Used Oil Recovery, Reuse and Disposal in New Zealand

Issues and Options
Foreword

Used oil is an issue in which organisations and some individuals in New Zealand have invested considerable time and energy over recent years. Since the mid-1990s, the major oil companies have operated used oil recovery networks based on service station forecourts. Milburn Cement has developed the capacity to burn used oil as a replacement fuel. More recently, interest groups have co-operated on guidelines for the safe management and handling of used oil.

Regionally, several councils have surveyed and addressed used oil issues in their areas. Council papers on road oiling and on broader used oil issues have been important in fleshing out our understanding of these issues.

In addition, the Ministry for the Environment has had information and advice from dozens of individuals and organisations, from vegetable growers and sellers of burners, used oil transporters and processors, local and regional council staff, and oil company representatives. Openness of discussion and generosity with time have characterised the work on used oil.

This paper pulls together the various dimensions of the used oil life story: recovery, handling, reuse and disposal. We have described the range of used oil issues as we see them, and proposed some solutions. In particular, we’re looking for balance between the national consistency sought by many of the groups involved in used oil management, and the regional variation valued by others.

Used oil recovery is complex – we are not aware of any country where policy development has been easy. While much has been achieved in New Zealand since the early 1990s, there is still scope for improvement in a number of areas.

The document is intended as a basis for discussion on options for improvement. We thank the individuals and groups who have already provided so much information. We hope that interested parties will continue to work together openly and that constructive debate will lead to sound policy solutions.

Denise Church
Chief Executive
Ministry for the Environment
# Contents

**Executive Summary**  
Used oil recovery and handling  
Policy options  

**Chapter 1: Introduction**  
Aim  
Definition  
Why is used oil an environmental problem?  
Contaminants  
Reuse and disposal options  
Best environmental disposal options  
International practice: what do other countries permit?  
Management issues  

**Chapter 2: Recovery Issues**  
Used oil recovery in the 1990s  
Safety and management issues  
Limitations of the recovery network  
Models for used oil recovery  
Conclusion  

**Chapter 3: Burning Used Oil**  
Why is burning used oil an environmental issue?  
Current regulation and national guidance  
Impacts of burning used oil  

**Chapter 4: Road Oiling**  
What is road oiling?  
Why is road oiling an environmental issue?  
Known receiving environments  
Current regulation relating to road oiling  

**Chapter 5: Options for Managing the Effects of Used Oil**  
Policy tools  
National, regional or local policy making?  
The national perspective  

**Summary of Questions**  
Recovery issues  
Burning issues  
Road oiling issues
Executive Summary

Used oil has been the subject of much debate over recent years. Issues of concern have included the effectiveness of used oil recovery systems, safety and handling issues, and the appropriateness of putting used oil on roads as a dust suppressant and burning it at low temperatures.

Used oil is the single largest non-watery liquid waste stream in New Zealand – an estimated 30 million litres are generated each year. During use, oil becomes contaminated with a number of substances that are hazardous to human health and the environment. New Zealand lacks an adequate management structure to ensure that all used oil is used, stored or disposed of in such a way that it does not cause environmental damage or harm to human health.

Substantial markets for used oil already exist and a considerable amount of used oil is collected for reuse in a number of ways. The markets don’t ensure that all oil is collected, and we cannot adequately account for nearly a third of the used oil that we know exists. Also, we lack confidence that the purposes for which oil is recovered are safe for human and environmental health.

This paper addresses the management of used oil in New Zealand. It outlines the recent history of used oil management in this country and the issues that now surround its management, and it seeks feedback on potential policy options.

Used oil recovery and handling

There has been considerable uncertainty over the safety requirements applying to used oil collection and storage. Guidelines for the management of used oil being published in December 2000 are intended to resolve this uncertainty. While we have the nucleus of a good recovery network for used oil, a number of improvements are necessary. The present recovery network is a good basis for an expanded voluntary service, although other options exist.

An environmental consultant company, Woodward-Clyde, has modelled the environmental effects of burning used oil at low temperatures and using it as a dust suppressant. The modelling uses particular scenarios and particular oil profiles, so the results apply directly only to those scenarios, though the results can be used to extrapolate for different scenarios.

The air modelling results show that an oil which conforms to United States Environmental Protection Agency specification for used oil, burned under specific circumstances, in a correctly operated burner will not emit air pollutants at levels beyond those specified in the Ministry for the Environment’s Ambient Air Quality Guidelines. No assessment of health effects has been carried out because the effects of burning used oil under these circumstances are deemed to be within 66 percent of the Ministry’s guideline values.

These results do not consider:

- the cumulative effects of a number of burners operating under these conditions
- the effects when burners are incorrectly operated
- the effects when the contaminants in the oil burned exceed the USEPA specifications.

The results of the modelling of road oiling indicate some effects that are unacceptable for human and environmental health. It is possible that road oiling could be carried out in such a way that it does not pose a significant risk to either human health or wider environmental health. This would require tightly controlled conditions, the most important of which would be control over the type and level of contaminants in the oil.

**Policy options**

Overall, if used oil is used for road oiling and for burning at low temperatures, a number of controls are necessary to reduce the risks of harm to human health and the environment. The policy options considered in this paper are:

- a national network for used oil collection
- an oil specification for used oil to manage contaminants
- accreditation of used oil processors
- national environmental standards for used oil
- national guidelines for used oil.

The paper concludes with a range of questions aimed to encourage feedback on key issues.
Chapter 1: Introduction

Aim

Used oil is the single largest non-watery liquid waste stream in New Zealand – an estimated 30 million litres are generated each year. During use, oil becomes contaminated with a number of substances that are hazardous to human health and the environment. We want to ensure that all used oil is utilised, stored or disposed of in such a way that it does not cause environmental damage or harm to human health.

Used oil can be reused in a number of ways, and substantial markets for the product already exist. A considerable amount of used oil is collected for reuse. However, the markets do not ensure that all oil is collected, and we cannot adequately account for nearly a third of the used oil that we know exists. On their own, the markets for used oil are also unable to ensure that the use to which oil is put is safe for human and environmental health.

Used oil poses a major environmental and human health concern in New Zealand because:

- there is a large volume of used oil generated each year
- many contaminants in used oil are extremely harmful
- a significant proportion of New Zealand’s used oil is unaccounted for each year and probably entering the environment in unacceptable ways
- there are environmental concerns over some of the known ways in which used oil is being used
- New Zealand has lacked effective recovery systems and management protocols for used oil.

Work on used oil is, therefore, a priority within the Ministry for the Environment’s Pollution and Waste Group.

Used oil has been the subject of much debate over recent years. Issues of concern have included the effectiveness of used oil recovery systems, safety and handling issues, and the appropriateness of putting used oil on roads and using it for low temperature burning. Some matters have seemed particularly complicated because several different authorities have overlapping responsibilities for used oil management, ie, Occupational Safety and Health and the Chief Inspector of Dangerous Goods, the Environmental Risk Management Authority, territorial local authorities, regional councils and the Ministry for the Environment.

---

2 Based on the nearest estimate of the Used Oil Recovery Group, March 2000.
As the Ministry has worked through issues with various groups over the past two years, there has been a clear request for certainty and consistency in rules applying to used oil. Given the mix of authorities involved, the Ministry cannot deliver that certainty alone. We can lay out the issues as we see them, provide firm answers on issues that have been clarified over the past 12 months, and suggest options for resolving or managing many of the remaining issues.

This paper addresses the management of used oil in New Zealand. It outlines the recent history of used oil management in this country and the issues that now surround its management, and it seeks feedback on potential policy options. The policy options that we consider in this paper are:

- a national network for used oil collection
- an oil specification for used oil to manage contaminants
- accreditation of used oil processors
- national environmental standards for used oil
- national guidelines for used oil.

**Audience**

The issues discussed in this paper will be of particular interest to:

- people working in industries that deal with oil and used oil – this includes people who sell, collect or use significant quantities of oil and/or used oil
- regional and district councils responsible for producing plans under the Resource Management Act 1991 (RMA) to control the environmental effects of activities in which used oil is a factor
- people and groups who are concerned about the environmental effects of the use of used oil.

**Feedback**

We are seeking your comments as a preliminary step towards establishing a sounder policy structure for used oil. A series of key questions are included at the end of each chapter, and summarised at the end of Chapter 5, but we welcome comments on other aspects of used oil management. Feedback should be addressed to:

Alison Handley  
Pollution and Waste Group  
Ministry for the Environment  
PO Box 10-362  
Wellington  
(04) 917 7485  
alison.handley@mfe.govt.nz

The deadline for written or email feedback is 1 March 2001. We will also be holding meetings with interested parties, probably in February 2001. We will be reporting to the Minister for the Environment in mid-2001. The Minister will then decide which recommendations to pursue.
Definition

In this paper used oil is defined as mineral or synthetic oil contaminated by physical or chemical impurities through use as a lubricant, or similar function, to the point where it is no longer fit for its original purpose. Its chemical composition will vary according to source and purpose, and the use to which it has been put.

Why is used oil an environmental problem?

Large waste stream

Used oil is a major liquid waste stream in New Zealand. Each year New Zealanders use approximately 60 million litres of lubricating oil in petrol and diesel engines and hydraulics, and in various industrial processes (hydraulic and gear systems, industrial engines, metalworking and process oils). Between 40 and 60 percent of this amount is consumed or lost during use. The rest, an estimated 30 million litres a year, is contaminated with a variety of substances, depending on the use of the virgin oil.

Contamination usually renders oil unusable in its original application. Re-refining, reprocessing or disposal is required. Of the approximately 30 million litres of used oil that requires management each year, the Ministry is aware of the destination of approximately 21 million litres. This leaves approximately 9 million litres that may be being disposed of into the environment in an unsafe or inappropriate manner.

Diagram 1 shows the known patterns of distribution, use, collection and reuse of lubricating oil in New Zealand. Minimum quantities for some uses are known or can be estimated to a reasonable degree of certainty, but for some categories we can only make broad assumptions.
Diagram 1: Used oil pathways

**Pathways for Lubricating Oil in New Zealand**

**Imported/Refined/Distributed By**
- Specialist oil companies
- Major oil companies
- Direct importers
- Specialist motor dealers
- Major store chains

**Retailed/Used In/Sold Through**
- Industry
- Garages and workshops
- Service stations
- Specialist car and auto parts dealers
- Chain stores and supermarkets

**Estimated 300 million litres used oil should be available for pick up**
- Lost oil - dumped, landfilled, stored

**Used Oil Available for Pick Up**
- Garages and workshops
- Industry sites
- Service stations (used oil drums for public)
- Landfill and refuse transfer station collection points

**Used Oil Transported By**
- Independent transporters
- Transports contracted for used oil recovery through major oil companies
- Re-refiners and re-processors of oil
- Small business & individuals

**Some Oil Reprocessed By**
- Waste Petroleum Combustion Ltd
- Alpine Oil
- Bens Oil
- New Zealand Marine
- Industrial oils (Glydol)

**End Users**
- Small business & individuals
- Asphalt plants
- Milburn New Zealand Ltd (cement kiln)
- Industry and horticulture for use as fuel oil
- Reused as lubricant by industry

*These organisations process only very small quantities of lubricating oil.*

(33 million litres per year)
Contaminants

Used oil is made up primarily of hydrocarbons, but also contains various additives, which boost its performance in particular applications. The amount and type of additives vary with the intended use of the oil. Hydraulic oils, for example, contain very few additives, whereas lubricating oils typically contain 10 to 20 percent by volume. Some of these additives can be harmful to human health and the environment, while others are harmless.

Used oil also contains physical and chemical impurities due to physical contamination, chemical reactions and wear occurring during its use. For example, the additive lead tetraethyl decomposes to lead, polycyclic aromatic hydrocarbons (PAHs) are formed by incomplete combustion of organic matter, such as oils, and heavy metal particles are introduced through wear. It is these contaminants, rather than the oil itself, which are of concern when oil is burned in particular ways or used on roads. When used oil is re-refined or reprocessed, the contaminants are not destroyed, but accumulate in the waste sludge. The contaminants render this oily sludge highly toxic.

There is wide variation in the properties of, and contaminants in, used oil. Table 1 shows the principal contaminants. There are other potential contaminants.

Table 1: Principal contaminants in used oil

<table>
<thead>
<tr>
<th>Metals</th>
<th>Chlorinated hydrocarbons</th>
<th>Other organics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>Dichlorodifluoromethane</td>
<td>Benzene</td>
</tr>
<tr>
<td>Antimony</td>
<td>Trichlorotrifluoromethane</td>
<td>Toluene</td>
</tr>
<tr>
<td>Arsenic</td>
<td>1,1,1-Trichloroethane</td>
<td>Xylenes</td>
</tr>
<tr>
<td>Barium</td>
<td>Trichloroethylene</td>
<td>Benz(a)anthracene</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Tetrachloroethylene</td>
<td>Benzo(a)pyrene</td>
</tr>
<tr>
<td>Calcium</td>
<td>Total chlorine</td>
<td>Naphthalene</td>
</tr>
<tr>
<td>Chromium</td>
<td>Polychlorinated biphenyls</td>
<td>Other PAHs</td>
</tr>
<tr>
<td>Cobalt</td>
<td></td>
<td>Sulphur</td>
</tr>
<tr>
<td>Copper</td>
<td></td>
<td>Nitrogen</td>
</tr>
<tr>
<td>Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silicon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulphur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The effects of the contaminants in used oil on human health and the environment include, but are not limited to, those described below. The effects of any particular used oil will depend on the levels and types of contaminants present in the oil.
Human health effects

The contaminants in used oil can induce a variety of illnesses and diseases in humans and other mammals through inhalation, ingestion or skin contact. Observed effects include lipid pneumonia, lipid granuloma in the lung, eczematous and contact dermatitis, folliculitis, oil acne, and melanosis. Used oil can induce cancer, principally squamous cell cancer of the skin and scrotum, bladder and liver cancer. These effects can be attributed largely to the presence of PAHs in used oil; benzene, toluene, and chlorinated solvents can also contribute to this toxicity.³

PAHs are formed by incomplete combustion of organic matter, such as oils. Seven PAHs⁴ have been classified as probable human carcinogens. PAHs are generally rapidly absorbed upon inhalation, ingestion or exposure through the skin.

Heavy metals tend to concentrate in the environment (eg, in plants, animals and aquatic species), and humans may come into contact with them, causing a wide range of illnesses such as cancer, anemia, skin ulcerations and cardiovascular disease.⁵ Considerable concern about the health effects of lead, which was present in worrying quantities in some parts of the New Zealand environment, led to it being phased out of petroleum in 1996. As lead levels in petrol have declined to trace amounts, so too have the quantities usually found in used lubricating oil. Particularly harmful metals that remain, to varying degrees, in used oil include arsenic, cadmium and chromium.

Particulates produced by burning used oil can aggravate and cause respiratory problems, and can result in the loss of lung function, loss of ability to resist infection, and death. Sulphur dioxide and nitrogen dioxide are also produced by burning used oil, and can have serious adverse respiratory effects.

Combustion of fuel containing carbon and chlorine can produce a wide range of organochlorine compounds. These can include 17 dioxins and furans, which pose a risk to human and environmental health. Toxic responses include skin toxicity, immunotoxicity, carcinogenicity, and adverse effects on reproduction, development and endocrine functions.⁶

Polychlorinated biphenyls (PCBs) are principally found in used transformer oils, but it is believed that there are now very low levels of PCBs remaining in New Zealand oils. Although the incidence of PCBs in used oil is low, the health effects from exposure are very serious. PCBs are highly persistent and can accumulate to high levels in human tissue. This can cause serious health effects, including liver damage, respiratory problems, cancer promotion, endocrine disruption and neurotoxicity.

⁴ Including benzo(a)pyrene.
⁵ Worley, 1999, Appendix 4, pp.5-6.
Ecotoxic effects

Animals and aquatic organisms will share some of the human health effects caused by used oil contaminants. Observed effects include acute toxicity in aquatic organisms as a result of poisoning by arsenic, cadmium, chromium and zinc; acute toxicity in fish, and tumours, caused by mixtures of PAHs; and a range of illnesses affecting fertility, reproduction, the immune system and growth caused by PCBs and dioxins.7

For some substances found in used oil, such as mercury, PCBs and organochlorines, the main issue of concern when released into the environment is not their short-term toxic effect but the risks associated with their bioaccumulation in organisms and the potential for secondary poisoning.8

Oil contaminants also have a range of properties poisonous to plants. Heavy metals, such as cadmium, arsenic and chromium have been shown to cause direct toxicity to plants. Deterioration of foliage and plant growth are caused by nitrogen dioxide and sulphur dioxide, as well as physical smothering by oil or by the particulates generated by the burning of oil.9 Oil floating on the top of water can prevent the penetration of oxygen into water, adversely affecting aquatic life.

Reuse and disposal options

The management options for used oil10 include re-refining, reprocessing and various forms of disposal. Available evidence indicates that greater quantities of used oil are being recovered in New Zealand than was the case five years ago. The principal reason for this appears to lie in the economic value of the oil; there are costs associated with collection and processing, but the raw material is often free for those who wish to collect it.

Re-refining

The re-refining process involves the removal of impurities, defects and products of use so that the oil can be used again as a lubricant.11

Until 1998 the Dominion Oil Company was re-refining approximately seven million litres of used oil at its Auckland refinery, for reuse as a vehicle lubricant. The plant closed down in mid-1998 because of poor economic viability and ongoing difficulties controlling the environmental effects of the operation, such as odour.

---

7 Worley, 1999, Appendix 4, pp.5-8.
8 ANZECC, March 2000, p.89.
10 This paper does not consider upstream activities which improve the efficiency of oil use, and therefore, reduce the rate at which oil becomes ‘used’.
Although used oil is re-refined in a number of countries, the cost of setting up a new plant which meets environmental controls is very substantial. The key difficulties in re-refining used oils are controlling emissions and destroying highly toxic residues. Relatively small volumes and increased specialisation of the oil market mean that re-refining the bulk of used oil is unlikely to be viable in New Zealand under current conditions.

Niche markets for re-refined oils do exist. One Christchurch company re-refines specialist industrial oils, such as hydraulic oils, for resale to industry. Most transformer oil in New Zealand is also re-refined, both because it is comparatively expensive, and so it is not mixed with other oils. It is generally reprocessed to a high degree so that it can be reused in the same application.  

Reprocessing

Reprocessing generally involves filtering or gravity separation to remove contaminants from used oil, to produce partially cleaned fuel oil. Treatment options range from basic sediment removal through to the use of chemicals.

A number of processors operate in New Zealand. The degree to which the oil is processed differs from one processor to another, and may differ for different types of oil. Some processors in New Zealand are removing only the water fraction, while others are removing a greater number of contaminants to provide a cleaner grade of oil. In New Zealand reprocessed oil is usually used as a fuel in various types of burners.

While processors should be complying with resource consents issued by councils for discharges from their own premises, there is currently no legal requirement that their oil product must conform to any particular specification. The Chief Inspector, Explosives and Dangerous Goods has recently promulgated a policy guideline for the treatment of used oil under the Dangerous Goods Class 3 – Flammable Liquid Regulations 1985. The guideline adopts a fuel specification based on that used by the United States Environmental Protection Agency (USEPA). Adoption of the fuel specification is a means of controlling the flashpoint of used oil, by ensuring used oil doesn’t contain contaminants with low flashpoints, such as solvents, and removing solid particles, which could clog burners.

As with re-refining, reprocessing produces toxic residues, usually in the form of sludge, which require special handling and disposal.

---

12 The techniques for processing transmission oil have variable effects on the environment. The acceptability of one technique, which uses a clay known as fuller’s earth to remove contaminants, is waning as conditions for disposal to landfill become more stringent. The technique is still used in New Zealand, but disposal of the contaminated clay by-product is likely to become an issue.


14 USEPA, United States Code of Federal Regulations, Title 40 Part 279.
Burning

Burning oil is a form of energy recovery. When used as a substitute fuel, principally for coal, diesel and light fuel oil, used oil has an economic value and need not be regarded as a waste.\textsuperscript{15}

A number of different burning applications for used oil exist in New Zealand, distinguishable partly by the temperature at which they burn, and partly by the control technology they use to reduce environmental effects. In some burning applications, such as cement production, ash residues are incorporated into the final product. In other applications, residual ash is a waste that requires special handling. In all applications, emissions to air and the disposal of waste products must be considered carefully to ensure they are not harmful to human health and the environment.

The appropriateness of burning used oil at low temperatures has been one of the issues of serious debate. This issue is covered in Chapter 3.

Road oiling for dust suppression

Used oil is applied to unsealed roads as a dust suppressant in some parts of rural New Zealand. While it has been the subject of some debate, previous reports have not provided clear evidence that the practice should be controlled.\textsuperscript{16} Although alternative dust suppression products exist, comments from councils suggest that they are judged to be more expensive and less effective than used oil.

As with burning, some people refer to the use of oil as a dust suppressant as waste disposal. While there is value in this activity for some people, it should also be recognised that in some parts of New Zealand used oil is dumped on roads as a convenient disposal route. Whatever the reason for pouring oil on roads, this is a discharge of a contaminant to the environment under Section 15 of the Resource Management Act, and as such, may be done only under a rule in a plan, or with a resource consent.

Work on this issue is addressed in Chapter 4.

Disposal

This paper does not specifically define used oil as a waste product, as a number of healthy markets for this product have been identified. For some people used oil is a waste, and getting rid of it is their only concern. If they dispose of it to landfill or into waterways, it is definitely a waste. If they pass it on to someone else who regards it as a resource, it is not a waste.

\textsuperscript{15} Although fossil fuels contribute to global warming, we accept that used oil is largely being burned in place of other fossil fuels, rather than renewable energy sources.

Disposal routes include landfills, stormwater and wastewater drains. These are not environmentally acceptable routes. Oil in landfills, as with any liquid, contributes to the formation of leachate, which has the potential to contaminate water and soil if incorrectly managed. Oil discharged into stormwater drains directly contaminates waterways, and it interferes with the efficiency of the wastewater treatment plant.

**Landfills**

Some landfills and transfer stations have collection facilities for small quantities of used oil, but many do not. Where facilities exist, and where we are aware of the quantities collected, these vary between less than 2000 litres per annum at some small landfills, and approximately 36,000 litres per annum over three transfer stations in Christchurch City. It is impossible to estimate the quantity of oil being disposed of in landfills, particularly as many landfills are not staffed, or have poor controls on the types of waste being deposited. Unfortunately, it is often at landfills in rural districts that controls are less stringent, and there is no used oil collection system available.\(^{17}\)

The recently revised CAE *Landfill Guidelines*\(^{18}\) detail best practice for landfill management. They recommend the provision of facilities at landfills for the collection of hazardous and special wastes, such as used oil.

One possible route for used oil to landfills is through used oil filters. An oil filter can contain approximately 500 ml of oil, unless it has been well drained. Some oil filters are sent to landfill, and some are sent to metal recyclers, but no information is available about the relative disposal quantities. Many mechanics do drain oil filters, but used oil filters may still account for a proportion of the used oil which is unaccounted for in New Zealand. The Motor Trades Association is aware of the need to educate members about oil collection and disposal, and will include information about oil filters in the material they are preparing on environmental management for their members.\(^{19}\)

\(^{17}\) The lack of a collection system is often the reason that no facilities exist at landfills.

\(^{18}\) Centre for Advanced Engineering, May 2000, p.27.

Is used oil a hazardous waste?

While used oil is not always a waste, some used oils could be described as hazardous substances because of the contaminants accumulated during use. No New Zealand legislation consistently describes whether used oil is hazardous. When the Hazardous Substances and New Organisms (HSNO) Act is fully functional\(^{20}\) it is possible that many virgin oils will be classified as hazardous substances. These oils will come under the control of the HSNO Act. In the transitional period\(^{21}\) all used oil will be treated as a hazardous substance because of its status as a Dangerous Good. The Dangerous Goods provisions apply until used oil is assessed and its long-term status is determined by the Environmental Risk Management Authority (ERMA).

Used oil will almost certainly be included in the definition for hazardous waste being developed within the Ministry for the Environment’s Hazardous Waste Programme. Companies managing used oil, and adhering to the newly introduced *Guidelines for the Management and Handling of Used Oil* (see Safety and Management Issues, Chapter 2) will be part of the hazardous waste definition trial.

Most of the sludges produced by processing oil to remove contaminants will be regarded as hazardous wastes, and as such, will require careful handling and disposal. Used oil sludge will contain, in varying quantities and concentrations, heavy metals, PAHs, straight-chain hydrocarbons, and sulphur and nitrogen compounds. It may contain other harmful contaminants, such as PCBs, depending on the previous use of the oil. The more rigorous the method of processing, the more toxic the sludges are likely to be. At present the exact distinction between hazardous substances and hazardous wastes is unclear, but there is little doubt that the sludges should be regarded and managed as hazardous.

Water

Used oil creates a hazard in water because it contains a number of contaminants which have the potential to dissolve in water. This makes the contaminants more available for uptake by plant and animal life. Metals such as arsenic, cadmium, chromium and lead will settle in sediments and persist in the environment indefinitely. The oil itself is a visual pollutant when it floats on the water, and drinking water is rapidly tainted by the taste of oil.

Reports from council officers suggest that dumping of used oil into water is a problem in some districts. In one district in particular, used oil is being tipped into the wastewater system, and is finding its way into sewage treatment facilities. This interferes with the efficiency of the sewage treatment plant. In a number of places in New Zealand wastewater treatment facilities are inadequate for coping with this type of waste.

---

\(^{20}\) This is expected to occur in late 2000.

\(^{21}\) The transitional period starts when the HSNO Act becomes fully functional.
Best environmental disposal options

In 1996 CONCAWE22 produced a report on collection, processing and disposal options in Europe. One of its overall findings was that ‘the savings of crude oil use and CO₂ emissions from collecting and disposing of used oil in some beneficial way is greater than the difference in these factors between the various disposal options. It is therefore more important in the first instance to ensure that this oil is collected and safely disposed of rather than to specify any particular disposal option’.23

The used oil collection system in New Zealand is discussed in Chapter 2.

In regard to various disposal options, the CONCAWE report described direct burning in cement kilns as having negligible environmental impact, while road oiling and direct burning in space heaters were described as having potential for localised adverse environmental impact.

A Belgian study24 of the Best Available Technology treatment options for waste oil found that re-refining and burning in blast furnaces are the preferred options. Next best are the closed-loop recycling of industrial oils, co-combustion in cement kilns, and use as fuel in a hazardous waste incinerator.25

A recent life-cycle assessment on used oil carried out by Ecobilan for the French environment agency concluded that burning used oil in cement kilns is the best environmental use in France. The study compared the impacts of high and low temperature burning and re-refining.26 The findings are applicable to New Zealand, but careful comparison would have to be made with New Zealand conditions before a similar conclusion could be drawn.

International practice: what do other countries permit?

European Union

The European Union’s policy for waste oil is set out in Waste Directive [19]75/442. The disposal priority is regeneration, followed by combustion.27

---

22 This is an acronym for the Oil Companies’ European Organisation for Environment, Health and Safety.
Belgium

In the Flemish region of Belgium most used oil is used as a fuel in cement kilns, hazardous waste incinerators and blast furnaces. The burning of used oil in space heaters and asphalt mixing plants has been illegal since January 1999.

British Columbia

In 1999 the British Columbian Government set restrictions on the use of waste oil. It allows the use of used oil for dust suppression, but only under prescribed conditions, and using oil that complies with a given specification. It also applies oil specifications to the burning of used oil as a fuel, with different specifications for burning in a cement kiln\(^{28}\) and burning in any other application. The contaminant levels allowed for burning in other applications are lower, and sometimes significantly lower, than those allowed for burning in cement kilns.

Australia

The Commonwealth Government in Australia is providing transitional assistance to ensure the environmentally sustainable management, re-refining and reuse of used oil, and the development of stewardship arrangements.\(^{29}\) Individual state governments currently have their own controls on the use of used oil.

United States

The USEPA has regulations for Standards for the Management of Used Oil. Within these regulations the burning of used oil is subject to a comprehensive set of process controls unless it can be shown that the used oil falls within set specifications for contaminant levels.\(^{30}\)

In 1995 the National Oil Recyclers Association (NORA) of America was instrumental in getting a specification for industrial-grade reprocessed fuel oil (RFO) approved by the American Society for Testing and Measurement (ASTM). The specification is a national standard. Industrial burners are now able to request ASTM reprocessed fuel oil using one of four grades and can be assured they are receiving a consistent product that the industry has approved for their industrial uses. Recyclers also have the opportunity to meet an ASTM standard that has been scrutinised by their industry and the burner community.\(^{31}\)

---

\(^{28}\) The regulations do not list the applications which comply with the category of ‘cement kilns’ but personal communication with the controlling authority indicates that lime kilns and other high temperature applications are included.

\(^{29}\) Environment Australia, 1999, p.v.


New Zealand

New Zealand has a mixture of national regulation and legislation covering used oil, but not specifically in relation to environmental standards. There is some confusion among used oil users, collectors, processors, and regional and local councils over the ways in which used oil should and should not be used. Along with uncertainty about the environmental effects of burning and road oiling, this has resulted in inconsistent rules, and application of rules, in regional plans. In the case of road oiling, this is a permitted activity in some parts of the country, while prohibited in others.

In the case of burning used oil, various different rules in regional plans apply, but anecdotal evidence indicates that rules are not always enforced. This is partly because council officers may be unsure of the environmental effects associated with used oil, and partly because they may not have the resources to oversee all burners utilising used oil. The small size of many used oil burners, and therefore, the relatively small emissions they generate, means they may not be mentioned in an air plan, or may be ignored in favour of larger burners unless they are creating a significant nuisance. This confusion has led to calls for some kind of national standard to be established so that consistent rules can be applied across the country.

Management issues

In the process of investigating the management of used oil, a number of issues have arisen. Some of these are addressed in this paper, while others require further work and consultation with relevant parties. Diagram 2 summarises the main issues and some options for used oil management.

Diagram 2
We believe the key characteristics of an effective used oil management system are:

- maximum recovery of used oil, within the bounds of economic, environmental and practical feasibility
- safe and environmentally sound methods of used oil collection, processing, reuse and disposal
- clearly defined roles and responsibilities for those involved in used oil management
- a level playing field in the markets for used oil.

Do you agree with these characteristics? Are there other objectives that should apply to an effective used oil management system?

This chapter provides an overview of the major issues relating to used oil. Are there other issues that should be considered?
Chapter 2: Recovery Issues

This chapter reviews the recent history of used oil recovery in New Zealand, identifies current issues, and looks at options for resolution. Underlying this chapter is the notion of product stewardship as a preferred way of assigning responsibility for used oil management and collection.

Principles

There are a number of principles that can assist in assigning responsibility for waste products. Relevant principles are as follows:

- **Polluter pays.** This principle is self-evident, but it is not always clear who the ‘polluter’ is (manufacturer, importer, retailer or end user) or what they should pay for. It is appropriate for end users to pay for the disposal of some forms of waste, but applying user charges to high-risk wastes may be less appropriate. To reduce the risk of illegal disposal, a levy further up the customer chain might be a better way of funding disposal.

- **Extended producer responsibility.** This principle requires manufacturers to take a life-cycle approach to their products. For example, they can ensure that components are recyclable, made from renewable materials, and/or can be taken back for dismantling at the end of their life. It is difficult to apply this principle across countries, as recycling and take-back systems differ, and any legislative base for these systems is not enforceable outside the country of origin. In this case, the ‘producer’ responsibility could be taken by the importer.

- **Stewardship.** This is a relatively new term, which we take to impose a duty of safe care on those producing, retailing and using environmentally harmful products. The nature of the duty may vary according to the operator; those at the production end who know the environmental risks have a responsibility to ensure that appropriate information is passed down the chain, including provision of information about disposal. End users are responsible for seeking out safe disposal routes. Responsibility for collection and recovery networks may be a matter of negotiation, but should be organised at the most practical point in the chain. The costs of stewardship will usually be built into the final cost of the product, signalling the environmental cost of the item to the end user.

In our view, stewardship is the most useful principle to apply to products such as used oil. It implies that any or all of those in a chain of production and use can be expected to take responsibility appropriate for that point in the chain. Used oil recovery and management in New Zealand already reflects some aspects of the stewardship principle.
Used oil recovery in the 1990s

Used oil emerged as an environmental issue in the early 1990s, with expressions of concern coming from the Local Government Association and individual councils, the major oil companies, the Parliamentary Commissioner for the Environment, and the Motor Trades Association.

In 1992, New Zealand was believed to be consuming 60 to 70 million litres of oil a year. Thirty to thirty-five million litres should have been available for recovery, but only 10–12 million litres was being recovered. Lack of collection and disposal facilities for used oil and a lack of demand for re-refined oil were identified as problems. Comments from councils illustrated the extent of the problem; one council was storing 11,000 litres, and oil slicks were visible on waterways in some places.

In 1992 the Government announced its Waste Policy. This emphasised the waste reduction hierarchy (reduction, reuse, recycling, recovery and residual management), placed responsibility on the generators of waste for waste reduction, and identified specific industries, including oil suppliers, with which the Ministry for the Environment was to negotiate waste reduction targets.

The major oil companies, except for Mobil, had already formed themselves into an industry group, and developed a proposal for a co-ordinated national collection system. The programme was to meet the Dominion Oil Refinery’s need for used oil and the remainder would be sent as fuel to Milburn Cement Ltd. The Used Oil Recovery Programme was launched in 1996, with the aim of recovering 50 percent of recoverable used oil in its first year and 95 percent by 2000. Mobil Oil established its own recovery programme. Both programmes have provided free pick-ups for major clients (such as large workshops), and provided plastic igloos on some service station forecourts for the home mechanic.

In retrospect, the target pick-up rate of 95 percent was very optimistic. Almost from the outset, it was apparent that the rate would not be met. Despite the best intentions of the people involved, the collection networks would not meet the expectations of many of the stakeholders. Concerns about the safety of used oil management and handling, gaps in the collection network, a poorly organised funding system leading to inequalities in responsibility amongst oil suppliers and lack of a co-ordinated promotion scheme, and loss of oil to other industries seemed to be the key problems.

Safety and management issues

Concern about the viability of used oil recovery programmes was raised in 1998, when the Chief Inspector, Explosives and Dangerous Goods, Kim Comben, declared used oil a Dangerous Good, Class 3A, under the Dangerous Goods Act 1974. The declaration was made because of the discovery of oil contaminated with highly flammable products. Mr Comben followed his declaration with a set of guidelines in October 1998. If implemented, they would have required garages, petrol stations, landfill operators and others to undertake expensive upgrades of storage facilities. In particular, plastic storage igloos would have had to be replaced

32 Until GST was introduced, virgin oil attracted a higher tax than re-refined oil. The replacement of sales taxes with a uniform GST and the consequent growth in sales of virgin oil may have caused or contributed to the growing concern about used oil.
with metal tanks, well isolated from other products. Igloos were removed from a number of forecourts to avoid the additional expense.

The ensuing discussions highlighted a range of problems with the storage of used oil. These included unsupervised and poorly sited igloos on service station forecourts (perched beside stormwater drains, for example), and containers in workshops that hold all waste liquids in addition to oil. Such lax management practices posed environmental and safety risks.

In mid-1999 a working group was set up to develop guidelines for the handling of used oil. The purpose of the guidelines was to ensure the safe management of used oil, without recourse to the quite expensive provisions that generally apply to Class 3 Dangerous Goods. The working group included oil companies, the Motor Trades Association, ERMA, an oil transporter, and Chemicals Industry Association representation.

The guidelines implicitly adopt a product stewardship principle. They identify the responsibilities which apply to different groups, from the home mechanic and forecourt attendant, to managers of commercial workshops and transporters. While the guidelines may not be legally binding on all these groups, they do reinforce the principle that all those handling used oil have a ‘duty of care’.

Key elements of the guidelines have statutory backing. The managers of petrol stations, garages and workshops are required to hold Dangerous Goods licences. They will not, however, be required to meet all the Class 3 standards if they can demonstrate that they are abiding by the management provisions contained in the guidelines. The guidelines have been published and are available now from the Ministry for the Environment.

**Limitations of the recovery network**

The major oil companies provide and pay for national networks for the collection of used oil from the service stations and large workshops they supply with virgin oil. There are, however, gaps in the system:

- Small users, or those who buy their oil from small companies, have to pay to have their oil collected by transporters that are part of the recovery network. Many prefer to sell or give their oil to a local processing firm, burn it themselves or give it to a local person to burn.

- In some areas, those with small to medium quantities of oil have trouble finding outlets. One South Islander who generated small quantities of oil found that his local landfill would not accept more than 20 litres, but that collectors would not call for less than 100 litres.

- A number of small towns and rural areas do not have access to public collection points.

- Landfill and transfer station operators who collect used oil have to pay to have it removed. This cost means that collection facilities are not available at all landfills and transfer stations, and some home mechanics are sent back to petrol stations.

- In city areas, igloos have been removed from some forecourts, in response to concerns that higher safety standards would increase management costs. Many home mechanics do not know where to take their oil or even that reception facilities exist. At the same time, there are places where a number of forecourts in the same vicinity take used oil. There may be some scope for rationalisation.
Even where access points are available, use appears to have dropped off because of public impressions that the recovery programme has folded. The official recovery programme started in a blaze of publicity in 1996, but little positive publicity has been generated since. The few news stories, such as the closure of the Dominion Oil Refinery, have only fuelled perceptions of the scheme’s actual or imminent demise. Point-of-sale material about the scheme and information for forecourt attendants have also fallen away, again in part because of concern about safety requirements.

**Incentives and obligations**

The obligations in the current scheme are uneven, which is a disincentive for those who shoulder those obligations to promote the scheme. The big oil companies that currently fund used oil recovery sell about 65 percent of the total amount of lubricating oil sold.\(^3\) The smaller oil companies supply most of the rest. The companies involved in the recovery programmes have frequently indicated their reluctance to extend the scheme or fund it to a higher level unless all oil suppliers are sharing the costs. Even within the scheme, the companies that provide a more extensive pick-up service pay more of the cost.

**Models for used oil recovery**

**Compulsory take-back scheme, British Columbia**

The British Columbian Return of Used Oil Lubricating Oil Regulation 1992 requires that retailers selling lubricating oil to consumers (do-it-yourselfers) provide them with a take-back service at no charge. This may be at the point of sale, or may be through a third party within a certain radius, and information about the take-back must be provided at the point of sale. Used oil from commercial sites is not covered by the regulations, as a long-established collection service is provided to commercial operators by the State refinery.\(^3\)

British Columbia estimates its recovery rate to be about 80 percent. Competition between retailers ensures that the take-back scheme is partially self-policing, but the Government acknowledges that it needs to ensure that enforcement measures are prompt and fair. It is up to the companies to decide whether the costs of the scheme are passed on or absorbed within the business. Similar schemes operate in other western Canadian states.

Germany and Austria also require collection facilities at the point of sale. Austria goes further and prohibits the sale of oil in quantities of between one and 24 litres. The aim is to restrict the handling of oil by home mechanics.\(^3\)

---

\(^3\) Most lubricating oil is sold through service stations, workshops and car dealerships, with an unknown but probably very small proportion sold through supermarkets and superstores.

\(^3\) Driedger, *pers. comm.*

\(^3\) CONCAWE, 1996.
Applicability to New Zealand

The oil recovery programmes operating in New Zealand are a form of take-back scheme. The difference is that not all groups participate, and coverage is uneven.

There is, at present, no legislation in New Zealand under which a take-back scheme could be mandated. If a take-back scheme were to be shaped by regulation, the Government would be in a strong position to control and shape specific features if necessary.

The costs of having oil picked up (or the price paid by collectors) within regional areas would probably reflect the demand for used oil within those areas. That is, there are likely to be local or regional markets on the same basis as exist at present. Such a scheme would not of itself require tracking or logging of used oil, although a reporting requirement could be included in any regulation developed to require take-back facilities.

Voluntary levy scheme, South Africa

In South Africa used oil recovery is managed by the Rose Foundation, a non-profit company owned by all the oil companies, and funded through a voluntary levy on oil sales. The Foundation was established in 1994 with the participation of eight major oil companies. All 17 significant suppliers of lubricating oil are now members.

Through contractors, the Foundation undertakes the full range of oil recovery activities: education of the public and operators, provision of storage tanks, organisation of the transport and storage network, the development of quality standards, and supply to approved recyclers. The Foundation aims to add value to the used oil, while still meeting necessary environmental standards. Preference is given, therefore, to the recycling processes judged to provide the highest environmental return.


Applicability to New Zealand

Arguably, voluntary levy schemes operate most effectively when most of the industry group agree to the scheme and have a sense of commitment to it. There is a risk that voluntary schemes may be weak in environmental protection, with more effort going into promotion of the scheme, and less into achieving the best result for the environment.

Successful Australasian models are few. They include a levy on particular refrigerants imported into New Zealand to fund the recovery and destruction of older, more ozone-depleting refrigerants (particularly CFCs). In Australia, a nationwide programme launched in November 1999 to collect cellphone batteries and cellphones for recycling is funded through a levy on each cellphone sold.

36 ROSE: Recovery of Oil Saves the Environment.
A scheme working on similar principles to the Rose Foundation in New Zealand would not require legislation. There would be scope, however, for a formal agreement between the Government and industry over objectives and target collection rates. As this would be a voluntary scheme, there would be no additional compliance or enforcement costs.

The scheme would differ from the present voluntary collection service, in that costs would be spread according to volumes of oil sold, and across all oil suppliers. It would be up to the industry to decide the point in the distribution chain at which the levy would be applied. A more substantial organisational structure would be required to manage the scheme than operates at present.

The scheme would enable a more systematic approach to drop-off and collection points, public education, and training for operators. The management organisation could require adherence to a set of standards such as the guidelines referred to above. It could ensure that relative environmental costs and benefits of reuse are considered when supply decisions are made. The potential to control the supply and reuse of used oil may, however, be seen as a disadvantage by some of those seeking access to oil. The scope for monopoly control may have to be worked through with the Commerce Commission.

Compulsory levy scheme, Australia

The Commonwealth Government in Australia is currently legislating to set up a levy scheme for the recovery of used oil as part of a comprehensive stewardship programme for used oil.37

Applicability to New Zealand

New Zealand already operates a levy scheme for maritime oil pollution prevention. The levy is authorised under the Maritime Transport Act 1994 and managed by the Maritime Safety Authority. It can be applied to ships, oil rigs and transfer stations in New Zealand waters.

New Zealand would require legislation to establish a compulsory levy scheme for lubricating oil. A levy scheme could operate on a similar basis to the South African Rose Foundation. It could, if necessary, be run from within an appropriate Government agency, or it could be tendered out to an appropriate private company. Advantages and disadvantages of different models would need to be assessed if this route were to be pursued.

Tracking and monitoring the recovery rate for used oil

Good information is the basis for good policy making. Currently, information is hard to come by, causing difficulties in policy making. The larger regional collectors have told us on a confidential basis how many litres they have collected in the past financial year. To complete the picture, we need to collect information on the myriad of small users who collect from their local garage for burning in space heaters and glasshouses, or spreading on farm tracks.

37 In addition to a levy system, it includes provision for tradable certificates which producers would buy from organisations undertaking environmentally acceptable recycling/reuse of used oil.
To be clear about the impact of used oil in New Zealand we need better data on the destinations of used oil in New Zealand. At present we can account for 21 million out of what we think is a 30-million-litre pool. We do not know how much of the uncollected oil is being burned or spread on roads, or disposed of through landfiling, tipping into drains or other undesirable practices. No recovery scheme can be effective if the other nine million litres remains ‘missing’.

**Conclusion**

We believe that the guidelines will deal with many of the management and handling issues for the used oil that is currently accounted for. While we have the nucleus of a good recovery network for used oil, a number of improvements are necessary. In our view, the present recovery network is a good basis for an expanded voluntary service. We will be seeking to work with all the oil companies over the next few months about options for development.

Used oil recovery raises a number of issues:

- Should we be continuing to rely on a voluntary scheme, or should we be recommending to the Government that used oil recovery be regulated in one form or another? If regulated, how?

- Should we look towards a comprehensive levy-based scheme, through which the end user ultimately funds the full range of services from information and education through transport and supply, or a take-back scheme based on retailer responsibility?

- Where should responsibility for education and information about used oil lie?

- Should we have a national scheme or set standards under which local arrangements can be developed to meet local market needs?

- How can we best monitor the recovery rate of used oil?
Chapter 3: Burning Used Oil

Why is burning used oil an environmental issue?

When any substance is burned, the elements and compounds of which it is made up are released into the air as gases or particles, or they collect in the ash. If released in high enough quantities, some of these gases and particles can have harmful effects on human health and the environment. The ash can also be harmful.

The effects on human health can be direct or indirect. Direct harm to human health can occur when the fine particles are inhaled into the lungs. People with asthma or existing respiratory disease are most likely to suffer direct adverse health effects. Indirect effects occur when the fine particles, which contain contaminants such as heavy metals, settle on food crops and end up in the food we eat.

Some oil can be burned without causing adverse effects on human health and the environment. To achieve this usually requires strict conditions such as:

- controlling the content of the substance burned
- using filters and scrubbers to remove particles and chemicals from the discharge
- designing chimney stacks to ensure good dispersion of the discharge
- ensuring the burner operates to a particular degree of combustion efficiency (temperature, residence time, etc)
- specifying methods of containing and disposing of ash.

To minimise emissions different types of burners utilise different safeguards.

Used oil is not a homogeneous substance. Different oils may contain many different impurities. The use to which the original oil was put determines the types of contaminants contained in the used oil. Where oils are not mixed, and the source is known, we can be more certain about the type of contaminants it contains. Where oils are mixed, the mix will contain all the contaminants in the source oils.

Types of oil burners

In New Zealand used oil is burned as a fuel in a variety of applications. Sometimes it is the only fuel burned and sometimes it is used as a supplementary fuel, either mixed or on its own. Different types of burners have different effects on the environment.

The following types of burners make up the majority of burners operated in New Zealand:

- ‘High temperature’ burning in cement kilns and process kilns. Used oil is usually a supplementary fuel in these burners. When operated correctly the kilns burn at such a high temperature that they destroy some of the gases and particles that cause health problems (such as organic contaminants which form dioxins and furans at certain
Low temperature versus high temperature burning

Some concern has been expressed about burning used oil at low temperatures. Low temperature burners often lack filtering equipment to catch particulates, metals and organics, and they don’t burn above a temperature sufficient to destroy some contaminants. If they are poorly maintained or inadequate control is kept over the fuel, incomplete combustion is likely.

A high temperature combustion process usually refers not to what the combustion temperature is, but to a process that maintains the post-combustion gases at high temperature for a period of time after combustion has occurred. The extended period of time at elevated temperatures ensures almost total destruction of organic compounds in the fuel. This does not guarantee that the gases discharged to the atmosphere will be free of organic compounds. New formation of organic compounds may occur, depending on what elements or compounds are in the gas stream and the speed with which the gases are cooled prior to discharge.  

This combustion process will not have any impact on the concentrations or quality of metal contaminants discharged. This is governed by mitigation measures, such as use of scrubbers on the combustion gases before they are discharged.  

Milburn New Zealand

The Milburn New Zealand cement works at Cape Foulwind, near Westport burns a relatively large amount of used oil, including ships’ slops, as a supplementary fuel to coal. In 1994 the

---

38 Woodward-Clyde, 2000, section 3.1.
39 Woodward-Clyde, 2000, section 3.
40 Ibid.
company obtained a resource consent from the West Coast Regional Council to burn used oil for 20 years, subject to conditions. The conditions include limits on the lead, cadmium, mercury, PCB, sulphur and total halogen content of the oil, and Milburn is required to test a sample from every load of incoming oil for these contaminants.

Internationally, burning used oil in cement kilns is generally regarded as an acceptable environmental practice, and in some countries, best practice. The Ministry is satisfied that, as long as Milburn continues to fulfil the conditions of its resource consent, including monitoring conditions, this is an environmentally acceptable disposal method for used oil. The Ministry is aware of several other high temperature burners in New Zealand that are using used oil as a supplementary fuel, but no information has been sought from these companies.

Current regulation and national guidance

Resource Management Act 1991

Under Section 30 of the Resource Management Act, regional councils and unitary authorities are responsible for managing air quality and the discharge of contaminants into the air. To manage the environment, councils can prepare regional plans specifying objectives, policies and rules to address the issues of concern in the region (Sections 63 to 70).

Under Section 15(1)(c) ‘no person may discharge any contaminant from any industrial or trade premises into air unless the discharge is expressly allowed by a rule in a regional plan ... a resource consent, or regulations’.

Under Section 15(2), ‘no person may discharge any contaminant into the air ... in a manner that contravenes a rule in a regional plan... unless the discharge is expressly allowed by a resource consent ...’.

Most regional councils have either an operative or a proposed regional plan. Few are still preparing plans or relying on transitional plans. The plans vary: some give definitions of ‘waste oil’ or ‘used oil’ while others don’t mention it at all. The rules relating to burning used oil in industrial situations range from ‘permitted’ to ‘prohibited’ activities.

---

41 The latest figure available is 11 million litres of used oil per year, excluding ships’ slops.
42 An oil and water mix containing predominantly bunker fuel and some lubricant drainage and drippings.
43 Halogens: any of a group of reactive, non-metallic elements (chlorine, fluorine, bromine, iodine and astatine) which form strongly acidic compounds with hydrogen, from which simple salts can be made (Concise Oxford Dictionary).
44 For example, Jacobs et al found cement kilns to be one of five Best Available Technologies (BATs) for managing used oil. A summary of their research is in Warmer Bulletin, May 2000.
45 Cement kilns operate at very high temperatures (peak gas temperatures up to 2000ºC) and the gases in the kiln are kept at high temperatures (over 1200ºC) over a long residence time. Because complete combustion occurs at these temperatures, organic contaminants are destroyed. Metallic compounds in fuel, whether coal or used oil, are broken down by the intense heat, but the metals are not destroyed. Most metals (generally as their oxides) are incorporated into the kiln products, cement clinker and kiln dust, with much of the remainder attached to the surface of dust particles. Over 99 percent of kiln dust is collected before combustion gases are discharged to the atmosphere.
Some conditions on permitted activities are more proscriptive than others. For example, the burning of treated waste oil is a permitted activity in Taranaki, provided it complies with a number of conditions, including stack height, maximum heat release, maximum smoke concentrations, and the adoption of the best practical option for minimising carbon dioxide emissions. In some regions, however, the distinction between virgin oil and used oil is unclear, so rules for burning virgin oil also appear to apply to used oil.

This lack of consistency may indicate the need for national guidance on the additional controls that are needed when burning used oil.

**Ambient Air Quality Guidelines**

In 1994 the Ministry published the Ambient Air Quality Guidelines. These guidelines have been used in New Zealand to shape regional air quality management under the Resource Management Act. The guidelines are principally aimed at regional councils, but there is no legal requirement for councils to give effect to the guidelines. The guidelines are for ambient air quality, rather than point source emissions to air. This means that they specify the maximum allowable level of contaminants in air, rather than specifying limits for emissions from individual burners. They are minimum requirements that all outdoor air quality should meet.

The guidelines are currently being reviewed. Old standards are being revised and the inclusion of standards for new contaminants is being considered. One of the subjects of the review is the need for national environmental standards for air quality, which would be binding on regional councils.

**Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985**

These regulations enable the Chief Inspector Explosives and Dangerous Goods to license burners, and to approve treatment processes for used oil. This is specifically in relation to the safety aspects of burning used oil. The Chief Inspector does not have the power under these regulations to impose controls on burners and treatment processes because of potential environmental impacts.

**Impacts of burning used oil**

To determine the environmental and health effects of burning used oil in a variety of applications, the Ministry commissioned research by Woodward-Clyde (NZ) Ltd. Woodward-Clyde was not asked to model emissions of organochlorines. Although organochlorines are the most toxic emissions we would expect to find in emissions from burning and road oiling, the content of the oil modelled was such that we would not expect to find high levels of these substances. Ministry for the Environment (December 2000) gives estimates for organochlorine emissions from used oil use and disposal.

---

46 Section 116(1).
47 Section 116(3).
48 Woodward-Clyde was not asked to model emissions of organochlorines. Although organochlorines are the most toxic emissions we would expect to find in emissions from burning and road oiling, the content of the oil modelled was such that we would not expect to find high levels of these substances. Ministry for the Environment (December 2000) gives estimates for organochlorine emissions from used oil use and disposal.
• examined typical situations in which used oil is burned in New Zealand
• reviewed the likely contaminants in used oil
• investigated the likely emissions of contaminants from different burners.

Discharges from several different used-oil-burning appliances were modelled using an atmospheric dispersion model. The model predicts the likely ground-level concentration of a contaminant contained in the discharge from the burner under certain meteorological conditions. The highest predicted concentration is then compared to environmental or health criteria (usually based on potential health effects), to assess whether the level of pollution discharged from the burner is likely to have an adverse effect on human health or the environment. 49

Several types of burners, and scenarios in which used oil is burned were examined. It was impossible to examine all applications or scenarios in which used oil is burned, so a series of ‘typical’ scenarios were constructed, including one in which a burner is not operated correctly. The conclusions drawn from the modelling need to take into account the assumptions used in the modelling and the scenarios, and that the assessments are not intended to represent all situations. 50

Emission factors used in the modelling

There has been limited testing of emissions from small used-oil-burning equipment in New Zealand, and there are no widely accepted emission factors for used oil burning here. Emission factors from the USEPA AP42 database were used. To check that these emission factors were suitable for New Zealand burners and oil, Woodward-Clyde compared the average concentrations of contaminants in United States used oil to those in New Zealand used oil. This comparison indicated that the emission factors derived from United States studies were sufficiently similar for the emission factors to be used.

To provide some means of comparison, the emissions as a result of burning diesel were also modelled. 51 Diesel is a fuel commonly used in burners in New Zealand.

The following summary of results provides information on the burning of used oil in New Zealand.

Vaporising burners

The potential effects of the emissions from a small vaporising burner using 5 litres per hour of used oil were found to be minor, 52 provided that:

(PP.95-97). Where used oil contains higher levels of chlorine than the USEPA specification oil, we would expect organochlorine emissions to be higher.

49 New Zealand Ambient Air Quality Guidelines, Victorian EPA design ground-level concentrations, and New Zealand Workplace Exposure Standards were used.
50 The Woodward-Clyde report contains full details of the modelling.
51 The emission factors for diesel are based on United States diesel.
52 Minor in this context means unlikely to cause significant adverse effects on human health or the environment according to current level of understanding.
- the stack height was sufficient
- the burner was operated efficiently
- the contaminants in the oil did not exceed those of the USEPA fuel specifications.

The stack height was found to be critical for emission levels. Woodward-Clyde modelled the off-site concentrations of contaminants when a vaporising burner is operated with a 2-m stack, rather than the correct 3-m stack. The results of this modelling showed a significant increase in the maximum off-site concentrations when compared to the correct stack height. Sulphur dioxide emissions also exceeded the acceptable criteria with the shorter stack.

Woodward-Clyde concluded that burning used oil in vaporising burners should occur only where the above conditions can be met. It also found that emissions of almost all the contaminants from used oil were far higher than emissions from diesel fuel. In some sensitive receiving environments where emissions need to be minimised as far as possible, used oil should not be burned. These include areas where there are already high background levels of air pollution or in particularly sensitive receiving environments, such as near schools or retirement homes.

**Atomising burners**

The potential effects of the emissions from a medium-sized atomising burner using 50 litres per hour of used oil were found to be minor, provided that:

- the stack height was sufficient
- the burner was operated efficiently
- the contaminants in the oil did not exceed those of the USEPA fuel specifications.

Burning used oil in atomising burners should occur only where these conditions can be met. As with vaporising burners, used oil discharged greater quantities of contaminants than diesel, so in sensitive areas it may not be appropriate to burn used oil.

**Asphalt plants**

Most asphalt plants will be subject to resource consent requirements, in which case a full assessment of the environmental effects of the operation is required. Because there are a number of asphalt plant operators seeking to employ used oil as a fuel, an atomising asphalt plant, using 1000 litres per hour of used oil, was assessed.

Modelling of a typical asphalt plant scenario, with Venturi scrubbers, found that the effects of burning used oil were relatively minor, although the sulphur dioxide criteria of one-third the ambient value was exceeded. Woodward-Clyde noted that the sulphur content in the oil sample used to derive the emission rate was higher than other used oil samples. If the used oil had contained an average sulphur content, then the modelling result would have been within the criteria.
What does this mean?

These results show that an oil that conforms to the USEPA used oil specification, burned under specific circumstances in a correctly operated burner, will not emit air pollutants at levels beyond those specified in the Ministry’s Ambient Air Quality Guidelines. No assessment of health effects has been carried out because the effects of burning used oil under these circumstances are deemed to be within 66 percent of the Ministry’s guideline values.

These results do not consider:

- the cumulative effects of a number of burners operating under these conditions
- the effects when burners are incorrectly operated
- the effects when the contaminants in the oil burned exceed the USEPA specifications.

Regional councils currently produce air plans containing rules that address these issues. While burning used oil is deemed to be acceptable under certain conditions, regional councils will still need to assess the cumulative effects of burning used oil in their region, as well as the risks associated with incorrect operation and the purity of the oil being burned. This will have different implications for different regions, depending on background levels of contaminants, existing sources of air pollution, and the sensitivity of the receiving environment.

National impact

At a national level the suggestion has been made that, as used oil contains a number of harmful contaminants, we should be using or disposing of it in the best way possible. The Woodward-Clyde modelling shows us the local effects of burning used oil in certain ways, but it doesn’t show the accumulated overall effect of burning large quantities of used oil in different ways. We can also see from the results that burning used oil in the three types of burners modelled will produce greater gross quantities of pollutants than burning diesel.

Although New Zealand currently manages air emissions according to their effect on ambient air quality, it is important to be aware that some methods of burning oil are more polluting than others.

To assess the cumulative effects of burning waste oil in different burners, Woodward-Clyde modelled the expected emissions from burning 10 million litres of used oil in an atomising burner, a vaporising burner and Milburn New Zealand’s cement kiln.\(^\text{53}\) It should be noted that this is not intended to be an effects-based assessment, but rather presents information on the total emissions to atmosphere from the different activities. This shows the potential cumulative effect of burning large quantities of used oil in different burners.

The results show the emissions associated with the cement kiln are significantly less than those associated with other types of combustion for most elements. If, for some reason, Milburn was unable to burn the large quantities of oil that it currently does, large quantities of oil may be burned in technologies that produce far greater volumes of environmental pollutants.

\(^{53}\) The oil modelled was the same as that used for the small-scale burning. Information on the cement kiln was obtained from Milburn’s Assessment of Environmental Effects, 1994.
This has implications for New Zealand’s total pollution levels. Should New Zealand adopt a system that ensures maximum quantities of used oil are used or disposed of by the most environmentally acceptable route? Should we be taking a national perspective on the use of used oil, and/or a system of disincentives, which would apply to users whose application falls below particular environmental thresholds?

**Issues for consideration**

- How can we ensure that burners are being correctly maintained and operated, and that their environmental impact is minimised?
- Do we need national regulations to standardise the ways in which used oil can be burnt, and standards for individual burners?
- When considering the national effect of burning used oil, should New Zealand encourage adoption of Best Available Technologies rather than continue to use more contaminating burners?
Chapter 4: Road Oiling

What is road oiling?

Used oil is applied to unpaved roads as a dust suppressant in some parts of the country. It is very cheap because it is easily obtained, and has historically been regarded as a waste with little potential for reuse. This is especially true in rural areas, which are often poorly served by existing collection systems, because of their distance from markets for used oil.

Oil is one of the best dust suppressants available. There is no evidence that used oil is better than virgin oil, but the cost of virgin oil would be prohibitive for this use.

It is not known what proportion of New Zealand’s unsealed roads are oiled. Different regions have different climatic and hydrogeological profiles, and differing lengths of unsealed road, so dust is less of a problem in some regions than others. There are also differing tolerances for the practice in regional plans. It appears there may be a significant disparity in the amounts of road that are oiled in each region, and we can’t make any reliable estimates about the total quantity of road oiling in New Zealand.

A study done in Canterbury region in 1999 estimated that 14.6 km, or 0.21 percent of the region’s unsealed roads were oiled. In the Queenstown Lakes District, approximately 32 km are oiled each year. The Otago Regional Council allows the practice in its regional plan, and the district has a comparatively high proportion of unsealed roads and large volumes of tourist traffic over summer. Communications with roading managers from district councils indicate that the Queenstown Lakes District figure is at the high end of road oiling in New Zealand.

Why is road oiling an environmental issue?

The environmental and health effects of road oiling depend on:

- the contaminant content of the oil
- the rate at which the oil is applied
- the period over which it is applied
- the receiving environment.

54 Clancey, June 1999.
Although much of the road oiling that occurs in New Zealand is done solely as a means of suppressing dust, there are known instances where the oil is applied at such a rate that it is clearly done as a means of disposing of used oil. There is a particular risk of this happening in areas with no readily accessible collection system. Over a long period roads treated in this way could become highly contaminated, as may the surrounding area.

Although pouring virgin lubricating oil onto roads may have localised effects, such as the inhalation of volatile compounds by those applying the oil, this does not have long-lasting or toxic effects for the surrounding environment. Used oil, however, contains various contaminants, some of which accumulate in the environment, cause cancer, and/or are toxic to humans, as well as to the environment. The contaminants in used oil have the potential to pose human health risks by entering the food chain, by direct inhalation, and by absorption through skin. The practice of road oiling also poses health risks to plant and animal communities (see pages 19 and 20 for health effects).

If used oils are poured onto roads, the contaminants will either remain on the road, blow off the road with dust, infiltrate groundwater, or wash off the road with rainwater. If poorly applied, the oil can run off directly into culverts. Oil will also adhere to vehicle tyres and spread to other areas.

Used oil in waterways can have several detrimental effects, again dependent on the contaminants in the used oil. The oil itself will float on the top of water, creating a negative visual impact, and possibly reducing the penetration of sunlight and oxygen into the water, thus affecting aquatic plant and animal life. Oil scum can kill fish and invertebrates that breathe from the surface of the water. The oil may also render the water unpalatable to humans and animals.

The contaminants in used oil also present problems. Heavy metals can accumulate in sediment and be ingested by aquatic animals, causing acute and chronic changes in both individuals and populations. Humans may also be exposed to heavy metal contaminants through consumption of exposed fish and shellfish. PAH contaminants, which do not dissolve readily in water, adsorb to particulate matter, and concentrate in sediments. Sediment-associated PAHs can accumulate in the tissues of filter feeders (such as shellfish), and pose a threat to the health of these organisms, as well as to the humans who may consume them. Mixtures of PAHs have been found to cause tumours in fish, and acute toxicity (ie, death).

Complaints about oiled roads are common in areas where road oiling is carried out. Concerns include odour and oil adherence to vehicles, and unease over the practice of pouring contaminated oil directly into the environment. For these reasons, and because a greater proportion of roads are now sealed, road oiling appears to be a dwindling practice in most parts of New Zealand.

---

Known receiving environments

Road oiling is an activity principally carried out in rural areas where a high proportion of the roading network is unsealed. In some rural areas traffic numbers may increase considerably during the summer months, thus increasing dust quantities at the driest time of the year. Road oiling also occurs in localised, unsealed areas such as quarries and work sites.

Oiling is carried out on public and private roads in New Zealand. On public roads the oiling is carried out on behalf of either the district council or locals who are concerned about the dust. On private roads, such as farm tracks, the oiling is carried out by, or on behalf of, the landowner.

Discussions with council officers indicate that road oiling is carried out because the dust creates a nuisance or hazard for people or agricultural land. Dust can cause:

- reduced visibility
- respiratory problems from inhaling dust particles
- continual nuisance from dust landing on vehicles, houses, clothes, etc
- alterations to agricultural and horticultural productivity.  

Most oiled roads are near agricultural land and rural households. The proximity to waterways varies, and some councils which allow road oiling include rules to limit the risk of oil getting into waterways.

57 There is limited evidence that dust affects the pollination, development and growth of fruit crops, but there is clear evidence that dust on crops can significantly reduce their market value. Some crops are rejected completely as a result of dust contamination.
Alternative dust suppressants

Some work has been done overseas on dust suppressants or ‘palliatives’. Much of this work has been generated by bans, or impending bans, on the use of used oil on roads. For example, in the United States the use of used oil as a dust suppressant is prohibited, except in a few states, which have been granted permission to oil roads as long as the oil complies with certain specifications.\(^{58}\)

Work has also been done in New Zealand to test and source alternatives. These include ligno-sulphates\(^{59}\) (a by-product of the timber-processing industry), bituminous emulsion, hygroscopic and deliquescent chemicals, water, lime and vegetable oil. Results of road tests of these products have produced variable results, but there is general agreement that oil is the most effective dust palliative.\(^{60}\)

The success of other dust suppressants depends partly on the climatic and geological characteristics of the area in question. Although it is unlikely that one product will suit all regions, some do suppress dust to a reasonable degree. While used oil may do a better job of suppressing dust, it is also markedly cheaper than most alternatives, which is one of the principal reasons for its use.

There are other practices that can be employed to minimise the effects of dust. Hedges between the road and the affected area will screen out some dust. A number of district council road maintenance units have tested the effect of different base courses for roads. For example, the Central Hawke’s Bay District Council now uses additional clay in the mix it puts on unsealed roads.\(^{61}\) This binds dust particles longer than the previous mix, and holds more water when it rains. Putting more shingle on the road can also reduce dust, but care is required to ensure safety isn’t compromised.

Current regulation relating to road oiling

Section 15 of the Resource Management Act controls the discharge of contaminants into the environment.

At present there are quite different approaches taken to the discharge of oil onto roads by different councils. For example, in Northland the discharge of petroleum oil and diesel onto or into unpaved land and into water (including unsealed roads) is a Prohibited Activity. In Otago, the discharge of oil or substances containing oil as a dust suppressant on formed roads is a Permitted Activity. There are conditions attached to the Otago rule: the lead concentration must be less than 100 mg/l; the material must be applied at a rate or manner whereby there is no run-off from, or ponding on, the surface of the road.

Section 70 of the Resource Management Act covers rules about discharges, and makes it clear that used oil should not be allowed to reach any watercourse.

\(^{58}\) USEPA, United States Code of Federal Regulations, Part 279. p.82.

\(^{59}\) Lignin and its derivatives have been shown to have adverse affects on aquatic species. Hodson et al, 1997.

\(^{60}\) See, for example, Bartley Consultants, 1995.

\(^{61}\) Pers comm, S Thrush, Central Hawke’s Bay District Council.
Impacts of road oiling

To assess the health and environmental impacts of road oiling Woodward-Clyde (NZ) Ltd was asked to model some typical scenarios where used oil is poured onto New Zealand roads.62

The modelling used a real New Zealand oil sample. In discussions with various companies involved in road oiling, Woodward-Clyde was told that only ‘clean’ waste oil collected from known service stations is used. The implication is that the oil is crank case oil from motor vehicles, and isn’t contaminated with the more dangerous contaminants, such as PCBs. There is no guarantee, without regular testing, however, that oil of this nature is not contaminated with other liquid wastes, such as solvents.

Woodward-Clyde based its modelling on two oil samples taken from companies that carry out road oiling. This is a very small sample size, and therefore can’t be said to be representative of all oil used for this purpose. For the purposes of this modelling, however, the oil sample provides some baseline information, and extrapolations for greater or lesser contaminations can be made if necessary. The oil profile is shown in Table 2.

Table 2: Road oiling concentrations*

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Confidential sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>71</td>
</tr>
<tr>
<td>Arsenic</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>Cadmium</td>
<td>1</td>
</tr>
<tr>
<td>Copper</td>
<td>105</td>
</tr>
<tr>
<td>Chromium</td>
<td>4.6</td>
</tr>
<tr>
<td>Mercury</td>
<td>1</td>
</tr>
<tr>
<td>Sulphur (%)</td>
<td>0.425</td>
</tr>
<tr>
<td>Chloride</td>
<td>184</td>
</tr>
<tr>
<td>PCBs</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>125</td>
</tr>
<tr>
<td>Total PAH</td>
<td>204</td>
</tr>
</tbody>
</table>

* All concentrations in mg/kg except sulphur.

They looked at three scenarios, and chose to model effects for the worst-case scenario. This was a medium-use road assumed to have 200 vehicle movements per day, in a horticultural/farming area. Rainfall was assumed to occur on 120 days per year, and oiling was assumed to suppress 90 percent of dust.

The human health risk assessment was carried out using a standard 70-year timeframe. While one application of oil to the road did not pose a risk to human health, at 70 years, taking all exposure pathways into consideration, used oil on roads created a risk to human health which is considered unacceptable. When each exposure pathway was considered separately, the risks

were acceptable, except that for children eating unwashed apples grown on trees beside an oiled road. The specific contaminant of concern in this case is benzo(a)pyrene, which is carcinogenic.63

The process used in the assessment was risk averse: that is, it assumed the worst case at all stages of the process by which the contaminants in used oil could reach humans. It is important to note that this modelling work used a particular oil profile, and that no modelling has been done for oils that exceed these contaminant levels. The oil modelling was also done using a particular application rate, camber and weather conditions. No assumptions were made about the sensitivity of the receiving environment. For oils with greater contaminant content, greater application rate, or greater slope of road, and for very sensitive receiving environments, these results are not applicable.

The modelling work also found that annual contaminant concentrations in water as a result of dust deposition and run-off exceed ANZECC64 guideline values for contaminants in water. With the exception of naphthalene, annual concentrations in stream sediment do not exceed ANZECC or NOAA65 guidelines, but after 70 years of accumulation, concentrations of organic compounds all exceed guideline values. Metals do not exceed guideline values. Annual contaminants accumulating in soil do not exceed ANZECC guideline values; after 70 years accumulation metals are still within the ANZECC background range, but total PAH concentration exceeds the background maximum value by three times.

As with the human health risk assessment, the worst case was assumed at every step in the path for modelling contaminant accumulations in soil, water and sediment, but again, the oil modelled does not represent the worst oil that may be used. This means we would expect that in most cases where oiling is carried out the accumulation of contaminants would be less than described in the report, but the use of oil which is more contaminated than that used in the modelling could considerably increase the risks to human and environmental health. This is especially so for the most toxic contaminants, such as PAHs and PCBs.

The results of the modelling suggest that road oiling can produce some effects which are unacceptable for human and environmental health. It is possible that road oiling could be carried out in such a way that it does not pose a significant risk to either human health or wider environmental health. This would require tightly controlled conditions, the most important of which would be control over the type and level of contaminants in the oil.

When considering the acceptability of road oiling the following points should be considered:

• Applying used oil to roads is a discharge of contaminants into the environment. While it may be possible to do this under conditions that reduce the risk of harm to human or environmental health, it requires a high degree of confidence in the type of oil used and the method of application, as well as good knowledge about the sensitivity of the receiving environment.

• Dust can be a significant problem for some people on medical grounds, specifically those who suffer from asthma and other bronchial diseases.

63 For specific pathways and methods used, see Woodward-Clyde, 2000, chapter 7.
64 Australia and New Zealand Environment and Conservation Council.
65 National Oceanic and Atmospheric Administration (United States).
• Horticultural areas are one of the main areas where dust can be a significant problem, and therefore, where some road oiling occurs. Whether or not the oil has any adverse impact on fruit and vegetables, pouring oil on roads could damage our image, both in New Zealand and internationally, as producers of safe, high-quality food. The same thinking can be applied to tourists travelling in areas such as Otago, where roads are oiled during the busy summer months.

The broader issue of controls is considered further in the next section. Initial questions are as follows:

• Safer methods of suppressing dust are available. Is it appropriate to use a product that releases contaminants into the environment, when a more benign product exists?
• If the spreading of used oil is to continue, what limits or restrictions should apply?
Chapter 5: Options for Managing the Effects of Used Oil

Previous chapters have outlined a range of issues related to the recovery and use of used oil. Likely solutions to collection issues were discussed in Chapter 2. Potential solutions for managing the effects of used oil on human health and the environment are outlined here. They include placing controls on inputs or on outputs.

Many councils, industry players, and those with environmental concerns, have expressed a strong wish for national clarification and consistency in the management of the effects of used oil, particularly when it is burned at low temperatures or spread on roads as a dust suppressant. Conversely, we know of some councils, which, given local circumstances, may prefer to maintain autonomy in managing the environmental effects of used oil. We are also aware that positions have been formed on the basis of assumptions about the environmental impacts of used oil. The research recently undertaken by Woodward-Clyde has provided firmer information on which decisions can be based. In the options we propose here, we are looking for a balance between consistency and clarity on the one hand, and excessive control on the other.

The environmental and human health risks associated with burning used oil and road oiling have already been outlined. The risks arise because:

- used oil that contains unacceptable levels of contaminants may be burned in equipment lacking control devices necessary to prevent the contaminants escaping into the environment
- used oil may be burned in poorly controlled and maintained burners
- used oil that contains unacceptable levels of contaminants may be applied to roads as a dust suppressant
- used oil may be applied to roads in such a manner that it escapes into the environment at an unacceptable rate, and to unacceptable places
- sludge produced in the reprocessing of used oil may not be disposed of safely, and contaminants may escape into the environment.

Because these risks exist, the controls on the environmental impacts of low temperature burning and road oiling should, at the very least, aim to:

- keep emissions from burners within safe and acceptable limits through control on inputs (fuel quality) or outputs, or a combination of these
- minimise the adverse effects of road oiling through, for example, a fuel specification and restrictions on coverage rates and proximity to waterways
- ensure that the wastes and by-products produced during re-refining and reprocessing are disposed of in a way that is safe and environmentally acceptable.
Policy tools

Input controls

Input controls influence outcomes such as the cleanliness of air, by controlling what goes into or is used in a process. Controls on the quality of fuel to be burned, or the type of burner used, are examples of input controls.

Oil specifications

Oil specifications can be used to describe the quality, or specify the maximum levels of particular contaminants, in oil. Setting specifications does not preclude the setting of other controls that must be complied with when using the oil. New Zealand currently has fuel specifications for virgin diesel oil under the Ministry of Energy (Abolition) Act 1989. Current specifications for light fuel oil are industry based and have no legislative backing.

As noted, used oil intended for burning is already subject to a quality specification under the Dangerous Goods Act. Because this deals only with the safety aspects of burning used oil, any expansion of this specification to protect the environment would require action under different legislation, such as the Resource Management Act.

A fuel specification provides a high degree of certainty. If there is certainty over what goes into a burner, and the burner is operated and maintained correctly, the operator can be fairly sure of the content of the emissions. The ‘cleaner’ the oil being burned, the cleaner the emissions. In the case of road oiling, an oil specification would be set to ensure that contaminant levels are never high enough to do damage to human health or the environment. The specifications for burning and road oiling could be the same or different, depending on the contaminants of concern. Specifications are unlikely to apply to high temperature burners if they are subject to their own site-specific consent conditions.

Adherence to oil specifications would involve some additional costs for operators in testing, processing and monitoring used oil quality. These would be greatest for operators who are some distance from treatment services. A specification would, however, provide a relatively inexpensive way of ensuring that the fuel in small burners and oil used on roads is safe. If individual burners and road oiling operations require resource consents and monitoring, the cost is likely to be greater.

Certifying burners

Fuel burners are currently controlled for safety purposes under the Dangerous Goods Regulations, but no specific legislation exists to control burners for environmental protection. Environment Canterbury does require that all burners operating in the Christchurch Clean Air Zone are approved under section 369(11) of the Resource Management Act. This section enables Environment Canterbury to authorise the installation and use of classes of fuel-burning equipment and fuel under transitional plan arrangements. Under this provision it has denied approval for used oil burners in the past. Moving from the transitional arrangement is creating some problems for Environment Canterbury, and it is unlikely that burners could be controlled in a practical way under the Resource Management Act without amending the Act.
Accreditation

Accreditation or certification is a means by which companies demonstrate that their products meet specified standards on an ongoing basis. It generally involves registration with an independent organisation, a rigorous initial review of systems and standards, and ongoing regular audits or reviews.

The accreditation of used oil reprocessors is an option for backing up an oil specification. It would provide the certification required under Dangerous Goods guidelines for use of used oil as a fuel, and provide assurance to users and to local authorities that the oil being used on roads is safe. More broadly, accreditation could provide some assurance that the reprocessing itself has met acceptable environmental standards, and that sound practices are in place for the disposal of sludges. The accrediting body could be the regulating authority, or an independent organisation such as International Accreditation New Zealand (IANZ).

Under present legislation, a possible mechanism for accreditation would be the resource consent process administered by regional councils. Accreditation would not do away with the need for close controls on emissions in heavily populated and highly sensitive environments, and where large quantities of oil are burned. The resource consent process would continue to allow councils to place conditions on the operation of burners, as well as the content of the oil being burned, and on the manner in which roads may be oiled, if at all.

The specified standard could be a national standard, which removes ambiguities between regions. The standard could be such that water content, heavy metals and organics would be minimised and the flashpoint controlled to protect human and wider environmental health.

The costs of accreditation would be borne by the processor, but much of that cost would probably be passed on to the customer. This would raise the cost of used oil, reflecting the human and environmental costs imposed by those using dirty oil. Accrediting oil processors would be a lot cheaper and easier than individual oil users having to prove that their oil is processed to the required specification.

Rules

Rules in plans are used to provide direction and certainty in areas where control is required, and one rule can be applied to all those wishing to carry out a certain activity. This avoids or reduces costs for both the potential applicant and the council. Rules could specify (and some currently do) the conditions under which used oil can be burnt, or roads oiled, including the acceptable contaminant level in used oil. Getting oil only from an accredited or licensed processor could become one of the conditions that allow people, in some cases, to utilise used oil without seeking a resource consent.

Controls on other aspects of an activity can also affect environmental outcomes. Rules concerning acceptable conditions for burning could include:

- correct maintenance and operation of burners to ensure maximum combustion\(^{66}\)
- controls on both the size of the burner and the volume of oil burned.

---

\(^{66}\) Such controls are already enforced under the Dangerous Goods Act 1974.
Rules concerning acceptable conditions for road oiling could include the:

- manner and rate at which oil is applied
- distance from a watercourse
- sensitivity of the receiving environment
- slope of the road.

Operators may face some additional costs, including the maintenance of burners, and transportation and processing of oil for road oiling. There are also monitoring and enforcement costs associated with input controls. These are, however, likely to be less expensive than some output controls.

---

**Oil sludge**

Oily sludges are generally hazardous, and must be handled and disposed of accordingly. The sludge must be processed and stabilised to a degree that makes it acceptable at a suitably engineered and well-managed landfill (one that can safely accept hazardous wastes). There are very few landfills in New Zealand with the level of containment and management practices necessary to accept hazardous wastes. Some countries burn such wastes in high temperature incinerators with stringent environmental controls. Incineration of hazardous wastes in this country is largely limited to medical and quarantine wastes at present.

If an oil specification is introduced, some oil processors would have to increase their degree of processing to remove more contaminants, and thus increase the concentration of contaminants in the sludge.

There is no provision for tracking hazardous wastes under the Resource Management Act, so there are no data, at present, on disposal practices for oil sludges. The Ministry's Hazardous Waste Programme is investigating management options that will seek to address this problem, but solutions are unlikely to be introduced in the near future. As acceptance criteria become more stringent at many landfills, it is likely that more of the wastes that are currently disposed of in landfills will not be accepted without pre-treatment. Oil sludge is likely to fall into this category.

Until clear guidelines are available to address hazardous wastes, we believe that there is a need to control the environmental effects caused by the disposal of oil processing wastes.

---

67 Used oil sludge can contain, in varying quantities and concentrations, toxic heavy metals, polycyclic aromatic hydrocarbons (PAHs), straight-chain hydrocarbons, and sulphur and nitrogen compounds. It may contain small quantities of PCBs (oils containing more than 10ppm of PCBs are subject to Ministry of Health controls).
Output controls

In the case of burning, output controls include pollution control equipment attached to burners, and monitoring of emissions and ash disposal. Large-volume burners of any fuel are already required to have pollution control equipment in place, and many also have to monitor their emissions, as the potential effects if something goes wrong are deemed to be high.

The likely control for small used-oil burners would be a specified maximum contaminant emission from burners. This would require those burning used oil to test their air emissions to ensure they don’t exceed stated levels. This is likely to be less effective and more expensive than the input controls described above. Testing air emissions is more difficult and more expensive than testing a batch of oil, and if emissions do exceed stated levels, some damage may already have been done before the burner can be stopped. For smaller burners, the cost of output controls is likely to negate the financial benefit of burning used oil over other fuels. Output controls for ash disposal would seek to direct how, and possibly where, ash could be disposed of safely.

For road oiling, the output control is also likely to require testing, but in this case it would be to ensure that levels of contaminants in soil, plants, water, and perhaps in residents, do not exceed safe levels. Again, this would involve additional expense, and damage may be done before the oiling can be stopped.

National, regional or local policy making?

The various tools described above can be applied at a national, regional or local level.

Setting national environmental standards

National environmental standards can be promulgated by the Minister for the Environment under Section 43 of the Resource Management Act. They typically specify a level of environmental quality that should be met to protect and maintain the environment and people’s health. Standards will most often be part of a broader government management strategy to address a particular environmental issue.

National environmental standards are binding on councils. Councils may develop rules that are more stringent if appropriate for local conditions.

The development of standards requires a formal consultation process and the Minister for the Environment must be able to demonstrate that they are the best way of meeting particular national problems. Section 32 of the Resource Management Act also requires the Ministry to consider alternatives, and the costs and benefits of any regulation that is developed.

Currently each region sets its own air quality standards, and these vary widely in regard to burning used oil. Because meteorological conditions differ considerably across New Zealand, it is often appropriate that different regions enforce different standards in regard to emissions to air. This can mean that the same activity may be allowed in one region, but not allowed in a neighbouring region.
Regional councils also set rules for road oiling, as a discharge under Section 15 of the Resource Management Act. As discussed in chapter 4, these rules differ considerably in different parts of the country.

Standards for the use of used oil could conceivably cover a fuel specification, with or without the requirement for accreditation of processors, other input controls (restrictions on use of burners or application of oil on roads) or output controls. They could set absolute limits on emissions for an area, or limits on emissions from individual burners. Councils would then decide how much additional control is required through regional plans.

National environmental standards are an appropriate tool for use when:

- the effects are of national significance
- a high degree of certainty is required to control environmental effects, ie, where the effects are serious, and/or where the risk of effects occurring is high
- where current control structures have proved inadequate to control the effects.

### Setting national guidelines

National guidelines are another means of providing national consistency, while providing scope for local variation. The Ministry has issued guidelines for a number of areas of environmental quality. Guidelines recommend the attainment of specified criteria in order to protect defined environmental values and uses. Guidelines may also explain the resource management options that are available to consent authorities.

Guidelines have no legal status. They may be translated into standards by local authorities and some may be translated into codes of practice by industry groups. If the Ministry were to issue guidelines for used oil relating to burning and road oiling, it would be with the expectation that regional councils would use them in writing plans. Regional councils could set fuel specifications and/or acceptable emission levels for particular contaminants, either in rules, or as a condition for resource consent. Industry groups, such as the Vegetable Growers Federation or oil processors, could also adopt the specifications to demonstrate best industry practice.

If the option of fuel specifications in national standards or guidelines is chosen, debate is necessary to establish the acceptable level of contaminants in the oil. Regional councils will still have to assess the likely contribution of burning used oil to ambient air quality in their region. Some burners may, accordingly, still require resource consents, especially if they are burning large quantities of used oil.

National guidelines are appropriate where:

- the issue is of national importance
- a high degree of certainty is required to control environmental effects, ie, where the effects are serious, and/or where the risk of effects occurring is high
- where current control structures have proved inadequate to control the effects, but where effects differ at regional or local level, and some flexibility can be applied to local circumstances.
Doing nothing

This option would leave all decisions over controlling the environmental effects of used oil with regional councils and territorial authorities, and Dangerous Goods legislation, as is currently the case. This would mean that regional councils and territorial authorities would continue to make their own rules about burning used oil and road oiling.

As previously noted, there is a range of rules in plans which cover used oil, and some plans don’t mention it at all. The research into the environmental effects of used oil provides sufficient concern about the potential effects of uncontrolled use of used oil that we do not favour this option. We would, however, welcome feedback from you on the desirability of this option.

The ‘no change’ option is appropriate where:

- the environmental effects are not serious, and
- current control structures are adequate to control any actual or potential effects.

The national perspective

This paper has highlighted some tensions between local and national interests in relation to used oil. This tension applies to collection issues: to the merits of one co-ordinated collection system which services all parts of the country, versus more localised arrangements which work well where demand for oil is high, and less well in remote areas.

The tension also applies to questions about consistent environmental rules versus the need to account for local circumstances. Individual practices usually fall well within the relevant air and water quality standards, but cumulatively the high levels of contaminants in used oil compared with other fuels is cause for concern. Given the millions of litres of oil being burned at low temperature, and the unknown quantity spread on roads each year, the cumulative amounts of contaminants going into the environment are significant.
Summary of Questions

We welcome your written or emailed comments on any material contained in this paper. We particularly welcome comments on the questions raised throughout the paper. They are as follows:

Recovery issues

- Should we be continuing to rely on a voluntary scheme for used oil recovery, or should we be recommending to the Government that used oil recovery be regulated in one form or another? If regulated, how?
- Should we look towards a comprehensive levy-based scheme, through which the end-user ultimately funds the full range of services from information and education through transport and supply, or a take-back scheme based on retailers?
- Where should responsibility for education and information about used oil lie?
- Should we have a national scheme or set standards under which local arrangements can be developed to meet local market needs?
- How can we best monitor the recovery rate of used oil?

Burning issues

- How can we ensure that burners are being correctly maintained and operated, and that their environmental impact is minimised?
- Do we need national regulations to standardise the ways in which used oil can be burnt, and standards for individual burners?
- When considering the national effect of burning used oil, should New Zealand encourage adoption of Best Available Technologies rather than continue to use more contaminating burners?

Road oiling issues

- Safer methods of suppressing dust are available. Is it appropriate to use a product that releases contaminants into the environment, when a more benign product exists?
- If the spreading of used oil is to continue, what limits or restrictions should apply?
References


About the Ministry for the Environment
Manatū Mō Te Taiao

Making a difference through environmental leadership.

The Ministry for the Environment Manatū Mō Te Taiao advises the Government on policies, laws, regulations, and other means of improving environmental management in New Zealand. The significant areas of policy for which the Ministry is responsible are: management of natural resources; sustainable land management; air and water quality; management of hazardous substances, waste and contaminated sites; protection of the ozone layer; and responding to the threat of climate change. Advice is also provided on the environmental implications of other Government policies.

The Ministry monitors the state of the New Zealand environment and the operation of environmental legislation so that it can advise the Government on action necessary to protect the environment or improve environmental management.

The Ministry carries out many of the statutory functions of the Minister for the Environment under the Resource Management Act 1991. It also monitors the work of the Environmental Risk Management Authority on behalf of the Minister.

Besides the Environment Act 1986 under which it was set up, the Ministry is responsible for administering the Soil Conservation and Rivers Control Act 1941, the Resource Management Act 1991, the Ozone Layer Protection Act 1996 and the Hazardous Substances and New Organisms Act 1996.

**Head Office**
Grand Annexe Building
84 Boulcott Street
PO Box 10-362
Wellington, New Zealand
Phone (04) 917 7400, fax (04) 917 7523
Internet http://www.mfe.govt.nz

**Northern Regions Office**
8-10 Whitaker Place
PO Box 8270
Auckland
Phone (09) 913 1640, fax (09) 913 1649

**South Island Office**
Level 3, Westpark Towers
56 Cashel Street
PO Box 1345
Christchurch
Phone (03) 365 4540, fax (03) 353 2750