill gas, using renewable energy or cleaner technology.

The company has found fuel savings and reduced environmental impacts can be achieved through better management of its operations and through driver education. It has

developed an effective leadership team and the necessary supporting policies and planning at all levels in the organisation. It treats suppliers as business partners and works with them to improve joint overall performance. It actively measures, analyses and reports quality performance throughout the organisation.

Tangible environmental performance improvements have been realised through:

- adjustable aerodynamics—correctly positioned, they will save fuel;
- tyres—correctly inflated tyres offer least resistance on the road, increasing fuel economy;
- wheel alignment—correct wheel alignment will further optimise fuel economy;
- minimising trailer movements—using prime movers to pull multiple trailers instead of singles where permitted;
- vehicle technology—improvements in engine technology will assist in managing fuel economy.

Managing driver behaviour plays a significant role in environmental performance:

- Smooth and progressive braking will save fuel and reduce stress on the driver, vehicle and load.
- Moderate acceleration improves fuel consumption; cruise control saves fuel when it is safe to do so.
- Use of the exhaust brake will contribute to a smoother decrease in speed and save fuel.
- Selecting the best gearing ratios keeps the engine within the limits and using the highest gear possible optimises fuel economy.
- Inclement weather reduces fuel economy as the driver adjusts their driving to suit the conditions, but safety is the key objective.

The WA Freight Group is a quality-endorsed company and accredited with Trucksafe, PACIA, NHVAS and WAHVAS. They are winners of a number of Operations Awards including the Transport and Logistics Industry Award 2006 (Australian Training Awards) and Outstanding Contribution to the WA Road Transport Industry Award 2007 (Transport Forum WA).

## SIMON NATIONAL CARRIERS: OPTIMUM SPEED

*fuel savings... were between  
5 per cent and 8 per cent.*

Simon National Carriers is a leading provider of transport and third-party warehousing and distribution services throughout Australia, with a fleet of more than 140 trucks, 205 trailers and 80 rail containers. A significant pool of regular subcontractors complements the national fleet. As members of TruckSafe, the industry's premier accreditation scheme, the company has established high levels of compliance in maintenance, driver health and training.

David Simon dismisses the myth that his company's self-imposed 90 kilometres per hour speed limit blows-out trip times. Simon argues there are numerous factors that impact on trip times and these are not always fully appreciated. They include speed limits imposed by built-up areas, hills and bends, other traffic, weather, the correct vehicle specification for the task, load weight and size and individual driver behaviour. These factors mean that on many routes less than 30 per cent of the trip is actually covered at the vehicle's limited speed, usually 100 kilometres per hour.

The Australian Design Rule (ADR) speed limiter has no effect on vehicle speed other than at the maximum speed. Various case studies over the years have shown that more than two-thirds of trip distances are under the

control of the driver and not the speed limiter. This means that driver training and practice of steady driving speeds can deliver substantial fuel efficiencies.

As speed increases, so too does wind resistance, so the horsepower required to maintain higher road speeds rises quickly. The company monitored a 900 kilometre route and found that the differences in trip durations between vehicles limited to 90 km/h and 100 km/h were measured in minutes. The lower speed limit saved \$41.23 per trip, amounting to a potential \$10,720 per year on this single example.

Overall, fuel savings at a speed limited 90 kilometres per hour on measured trips were between 5 per cent and 8 per cent. Some particular trips over long flat country showed actual fuel savings of 9 per cent.

Limiting the maximum speed enhanced vehicle suspension life and chassis and body integrity. The company points to reduced driver fatigue, shorter stopping distances, less damage to road surfaces, beneficial insurance

implications, load integrity improvements and higher vehicle resale values.

The 90 kilometre per hour maximum speed limit, together with its policies to not fit bull bars and to maintain the line-haul fleet at an age of less than 5 years assists Simon National Carriers in achieving its environmental objectives.

Simon National Carriers invests in its staff training and, in particular, driver selection and training. The company employs training personnel covering all disciplines. All drivers are given a 14-day training program addressing all aspects of the driving task including general driver training subjects such as route planning, defensive driving, load restraint, fatigue management, OH&S matters, dangerous goods and road trains. Drivers also receive on-road training.

Operations management systems support and maintain the overall driver performance standards aided by other monitoring programs that include various on-board monitoring systems and GPS.



## TRACKAXLE: INNOVATION IN AXLE TECHNOLOGY

Trackaxle Transport Systems in Shepparton, Victoria, provides the road transport industry with an active-steering system for semi-trailers to improve the manoeuvrability of vehicle combinations.

Trackaxle equipped vehicles require less space to make a turn, reducing opportunities for a car to move through on the inside of a turning semi-trailer or B-double combination. There is no dragging or scrubbing of tyres, creating obvious savings for the operator. Dragging tyres sideways creates drag on the bitumen pavement surface, thereby reducing the surface life of the pavement. Trackaxle eliminates most of this drag as well as the off-tracking which frequently damages kerbing and even road signs.

With the Trackaxle active steering system, all axles align with the direction of travel so that approximately 40 per cent less power is needed to make a turn. It results in a substantial reduction in engine noise and improved economy.

Standard freight vehicles can disrupt two lanes of traffic when cornering, and local traffic

when reversing into sites. Trackaxle equipped vehicles perform a turn in a single lane. 'Command steer' reversing functionality allows the truck to reverse around a corner in less time and using less space.

The system contributes to lowering greenhouse gas emissions. In urban operation, substantial power is used to change the direction of multi-axle, commonly tri-axle, trailers. The Trackaxle system reduces the power needed and therefore produces less exhaust emissions. Due to the dramatic reduction in tyre scuff, considerably less rubber residue is left on the road and fewer of the volatiles which escape fracturing rubber.

Trackaxle data shows the current tri-axle fleet assigned to urban work achieves between 11,000 and 20,000 kilometres on a set of tri-axle tyres; interstate vehicles achieve up to

150,000 kilometres per set. The data indicates an improvement to tyre wear by a factor of 10. Taking into account the energy saved from producing fewer tyres and the potential for improved fuel consumption, there is a dramatic improvement to greenhouse gas emissions per urban transport kilometre travelled.

The active-steering trailer axle system delivers a reduction in drive train torque requirements. Lateral stresses not only increase tyre wear but they also wear wheel bearings, rims and suspension components, measured in the cost of parts, labour and unproductive downtime.

Volumes per trip may be improved by enhanced access to difficult destinations using a command steered Trackaxle trailer. Higher productivity means lower total exhaust emissions.

*40 per cent less power is needed to make a turn*



## BP: FUTURE DEVELOPMENT OF DIESEL FUELS



At the beginning of this century, the typical Australian diesel sulphur component was 1300 mg/kg up to a maximum specification of 5000 mg/kg. In 5 years, the maximum sulphur level has dropped from 5000 mg/kg to 500 mg/kg; then to 50 mg/kg and now to 10 mg/kg in some areas and Australia-wide in 2009.

Automotive diesel fuel now contains less sulphur than petrol or jet fuel. Australia's automotive diesel fuel is comparable to that used in America, Europe and Japan, which means Australia has access to technologically advanced engines with better fuel economy, performance and lower emissions.

The fitting of particulate filters and traps means that diesel exhaust particulate emissions are now extremely low. Future changes to diesel fuel will involve reducing those remaining fuel components that contribute to particulate matter and oxides of nitrogen in the exhaust. These are compounds called polyaromatics, and there are proposals to reduce the permitted amount of polyaromatics from 11 per cent mass to 7 per cent. This could involve increasing use of components that contain no sulphur or aromatic compounds. One source of a cleaner-burning diesel component with no sulphur and no aromatic compounds is produced by linking gas molecules to form diesel fuel, and this technology is available and in use in a number of countries. Another source is to use diesel produced from biomass, a biofuel. It also enables a reduction in the remaining diesel exhaust emission—the greenhouse gas, carbon dioxide.

Carbon dioxide can be reduced by improving fuel economy using higher injection pressures and improved engine management systems, or by using diesel fuel that comes from a renewable source that does not add fossil carbon to the atmosphere. Examples of such fuels are biodiesel, diesohol and renewable diesel. Biodiesel is produced by treating a plant or animal oil in a chemical reaction to produce a hydrocarbon liquid with similar properties to diesel, albeit with a slightly reduced energy content.

Biodiesel is blended into normal diesel at varying ratios, typically B5, B20, B30, or can be used as a B100. Currently, a B5 blend is accepted as part of the European standards. Higher blends may be used but reference needs to be made to the engine manufacturer's recommendations. Diesohol is produced by combining an alcohol such as ethanol with diesel and special additives to stabilise the mixture. Renewable diesel is manufactured from vegetable and animal oils using a special refining process that produces a fuel identical to diesel refined from crude oil. The advantage of biodiesel, diesohol and renewable diesel is that they have no aromatics or sulphur, so when added to mineral diesel fuel they lower the sulphur and aromatic content. This results in lower exhaust emissions and greenhouse gas emissions. Currently, these products are made from vegetable and animal oils that are by-products of food production. In the future, they may be produced from sources which have no food use and can utilise marginal land.

Development of diesel fuels will continue to reduce the level of compounds such as sulphur and aromatics that contribute to regulated exhaust emissions. This will also enable improvements in engines to increase efficiency, resulting in better engine fuel economy and reductions in greenhouse gas emissions. The challenge to reduce greenhouse gas emissions will be met by the increasing use of diesel fuel containing components that have been produced from a renewable and sustainable source. This is currently met by the inclusion of biofuel components, but in time new and advanced biofuels will be developed.

Renewable diesel can be produced at some refineries by refining biomass components such as tallow or vegetable oil. Unlike biodiesel, which is produced by reacting tallow or vegetable oil with chemicals to remove or neutralise unwanted components, the renewable diesel is produced by refining the tallow or vegetable oil in exactly the same way that its mineral equivalent is refined. Renewable diesel is the same as mineral diesel except that the carbon dioxide produced when it is burnt is from a renewable source. Like biodiesel, renewable diesel has no sulphur or aromatic compounds so when added to mineral diesel it improves exhaust emissions. There will also be developments in advanced biofuels as current processes for producing ethanol or vegetable oil are developed further to produce biofuels that are more compatible with current fuel properties.

## NOSKE GROUP: MATERIALS AND COMPONENTS IMPROVEMENT

The Noske Group produces innovative designs in high-volume bulk commodity vehicles.

Principal, Tony Noske, is an experienced and respected transport manager who is showing the importance of careful component selection to ensure all components can be matched to deliver the maximum designed performance at the lowest operating cost. The company's purpose-built fleet is operating long-distance contract cartage of bulk commodities using the 26 metre B-double in a tipper configuration. One of the tipping features is that the B-double combination design allows the trailers to tip the load clear of the chassis structure, without the need to uncouple the trailers.

Among the key design elements has been the attention given to minimising the weight of components, while ensuring an acceptable working life and high performance. This approach has led to some innovative matching of the latest technologies in many major components including a widespread use of aluminium in tipper bodies, wheels, hoists and fuel tanks. The result is a significant reduction in operating tare weight per trailer.

The new B-double configuration has many specification efficiencies that together create highly efficient and low cost transport. Apart

*... they deliver reductions of 7.5 per cent in greenhouse*

from the merits of each component, the focus for this case study is to show the important contribution of the wheels, wheel track width and tyre specification to lowering operating costs. Aluminium hubs and rims, 14" x 22.5", deliver lower tare weight improvements on every axle which adds up to a higher net payload of about 1000 kg every trip. The initial capital cost of super single tyres is 17 per cent higher than conventional tyres, but they deliver reductions of 7.5 per cent in greenhouse gases and lower particulates. Another benefit is improvements to vehicle stability and resultant driver confidence.

Heavy-duty aluminium hoists weigh 188 kg. This compares to traditional models that typically weigh 350–390 kg. Savings in the order of 200 kg per hoist reduce fuel requirements, with a resultant positive effect on emissions.

The Noske Group's imported air suspension systems are among the lightest available in the

market. They boast unique features such as no U-bolts, a suspension arm that incorporates the trailer axle, and large diameter discbrakes for high performance and long life. The suspension unit with welded axle beam and trailing arm thus performs like an anti-roll bar on the trailers, which improves stability.

Each axle group is fitted with a scale linked to a GPS-based management information system that supplies accurate load information to both clients and management.

Recent body design changes further reduced the need for drivers to climb into the tipper bodies to carry out internal washing and cleaning between different product loading, some of which includes food grade product. Inward opening doors have been fitted to each trailer body allowing easy access. In conjunction with this task a plumbed high-pressure water system sprays water to all parts of the body, avoiding the need for the driver to handle hoses.

## PATRICK: HIGH EFFICIENCY CONTAINER TRANSPORT B-DOUBLES

In 1992/1993, the Port of Melbourne funded a research program to bring together the terminal operators, road and rail carriers, shipping lines and other port users to identify potential improvements that could be made to the transport interface. Time-slotting rules aimed at prohibiting queuing on roads within the port and other road related improvements were initiated and a pilot system was set up. The interface between rail and road was also scrutinised.

The cost of transferring a container was around \$100 per Twenty Foot Equivalent Unit (TEU) with a route passing under several low clearance bridges. The Government funded a new five million dollar direct road link from the wharf to the rail precinct and the design was intended to take heavier than standard wheel loads for future development. As one of the largest container carriers' in the port, Patrick was invited to suggest a more efficient manner of transporting this sizable volume of trade. Different combinations were considered such as dual trailers linked by dollies, Mafi style shipping decks, etc but all were found to be unsuitable solutions.

The key criteria considered included:

- able to be loaded or unloaded in the same manner as the existing road fleet.
- able to interface with other road users without causing delay or concern through unfamiliarity.
- able to reduce cost through carrying the maximum number of TEU's safely
- as with all innovation, initial cost must be at a level that can be recovered in a reasonable time frame.

In conjunction with Krueger Transport Equipment, a larger than standard B-double was designed

and approved by the Victorian Road Agency, VicRoads. Where a standard B-double was restricted to a length of 25 metres and as such can only carry three 20' containers, or one 20' and one 40' container, the Super B-double concept was to carry four 20' containers or two 40' units. The permit allowed an overall length of 29 metres. This has since been increased to 29.5 metres to accommodate the different fleet prime movers available for the task. The trailers are two decks of 12.00 metres pinned for a single 40' or two 20' containers. The lead (A) trailer has a quad axle suspension with a self-steering rear-most axle group. The initial two units were introduced in 1994 with the opening of Dock Link Road in Melbourne. The cost to users to transfer a container to or from rail to wharf reduced to around \$50 per TEU, with a corresponding reduction in vehicle trips and emissions.

The trailer steering mechanism is achievable by lock sensors. The rear (B) trailer is a tri-axle and air suspensions are fitted to all axles. Tyres are standard 11R - 22.5 tubeless. Three different types of prime movers have now been operated successfully, but in broad terms they are a standard B-double prime mover with road rated air compressors and engine power of around 500 horsepower.

In the fifteen years since the first High Efficiency Container Transport (HECT) B-doubles were introduced to the Port of Melbourne, the high degree of efficiency they offer is recorded in the Port of Melbourne Container Origin Destination Study. The study showed HECT B-doubles had a utilisation factor of 3.56 TEU's, as against 1.53 for a conventional B-double or 1.02 for a semi trailer. There has not been a HECT B-double involved in a motor vehicle accident or complaint regarding vehicle on-road performance behaviour

to fleet owners or enforcement authorities.

Currently, twenty four units as described, along with two units of nine axle design are operated by six Melbourne based wharf carriers. One unit operates as a nine axle from the wharf to Toyota's metropolitan location at Altona.

Terminal operators, the transport industry, unions and regulatory bodies support the deployment of the vehicles for the efficiencies they bring - fewer vehicle trips, less congestion on busy city routes, reduced emissions and higher productivity. Many of the units work around the clock 24/7.

The Melbourne based units have travelled to country centres such as Geelong and Shepparton on trial runs without causing any concern to the general motoring public. Since their introduction the efficiency benefits have been duplicated at other container ports in Australia. Eighteen sets of these HECT B-double units are operated by five carriers within the Brisbane Port of Fisherman Islands in Queensland.

All legislative rules as to operation of a normal B-double apply. The overall combination length is 30 metres. The NTC has now issued 'Blue-Print' Performance Based Standards (PBS) specifications for such vehicles.

Typical conditions specified by permit include:

- specific operating conditions including speed apply.
- additional warning signage for extra vehicle length.
- side and frontal under run protection.
- driver must have held a multi combination license for no less than two years.
- on board speed monitoring or GPS must be in place, with records available for audit.



## VOLVO: THE ROUTE TO SUSTAINABLE TRANSPORT SOLUTIONS



The global demand for transportation and energy is increasing at the same time as oil prices continue to increase. This is driving the Volvo Group to focus its efforts on alternative fuels, energy efficiency in the transport sector and the development of new drivelines. Tomorrow's transport problems will not be solved by just one solution, but rather by a combination of alternatives. The Volvo Group is working on a broad front in its development work, with the focus on maximum energy efficiency combined with the minimum possible environmental impact.

The foundation of all development in the Volvo Group's drivelines is the piston engine which today is almost exclusively powered by diesel fuel in heavy duty vehicle applications. The diesel engine is a highly efficient energy converter and it can run on a variety of fuels such as synthetic diesel and DME. It also forms the basis, for instance, for a variety of hybrids in parallel with electric motors, batteries and fuel cells.

The Volvo Group views tomorrow's fuels and drivelines from a "well-to-wheel" perspective. The aim is to obtain the maximum possible energy efficiency from the energy source itself all the way to the vehicle's wheels, but with the lowest possible emissions of carbon dioxide and other substances on the way. A holistic perspective is the very foundation of the Volvo Group's development strategy. It does not believe in a single global fuel, but instead that energy

supply will vary with regional conditions and requisites. The task is therefore to take an active role in this development process and to adjust its product development accordingly.

Solutions that are too costly today may well be suitable for series production in the future. In order to be able to offer the most cost-effective solution, one that is tailored to the customer's particular needs, Volvo is working on several different alternatives for future drivelines and fuels.

### EMISSIONS OF NITROGEN OXIDES REACH SUSTAINABLE LEVELS

The problem with nitrogen oxides and carbon dioxide emissions is that they counteract one another. If nitrogen oxide emissions are reduced in the combustion process, fuel consumption increases, in turn causing a rise in carbon dioxide emissions. Within a few years, however, improved cleaning technologies will reduce nitrogen oxide emissions to sustainable levels. The focus now is therefore on developing even more fuel-efficient engines, as well as engines suitable for carbon dioxide-neutral fuels produced from biomass, such as synthetic diesel, RME (rapeseed methyl ester) and DME (dimethyl ether). Exhaust filtration in the Volvo Group's engines comprises both SCR (Selective Catalytic Reduction) and EGR (Exhaust Gas Recirculation). These two methods reduce emissions of nitrogen oxides.

With SCR, the exhaust gases are mixed with a blend of urea and water known as AdBlue. The high temperature in the exhaust system converts the urea into ammonia, which in turn reacts with the nitrogen oxides in the catalytic converter. The residual product is harmless nitrogen and water vapour. With EGR, some of

*... aim is to obtain the maximum possible energy efficiency from the energy source itself*

the exhaust gases are re-circulated back into the engine, lowering the combustion temperature and thus reducing the emissions of nitrogen oxides.

The introduction of the American US10 exhaust emissions legislation in 2010 and Europe's EURO 6 will bring emissions of nitrogen oxides and particulates down to levels that are sustainable in the long term. The Volvo Group is deploying a variety of technologies to meet these requirements. One such technology is based on a combination of SCR, EGR and particle filter. HCCI (Homogenous Charge Compression Ignition) is yet another promising new combustion technology that exploits the benefits of both the petrol and the diesel engine. Emissions from Volvo's vehicles will thus be slashed almost a hundred-fold in less than thirty years, that is to say 100 new vehicles will discharge less than one old vehicle.

Previously, there were few rules for emissions of nitrogen oxides and particulates. The most effective and the quickest way of improving air quality is therefore to replace old vehicles with new ones.

### HYBRIDS

A hybrid driveline cleverly exploits the benefits of different engine types and energy-storage systems. One example is that the hybrid engine can store up the braking or retardation

energy created as the vehicle slows down, and can then release this energy when it is time to accelerate the vehicle. The Volvo Group considers that hybrid technology is one of the most promising and competitive technologies for heavy duty vehicles. The battery is a crucial part of a hybrid solution, with lifetime and weight being the key to battery price. The Volvo Group is taking an active role in the development of efficient new batteries.

### FUEL CELLS

Fuel cells may be the power source of the future for heavy duty vehicles. In a first stage, fuel cells can be used to drive auxiliary systems, but further down the line they may constitute the vehicle's main power source. The technology involves converting chemical energy into electrical energy. The fuel for the fuel cell normally consists of hydrogen and oxygen, and the exhaust residues consist solely of water. Production, transportation and storage of hydrogen gas in an efficient way are crucial to the future of the fuel cell. In 30 to 40 years, perhaps, fuel cell systems will be so efficient that they will be able to be used to power heavy duty vehicles on a larger scale.



# APPENDIX B

IMPROVING FLEET MANAGEMENT  
AND VEHICLE ROUTING



## RAPTOUR: INTELLIGENT VEHICLE ROUTING AND SCHEDULING

Carriers performing local deliveries in cities are under enormous pressure as they face increasing demands from customers while having to operate in more congested traffic systems. Recently, there has been a considerable increase in the demand for 'direct delivery' of less than full truckload transport services within time periods specified by the shipper or the receiver. Orders are being placed later and delivery time windows are becoming narrower. Traffic levels are rising with increased congestion, reducing the number of deliveries that can be undertaken.

Multi-drop deliveries within urban areas are becoming more common and complex. These typically consist of runs of rigid trucks or light commercial vehicles from a depot to a number of specific locations. Consignments consist of either a small number of pallets or parcels. Delivering goods directly to homes is a recent trend as a result of the growth in e-commerce and the ageing populations living in urban areas.

The Raptour method of representing the uncertainty of travel times between customers is based on the amount of time that a vehicle

arrives at a customer site before the end of the time windows. Spare time is incorporated within the optimisation procedures as an indirect benefit. The net result is lower fuel consumption and fewer empty kilometres.

Current vehicle routing and scheduling (VRS) procedures often fail to provide adequate information for distribution managers to assist them to lower their costs in dynamic operating environments. Intelligent VRS procedures can provide additional information that will assist distribution managers cope with change. Existing procedures do not account for the uncertainty and variability of travel times experienced by vehicles operating in urban traffic networks. The concept of 'spare time' is the basis of determining more robust solutions to accommodating unexpected traffic congestion than the current methods provide.

The VRS process gets the customer orders grouped into truck runs and then a delivery sequence is determined. VRS largely determines the transport costs for carriers and the level of service provided to both shippers and receivers of goods.

The VRS process provides significant savings in transport costs: short payback periods are typical. The systems generally lead to lower operating costs through reduced distances travelled on road and through lower fuel usage. Reduced fixed costs may also be possible with more efficient routes requiring fewer vehicles.

Typical fleet cost reductions have been in the order of 20%–30%. Raptour purports to be a good tool to assist with network and fleet reviews, and even the implementation of Performance Based Standards within a current network.

*Typical fleet cost reductions  
have been in the order  
of 20%–30%.*

## K & S FREIGHTERS: MEPATANKERS

K&S (Kain and Shelton) was founded in 1945, in Mt Gambier, South Australia. Originally established to transport timber, K&S soon expanded to support other industry segments. In 1972, the business was acquired by Alan Scott and, after its public listing in 1986, has grown to become one of Australia's and New Zealand's true national multi-modal providers of transport and distribution services.

K&S's core business is in the management of complex supply chains where linehaul and local transport, export, wharf cartage, bulk transport and storage play key roles. Supply-chain design philosophy is built around the principles of simplicity, integration and partnering arrangements that continually drive improvements.

The company reviewed world's best practices during extensive visits throughout North America and Europe in the late 1990s. It studied the transportation of finished newsprint paper

and the input of manufacturing materials to paper manufacturing sites. The practice of using 'barrel tankers' to cart liquid product for manufacturing requirements with the unit then running empty to repeat this process was seriously challenged. The aim was to find a way to utilise the vehicle productively travelling in both directions. With the aid of its local trailer manufacturers and expertise from Europe, the concept of the Mepa (meaning, 'round trip') tanker was formed.

After much design work and obtaining necessary permits from government authorities the first B-double Tautliner Mepa Tanker was brought into operation in 1999. It transports liquid product to a customer's manufacturing site each day and loads out with finished product on the return trip. It is estimated that 150,000 km in empty travel each year has been avoided since its introduction.

Based on its success, a second unit was built in 2001 but this was a B-double flat top Mepa

tanker. As with the first unit, its purpose was to transport liquid product in one direction and finished product on the return journey. However, the second unit's operational scope involved two customers rather than one. Liquid product was transported on behalf of the first customer and, when unloaded, finished product loaded on behalf of the second customer. As much as 100,000 km of empty travel each year was avoided through this innovation. Over eight years it equates to 800,000 km and 525,000 litres of fuel saved from unproductive journeys. This unit still operates in its original form.





A close-up photograph of a diamond-shaped sign. The sign is white with a black border and is mounted on a dark surface. The text on the sign is in bold, black, sans-serif font. The word "Please" is positioned above the words "DRIVE SAFELY". The sign shows signs of wear, including some dirt and small holes.

**Please**  
**DRIVE SAFELY**