ENVIRONMENTAL RISK MANAGEMENT AUTHORITY

NGĀ KAIWHAKATŪPATO WHAKARARU TAIAO

MONITORING REPORT

April 2009

Monitoring the Effectiveness of the Hazardous Substances and New Organisms Act 1996

Report to the Minister for the Environment

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Acknowledgements

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Executive Summary

This report consists of three parts: an overview of the HSNO Act regime; an assessment of HSNO specific interventions with a focus on workplace solvents and volatile chemicals; and indicator data. The report is based on data and information from the 2007/08 financial year. Data and information from outside this period is also used to provide a more complete analysis. The key messages are:

Part One - Overview of the HSNO Act Regime

- Measuring the effectiveness of the HSNO Act is challenging because of limitations in data and difficulties in directly attributing changes in adverse effects to HSNO Act interventions.
- Incidents relating to new organisms have declined in 2007/08; however the number of hazardous substance related incidents has increased since 2005/06.
- The change in fireworks regulations has resulted in fewer fireworks being imported, and fewer fire service call outs in 2007/08 and 2008/09.
- The enforcement of new organism regulatory requirements has been an area of development and improvement over recent years.
- Hazardous substance compliance and enforcement has been identified as a significant challenge for the HSNO regime and the Authority considers the current compliance and enforcement programme needs to be strengthened to manage risks in the workplace.
- The HSNO Act application process is effective in processing applications in a timely and cost efficient manner.
- Pro-active engagement with local iwi and Māori has assisted in effective implementation of HSNO Act requirements.
- Effective implementation of HSNO Act matters relating to international obligations has been achieved through active participation in many international conventions.
- ERMA New Zealand works closely and effectively with a network of other agencies, particularly agencies responsible for enforcement of the HSNO Act.

Part Two - Assessment of HSNO Specific Interventions: Workplace Solvents and Volatile Chemicals

- There are limited data available on the harm caused by exposure to solvents and volatile chemicals in the workplace, particularly chronic effects which are very difficult to identify and track.
- Ammonia gas leaks from refrigeration systems make up half of the incidents reported to ERMA New Zealand.
- There are a relatively high number of reported hospitalisations caused by exposure to chlorine gas and 'unspecified' solvents in the workplace.

Boat Building Industry

- There is a considerable risk to the health of boat builders who are exposed to hazardous substances, and the most significant harm arises from chronic exposure to solvents, which is not readily measured. It will be important for government agencies and industry to continue communications in order to improve industry-specific knowledge on health and safety management and monitoring.

Light Organic Solvent Preservatives (LOSPs) in the Timber Treatment Industry

- Timber treatment workers, suppliers, builders and, to a lesser extent, occupants of houses and offices built with LOSP timber face potential adverse health effects from the solvents used in the treatment process. These effects can be prevented or managed by allowing the solvent to evaporate before the timber is handled.
- Current industry guidelines for managing the risks from solvent in LOSP timber are deficient and are not consistently complied with.
- The timber treatment industry has primary responsibility to identify solvent evaporation limits that are safe for downstream users of the timber, and for complying with those limits. The industry has proposed a review of its guidelines.
- Increased enforcement by the Department of Labour may reduce the extent of non-compliance evident in the timber treatment industry.

Part Three – Indicator Data

Data has been collected for a set of key indicators since 2001, and was used as the basis of previous monitoring reports. These indicators provide a general indication on the effectiveness of different aspects of the HSNO Act regime. However this data is increasingly unreliable, due to problems with data availability and accuracy. It is useful for identifying general trends, but must be treated with caution.

Introduction

The purpose of this report is to review the effectiveness of the Hazardous Substances and New Organisms (HSNO) Act 1996. Section 11(1)(b)(i) of the HSNO Act confers on the Authority the power to monitor and review the extent to which the Act reduces adverse effects on the environment or people from hazardous substances or new organisms.

This report meets the annual requirement of ERMA New Zealand's Output Agreement with the Minister for the Environment to provide the Minister with a report on *Monitoring the Effectiveness of the HSNO Act*.

This report is the second since a revised approach was adopted. Previously, the reports were based around a set of indicators. This indicator data is still collated annually and is available in Part Three of the report. However, rather than relying solely on the limited quantitative data, a broad overview of the effectiveness of the HSNO Act regime is provided from a range of information sources, along with a more focussed assessment of HSNO specific interventions in a specific topic area.

Part One – Overview of the HSNO Act Regime

The objective of this part is to present a broad overview of the effectiveness of the HSNO Act regime. This part also aims to provide indications of where the HSNO Act regime may be working well and where there are challenges for the regime.

Part Two – Assessment of HSNO Specific Interventions

The objective of this part is to evaluate the performance of HSNO Act interventions in priority areas. The focus in this report is on the topic area of *workplace solvents and volatile chemicals*. A general assessment of this particular set of substances is provided, along with a number of case studies which look in detail at specific industries where workers are exposed to these substances. Topic areas are reviewed annually and the 2010 report will be based on a topic relating to new organisms.

Part Three – Indicator Data

This part of the report presents the data collected for a key set of indicators - most of which have been collected annually since 2001. Any strong trends are discussed in brief, but due to limitations of accuracy of the data this is provided mainly for information purposes only.

Part 1

Overview of the HSNO Act Regime

This part of the report provides a broad overview of the effectiveness of the HSNO Act regime. This section goes beyond trend analysis of available quantitative data (provided in Parts Two and Three) and draws on various other sources of information to assess where the HSNO Act regime is working well and where there are challenges.

Key Messages

- Measuring the effectiveness of the HSNO Act is challenging because of limitations in data and difficulties in directly attributing changes in adverse effects to HSNO Act interventions.
- Incidents relating to new organisms have declined in 2007/08; however the number of hazardous substance related incidents has increased since 2005/06.
- The change in fireworks regulations has resulted in fewer fireworks being imported, and fewer fire service call outs in 2007/08 and 2008/09.
- The enforcement of new organism regulatory requirements has been an area of development and improvement over recent years.
- Hazardous substance compliance and enforcement has been identified as a significant challenge for the HSNO regime and the Authority considers the current compliance and enforcement programme needs to be strengthened to manage risks in the workplace.
- The HSNO Act application process is effective in processing applications in a timely and cost efficient manner.
- Pro-active engagement with local iwi and Māori has assisted in effective implementation of HSNO Act requirements.
- Effective implementation of HSNO Act matters relating to international obligations has been achieved through active participation in many international conventions.
- ERMA New Zealand works closely with a network of other agencies, particularly agencies responsible for enforcement of the HSNO Act.

1.1 Incident Reporting

ERMA New Zealand defines an incident as an event involving a new organism or hazardous substance that has potential to cause adverse effects to human health and safety, or the environment and may or may not involve non-compliance with regulatory requirements. Incidents can be identified by ERMA New Zealand through monitoring of compliance, reported by enforcement agencies, identified through media monitoring or otherwise advised to us e.g. by a member of the public.

ERMA New Zealand registers incidents in order to monitor the effectiveness of the regulatory system and the appropriateness of controls. It is noted however that data limitations mean that reductions in adverse effects from hazardous substances and new organisms are unlikely to ever be fully quantifiable or attributable to a specific action taken under the HSNO Act.

New Organisms

The number of new organism incidents reported has decreased from 25 in 2006/07 to 11 for 2007/08 (Figure 1), with only one incident resulting in minor adverse effects to the health and safety of people. No adverse effects on the environment have been reported as a result of these incidents.

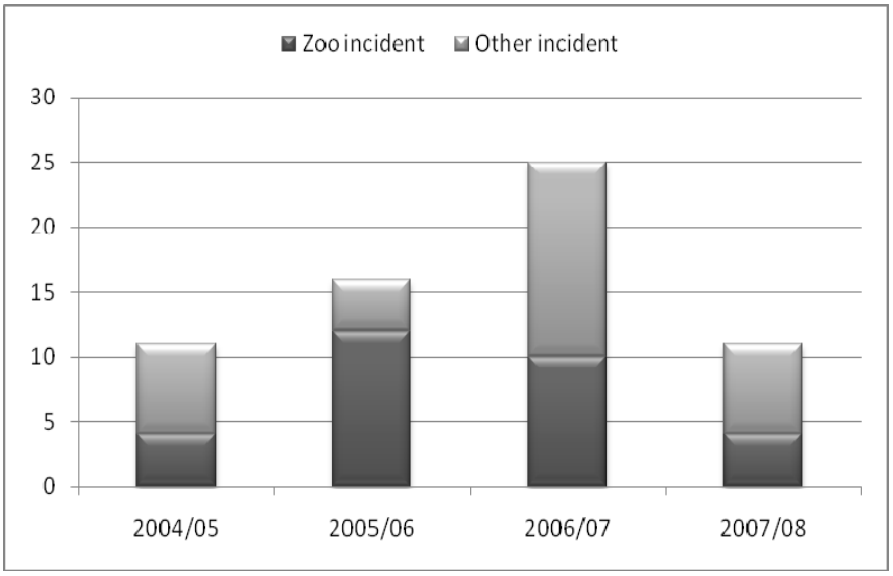

Figure 1: Number of new organism incidents reported to ERMA New Zealand by financial year

The majority of incidents in 2006/07 resulted from a failure to follow correct procedures, with the number of Ministry of Agriculture and Forestry (MAF) incursion responses to new organisms in the wider environment increasing to five from one in 2005/06.

There was a notable reduction in incidents occurring at zoos with only four reported in 2007/08, compared with 10 in 2006/07. The increase in 2005/06 and 2006/07 of zoo incidents may reflect the clarification by MAF of the term "escape from containment", whereby a zoo animal is now considered to have escaped from containment if it leaves its enclosure (previously it was interpreted as escape beyond the zoo boundary).

One incident in 2007/08 resulted in the successful prosecution under the HSNO Act for the unapproved importation and possession of Mexican Sour Gherkins by a seed importer.

Compliance with controls relating to genetically modified organism (GMO) field tests has come under increased scrutiny in the past few years. Since the commencement of the HSNO Act in 1998 to the end of the 2007/08 financial year there have been a total of eight incidents of breaches of containment of field test sites containing GMOs. None of these incidents resulted in the organisms escaping from containment. Six breaches were from unauthorised access to field test containment facilities, primarily by protesters.

Hazardous Substances

Over the last seven years the number of incidents reported to ERMA New Zealand relating to hazardous substances has remained relatively constant to 2005, although there has been an increase over the last two years (Figure 2). This increase may be due to a combination of better reporting and fewer inspections (see Figure 5), resulting in lower levels of compliance.

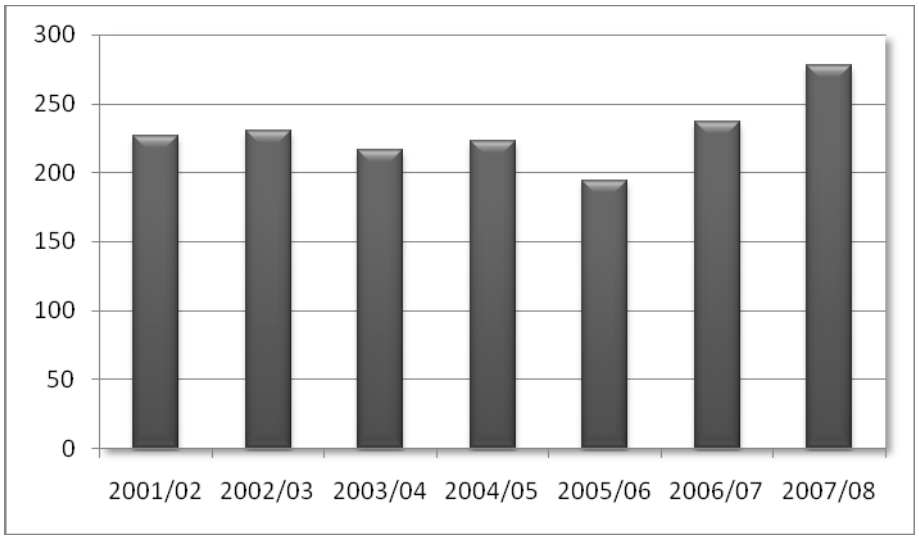

Figure 2: Total number of incidents involving hazardous substances reported to ERMA New Zealand

Of the total number of incidents reported to ERMA New Zealand in 2007/08, 26 percent recorded adverse effects on human health and 46 percent recorded adverse effects to the environment. Incidents where human deaths were reported continue to stay below two percent of total incidents. However, the ability to extrapolate to overall effects on the environment and population is limited.

The majority of human health-associated reports are related to acute exposure; however, it is recognised that chronic health effects make up a large proportion of the burden of occupational mortality and morbidity (the incidence or prevalence of a disease) mainly resulting from occupational exposure. Data deficiencies (lack and quality of data) mean that it remains difficult to capture and directly attribute chronic harm to specific substances.

The Ministry of Health has commissioned the Institute of Environmental Science and Research Limited (ESR) to develop a national Chemical Injury Surveillance System (CISS). ESR collates mortality and morbidity data. For 2007 ESR reported 158 emergency department notifications (involving 46 hazardous substances covered under the HSNO Act), an increase from 135 notifications (involving 29 substances) in 2006[1]. The majority (74 percent) of notifications in 2007 were the result of intentional exposure, for example substance abuse. The most notable change was a reduction in notifications involving household cleaners from 24 in 2006 to 14 in 2007.

[1] It is noted that this is not a complete national dataset, as in 2006 six emergency departments supplied data, whereas in 2007 five emergency departments supplied data

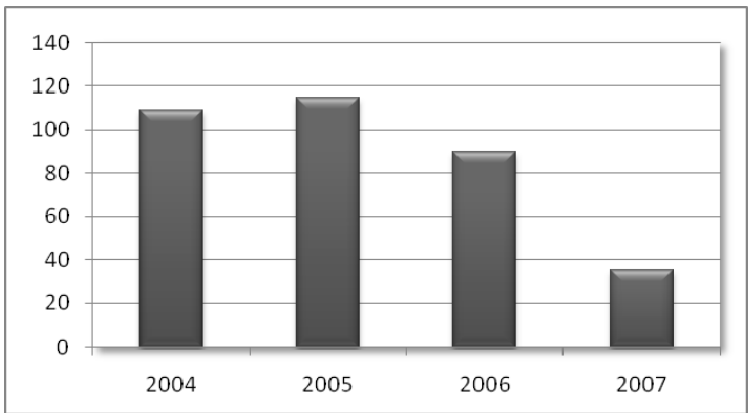

Figure 3: Hazardous substance related deaths reported by the Coronial Services Office

Thirty five chemical injury-related deaths (where a hazardous substance was identified as the primary substance involved) were filed at the Coronial Services Office (CSO) for 2007 (as at 31 December 2007) (Figure 3). The majority of these deaths (86%) were the result of intentional exposure. It is noted that the CSO data are only partially complete due to the time lag in the coronial investigation and reporting process. There have been two recorded chemical injury-related deaths of children under the age of five since CSO records began in 2001. These occurred in 2001 and 2002 were the result of carbon monoxide poisoning from cooking fires.

The number of non-vehicle incidents involving hazardous substances attended by the New Zealand Fire Service (NZFS), where environmental contamination was recorded, decreased by 21 percent in 2007. Of the total incidents reported to the NZFS 13 percent involved liquefied petroleum gas (LPG) following the overall trend of decreasing LPG incidents since 2000/01[2].

1.2 Regulations

Fireworks Regulations

Over the past two Guy Fawkes' seasons a joint fireworks safety campaign was run in collaboration with New Zealand Police, New Zealand Fire Service and the Ministry for the Environment. This campaign, combined with new regulations around the purchase and use of

[2] Incidents where the substance involved was entered as either a 'liquefied gas' or 'flammable liquefied gas' are included in the analysis of LPG incidents.

fireworks, resulted in the quantity of retail fireworks imported being 20 percent lower in 2007 than in 2006.

Data provided to date show that the 2008/09 financial year has had the lowest number of emergency callouts since records began in 1996 (Figure 4). The total number of callouts during the four-day sales period was down by 60 percent on callouts over the 10-day sales period in 2006. Therefore the data suggest that tightening restrictions on access to fireworks (by placing time restrictions on the sales period) has been effective in reducing the adverse effects of fireworks on people and the environment.

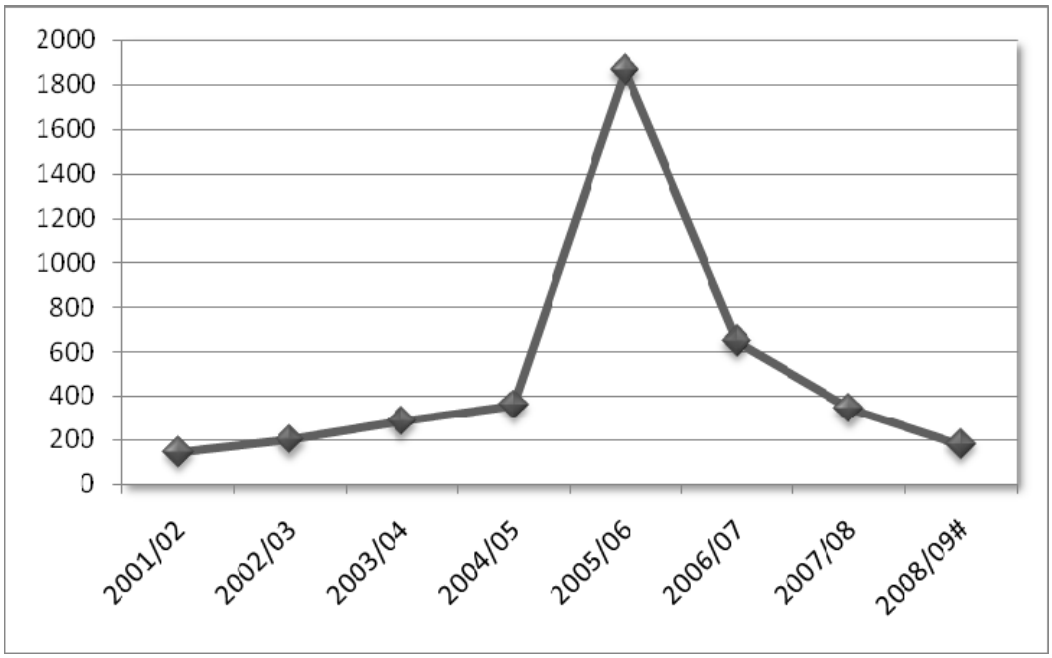

Figure 4: Total number of fireworks call-outs reported by NZFS
(# The 2008/09 data is complete as at February 2009, however the vast majority of fireworks related fires occur during November, so we can assume that this figure will not significantly alter by the end of the financial year)

To further build on these achievements, ERMA New Zealand has developed a Code of Practice for Outdoor Pyrotechnic Displays, in consultation with industry, agencies and the public.

1.3 Compliance and Enforcement

New Organism Compliance and Enforcement

The enforcement of regulatory requirements relating to new organisms has been an area of development and improvement over recent years. ERMA New Zealand and MAFBNZ, the enforcement agency, have a close working relationship which has contributed towards a more streamlined enforcement and compliance system.

MAF has primary responsibility for reviewing and developing containment facility standards, under which most HSNO Act approval holders must operate. There continues to be a considerable amount of activity towards improving these standards and ERMA New Zealand has increasingly taken a more active role in containment standard review and development, as seen with the revision of the Facilities for Microorganisms and Cell Cultures Standard, and the Containment Standard for Zoo Animals and Facilities for Invertebrates standards currently under review. These developments mean that ERMA New Zealand decision documents can now reference these containment facility standards thereby reducing duplication of controls.

The level of compliance with HSNO Act approvals remains high. Enforcement reports have indicated a higher level of scrutiny in auditing facilities by Biosecurity Inspectors, resulting in generally improved compliance with approval requirements.

Several high profile HSNO Act approvals remain in the public focus, including those related to genetically modified organisms and zoo animals. Although these tend to attract public concern in terms of the adequacy of the enforcement and compliance regime, the system has been effective in managing risks and protecting New Zealand's environment and people from harm.

Hazardous Substance Compliance and Enforcement

Hazardous substance compliance and enforcement is an area that has been identified as a significant challenge for the HSNO Act regime with questions around the level of enforcement and in particular whether enforcement is resourced at a level adequate to ensure that hazardous substance risk is well managed in New Zealand workplaces.

Most hazardous substance use occurs in a workplace context and it is estimated that approximately 150,000 New Zealand workplaces use hazardous substances and about 20,000 have significant hazardous substances holdings that require some form of test certification.

There has been a slow uptake by businesses in complying with HSNO Act controls with only 4,000 worksites obtaining Location Test Certificates from the 15,000 worksites that held licences under the now repealed Dangerous Goods Act[3].

Compliance activity in the workplace is delivered through the Department of Labour (DoL). Over the past five years, workplace visits have been reasonably stable at around 5,000 but are expected to decrease by 10 percent this year to 4,000. This projected figure of 4,000 inspections would represent a decrease in inspections of more than 35 percent over the last three years.

Figure 5 below sets out the number of HSNO workplace visits undertaken since 2001/02. During the first three years (2001/02, 2002/03, and 2003/04) workplace hazardous substances compliance was under a transitional regime which carried over the rules and regulations from previous legislation (primarily the Dangerous Goods Act and the Toxic Substances Act).

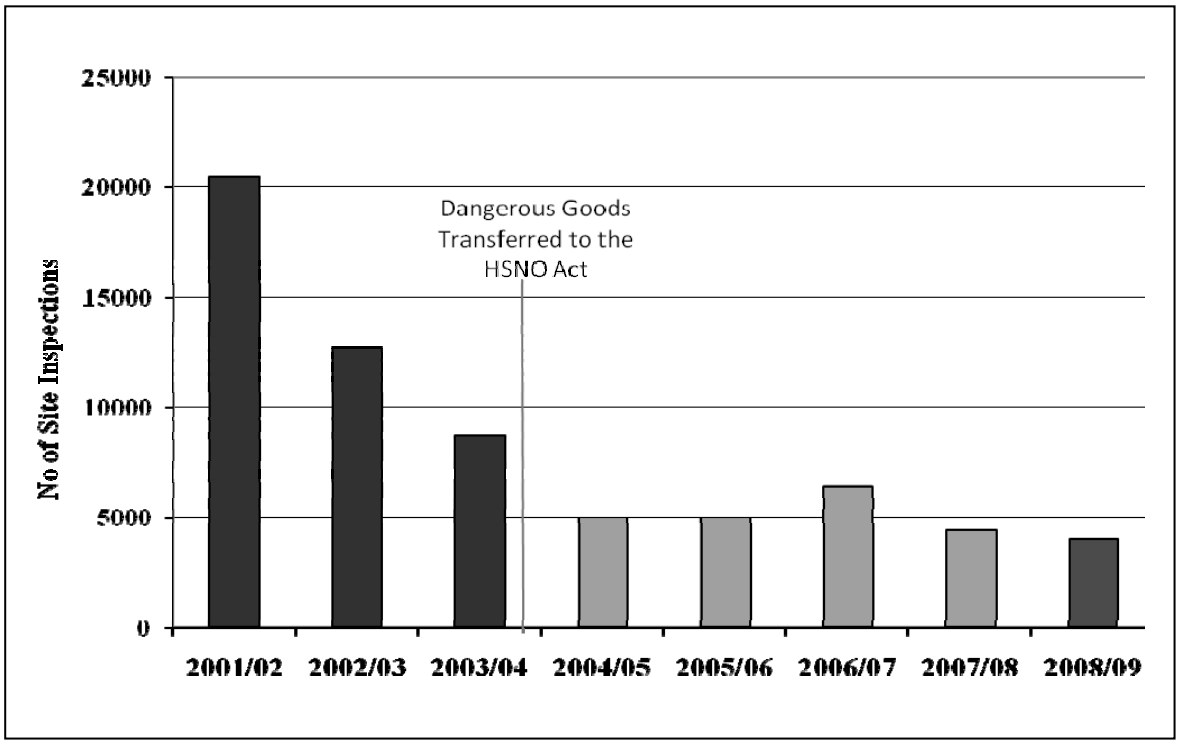

Figure 5: Number of workplace site visits undertaken (figure for 2008/09 is projected)

[3] Dangerous goods were transferred under the HSNO Act on 1 April 2004.

The large decrease in the number of site visits in the three years from 2001 to 2004 was due to the territorial authorities downgrading their involvement in hazardous substances compliance in the workplace as the transitional regime came to an end. Figures for subsequent years indicate site visits undertaken by DoL and its contractors.

Test certification is an essential part of getting businesses to comply with the HSNO Act. Businesses using specific quantities and types of substances are required to demonstrate to an approved test certifier that they comply with the controls and to obtain a test certificate to that effect. The Ministry for the Environment is undertaking a review of the test certification regime to assess the effectiveness of the regime to manage hazardous substance risks.

A recent survey of test certifiers and other interested parties was undertaken by the New Zealand Institute of Hazardous Substances Management (NZIHSM[4]) to provide some data on how the HSNO Act regime is performing. The responses that related to location certificates indicated that only 10 percent of sites are compliant at the first visit, and only 57 percent of location certificates are completed within a year of their first visit. Of more concern is the estimated 42 percent of non-compliant sites that do not begin the process.

In December 2006 a five-year Hazardous Substances Compliance and Enforcement Strategy was approved by the government in order to address the issue of low compliance levels. This strategy established a phased approach and envisaged that information and education would initially be provided to businesses and others to help them adapt to the new regulatory regime. During this period enforcement was expected to be kept light handed, moving to full enforcement in 2008 when those subject to the HSNO Act had time to become aware of what was needed to be done to comply. Implementation of the Strategy has been slower than envisages due to the limited availability of resources and there is concern by ERMA New Zealand, MfE and DoL that the Strategy will not be delivered within the five year timeframe.

[4] NZIHSM is an organisation which represent test certifiers, enforcement officers and users of hazardous substances

1.4 Applications

Trends in applications decided by ERMA New Zealand

Figure 6 indicates that the total number of Part 5 and 6 applications for new organisms and hazardous substances which have been decided has steadily increased from 1998/99 to 2005/06. After this period of rapid growth, we see a reduction in applications as the market for these substances becomes established.

New organism applications fluctuated between 1998/99 to 2003/04 then have remained relatively stable while hazardous substance applications gradually increased until 2006/07.

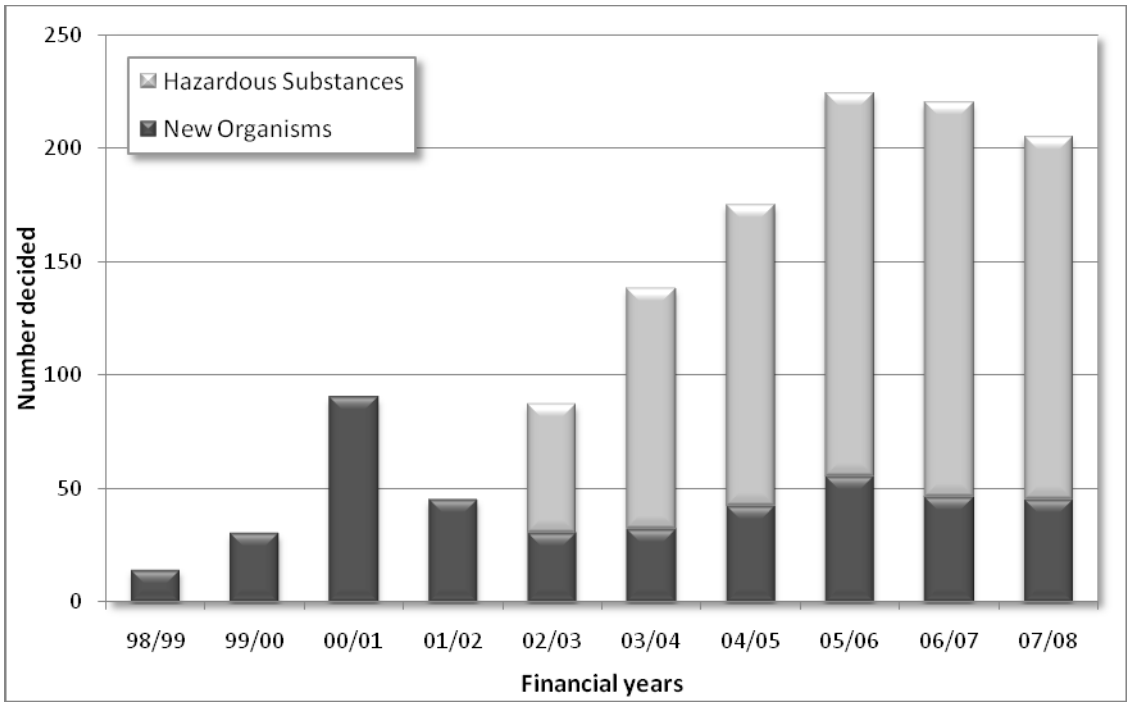

Figure 6: Substantive applications decided (excluding non-statutory advice, amendments and Institutional Biological Safety Committee decisions)

A HSNO Act application may be declined if the adverse effects of the substance or organism outweigh the beneficial or positive effects. The number of applications declined (Figure 7) indicates that the HSNO Act effectively sets limits around exercising judgement in risk management. No applications were declined in 2006/07 or 2007/08. There have also been

some circumstances when the Authority has chosen to decline parts of an application which was otherwise approved. This is termed a "partial decline".

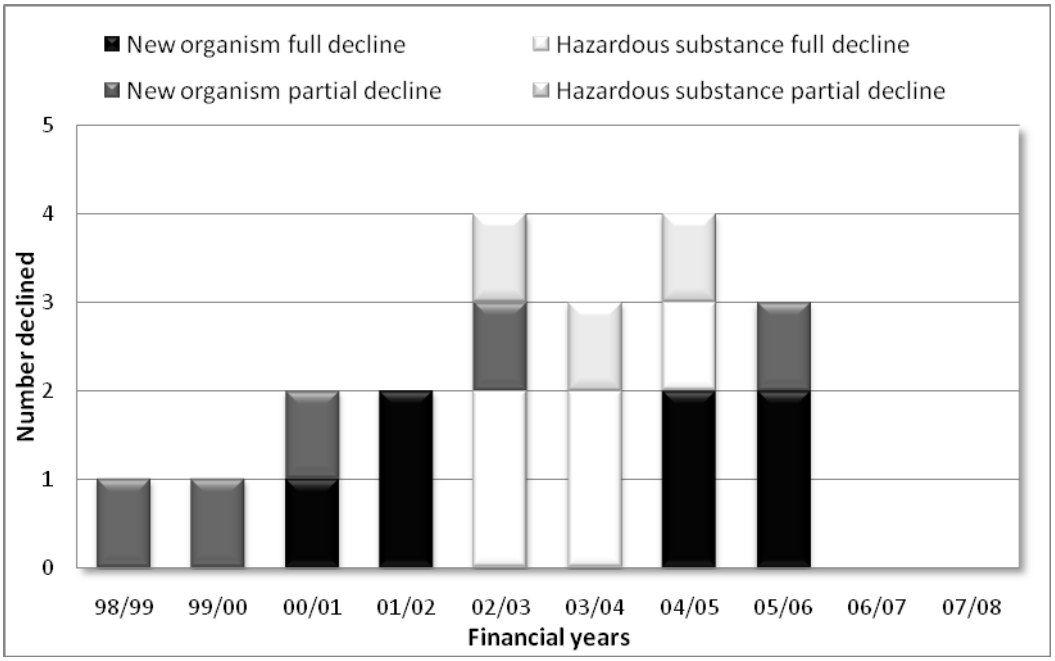

Figure 7: Applications declined

Processing applications within statutory timeframes

Timeliness is an important aspect of processing hazardous substance and new organism applications. The HSNO Act specifies statutory timeframes, and conditions for approved extensions or waivers (where need be) for the processing of each type of application.

Figure 8 indicates that in 2006/07 almost all applications were processed according to the statutory timeframes. In 2007/08 there was a slight decrease from the previous year, however the timeliness has steadily improved from 2004/05 with permitted extensions, even with an increase in the number of applications decided (see Figure 6).

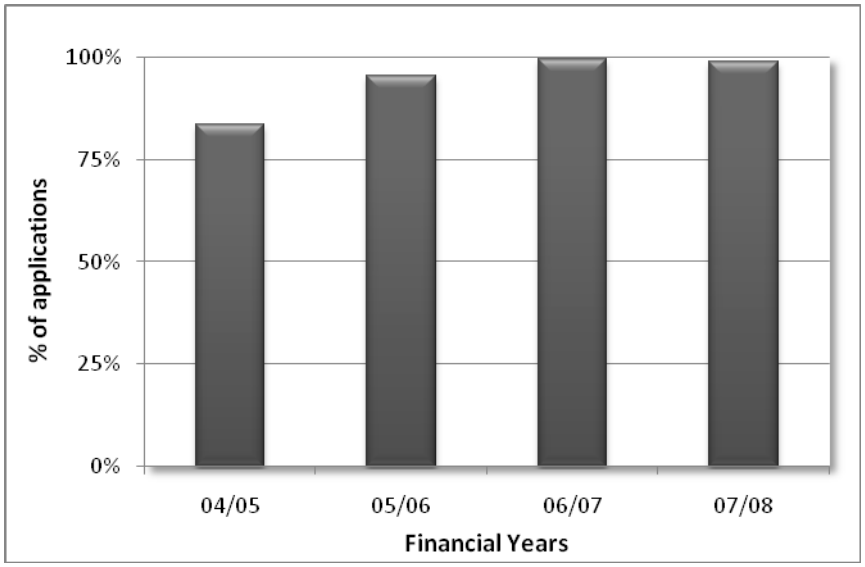

Figure 8: Percentage of applications processed within statutory timeframes from 2004/05 – 2007/08[5]

International Comparisons of timeframes and fees

It is important to note that the information set out below is indicative only. Each regulator operates under different legislation and in the case of the overseas comparisons under a slightly different regulatory system. Nevertheless, it is possible to obtain a broad indication of costs and timeliness.

When compared to overseas jurisdictions, HSNO Act statutory timeframes are generally shorter. Table 1 provides a comparison for hazardous substance regulation (based on information available in 2006/07). A comparison of the application fees (converted to New Zealand dollars and based on information available in 2006/07) (Table 2) with ERMA New Zealand fees, also indicates that in many cases ERMA New Zealand's fees are significantly less than those charged by overseas agencies.

[5] Taking into account the use of timeframe extensions or waivers.

Table 1: Comparison of statutory timeframes (in months) for hazardous substances applications

Application Type	ERMA New Zealand	Agricultural Compounds and Veterinary Medicines Group	Environmental Protection Agency - pesticides (US)	Pesticides Safety Directorate (UK)	Australian Pesticides and Veterinary Medicines Authority
New Active (category C)	5	4	24	11	15
Reformulation (category B)	5	2	6	11	5
Reformulation (category A)	5	2	6	11	5
Rapid assessment to import or manufacture	0.5	2	3	11	
Experimental use (containment)	2	2	18		5

Table 2: Comparison of hazardous substances application fees, 2007 (in $NZ, based on exchanges rates of October 2007)

Application Type	ERMA New Zealand	Agricultural Compounds and Veterinary Medicines Group	Environmental Protection Agency - pesticides (US)	Pesticides Safety Directorate (UK)	Health and Safety Executive (UK)	Australian Pesticides and Veterinary Medicines Authority	Pest Management Regulatory Agency (Canada)
New Active (category C)	15,000	4,550	624,922	256,476	128,238	56,006	233,493
Reformulation (category B)	5,000	4,550	5,262	25,648	10,259	24,312	77,831
Reformulation (category A)	3,000	2,590	5,262	25,648	17,953	3,783	77,831
Rapid assessment to import or manufacture	500	3,330	1,316	25,648			77,831
Experimental use (containment)	500	1,420	65,781		6,412	900	5,968

For new organisms applications the fees range from $500 - $35,000. The Australian Office of the Gene Technology Regulator (for GMOs) and the US Department of Agriculture's Animal and Plant Health Inspection Service process applications for other non-GM new organisms at no or only minor costs.

1.5 Engagement with iwi/Māori

The implementation of various initiatives set out in ERMA New Zealand's iwi/Māori engagement strategy seeks to ensure effective participation by iwi/Māori in HSNO Act processes.

1.5.1 Tikanga and Technology Hui

A highlight for 2008 was the Tikanga and Technology hui held in Wellington in May and sponsored by the Allan Wilson Centre for Molecular Ecology and Evolution and GNS Science. It brought together over 120 researchers, scientists and ERMA New Zealand's Māori National Network members to discuss potential implications and opportunities of new and emerging biotechnologies and nanotechnology on Māori tikanga (culture) and kaitiakitanga (guardianship) (Figure 9).

Figure 9: Participants at the Tikanga and Technology Hui

1.6 Meeting International Obligations

Section 6 of the HSNO Act requires that New Zealand's international obligations are taken into account when making decisions on hazardous substance and new organism applications. New Zealand engages with the global community through a number of international agreements and conventions that are concerned with the protection of the natural, social and cultural environment; protection of human health and safety; and trade. These obligations are met by ERMA New Zealand and other agencies participating in a number of international forums and ensuring that international best-practice standards are adhered to.

An important international activity is New Zealand's involvement with the Biosafety Clearing-House (BCH), a mechanism set up by the Cartagena Protocol on Biosafety to facilitate information exchange between parties across the world who deal with living modified organisms to better comply with the obligations under the protocol. ERMA New Zealand staff are involved with the global interchange of information by registering information in the BCH each time a decision on a new organism is made.

The more significant international hazardous substance related forums that ERMA New Zealand has participated in over the last year include the United Nations Globally Harmonised System of Classification and Labelling of Chemicals (GHS), the Organisation for Economic Co-operation and Development (OECD) and the Strategic Approach to International Chemicals Management (SAICM) forums.

The GHS is the international initiative that the hazardous substances regulatory framework under the HSNO Act is based on. New Zealand's early adoption of the GHS is regularly held up as an example and, for instance, is noted favourably in the 2009 Resolution from the United Nations Economic and Social Council. New Zealand work in this forum has assisted both with the development of the GHS at the international level and the programmes for adoption of it in other countries. In turn, these activities are of assistance to New Zealand as we look to update the HSNO regulatory framework to better align with the current content of the GHS. Through this, New Zealand's regulatory system will become more consistent and compatible with international best practice and this should lead to both a decrease in compliance costs and an increase in the effectiveness of the Act.

The OECD provides multi-faceted environmental initiatives and is an important body in the overall process of information exchange on chemicals and compliance. A significant contribution to the international community is the importation of the ERMA New Zealand Chemical Classification Information Database (CCID) into the OECD internet e-ChemPortal. The portal offers free public access to information on the properties of chemicals,

environmental behaviour and toxicity levels. It allows for a simultaneous search of multiple databases, giving access to data submitted to government chemical review programmes at national, regional, and international levels. This contribution exemplifies how ERMA New Zealand's risk management portfolio meets international best-practice standards.

Involvement in SAICM allows engagement in the global knowledge-sharing process which adds value to the way we use and regulate chemicals in New Zealand. SAICM is a voluntary agreement (under the auspices of the United Nations Environmental Programme [UNEP]), based on a non-legally binding policy framework which fosters best-practice management of chemicals to minimise adverse effects on the environment and human health. In the future years to come, ERMA New Zealand can both utilise and contribute towards SAICM's policies as we progress our sustainable chemistry initiative.

1.7 ERMA New Zealand Interactions and HSNO Act Amendments

Interactions between ERMA New Zealand and other government agencies

ERMA New Zealand, as the regulatory agency for hazardous substances and new organisms, works with a network of other agencies, particularly agencies responsible for enforcement, to deliver the purpose of the HSNO Act. ERMA New Zealand has working relationships with the Ministry for the Environment, the Ministry of Agriculture and Forestry (MAF), MAF Biosecurity New Zealand (MAFBNZ), the Department of Labour, the New Zealand Food Safety Authority, the Department of Conservation, the Ministry of Health (MoH), and the Ministry of Consumer Affairs (MCA).

An area where there has been significant activity in 2007/08 has been the interactions between ERMA New Zealand and the MCA regarding product safety. If a product safety issue is identified that cannot be addressed by the HSNO Act, ERMA New Zealand can provide advice to the Ministry of Consumer Affairs to use their powers under the product safety provisions of the Fair Trading Act and potentially ban any product, or issue a mandatory recall.

There have been a number of instances where MoH was also involved in these product safety issues, particularly on matters where manufactured articles contain hazardous substances. Some examples include:

- children's water colour paints
- B'loonies (plastic bubble balloons)
- formaldehyde in clothing
- bubble soap

Figure 10: Tian Mao water colour paints that were banned by MCA and voluntarily recalled.

To formalise these connections, a joint Memorandum of Understanding (MoU) was signed in May 2008 between MCA, MoH and ERMA New Zealand for managing complaints/enquiries in relation to hazardous substances.

ERMA New Zealand also has MoUs with a number of other government agencies (including MAF, DoC, NZFSA, DoL, MfE, and New Zealand Customs Service) to formalise arrangements concerning the exchange of information, monitoring requirements, interrelationships, and enforcement.

Biosecurity Act interface resolution

Uncertainty around the interface between the HSNO Act and Biosecurity Act 1993 was resolved in April 2008 by amendments to both Acts. These amendments made it explicit that the Biosecurity Act is the appropriate statute for determining the biosecurity risks from non-GM passenger organisms that incidentally arrive in New Zealand.

Part 2

Assessment of HSNO Specific Interventions

Workplace Solvents and Volatile Chemicals

This section looks at the use of solvents and volatile chemicals in the workplace and is based on, but not limited to, data for the period 1 July 2007 to 30 June 2008.

Key Messages

- There are limited data available on the harm caused by exposure to solvents and volatile chemicals in the workplace, particularly chronic effects which are very difficult to identify and track.
- Ammonia gas leaks from refrigeration systems make up half of the incidents reported to ERMA New Zealand.
- There are a relatively high number of reported hospitalisations caused by exposure to chlorine gas and 'unspecified' solvents in the workplace.

2.1 Overview

Solvents and volatile chemicals are used in many different workplaces in New Zealand. The Department of Labour (DoL) have identified three industries as priority focus areas in their 2008/09 Workplace Regional Delivery Plan that use large quantities of solvents and volatile chemicals. These industries are manufacturing, timber treatment and the retail sector. ERMA New Zealand's Hazardous Substances Risk Reduction Strategy (2004) also identified solvents and volatile chemicals used in workplaces as substances of concern. The strategy aims to progressively reduce the adverse effects of hazardous substances on people and communities, the environment, and the occupational workforce.

A solvent is any substance that dissolves another substance to form a solution. Common solvent groups include styrene, toluene, phenols, alcohols, ketones, white spirits and other aromatic hydrocarbons.

Volatile chemicals are substances that evaporate easily, forming a vapour, or exist as a gas at normal temperatures and pressures. Volatile chemicals commonly found in some New Zealand workplaces, that are not also solvents, include chlorine gas and ammonia.

Many substances are both a solvent and volatile, and are often highly flammable. This report focuses on the toxic effects of solvents and volatile chemicals and not on the flammability of the substances. Therefore incidents involving explosion or fire are beyond the scope of this report.

Solvents and volatile chemicals can pose significant health risks to people exposed to them, as they can be readily inhaled or absorbed through the skin. Acute health effects from solvent or other volatile chemical exposure include nausea, vomiting, and disorders of the nervous system, and can lead to unconsciousness if inhaled in large amounts. Chronic exposure to some solvents can cause chronic solvent neurotoxicity (CNS, or chronic solvent-induced toxic encephalopathy). Symptoms include memory loss, fatigue, difficulty concentrating and personality changes. Other chronic effects of solvent exposure include cancer and damage to the liver, kidney or brain.

Many industries and activities use solvents and volatile chemicals in manufacturing or other processes, such as the production and/or use of dyes, textiles, printing inks, polymers, plastics, adhesives, cosmetics and pharmaceuticals. These include:

- Printing
- Nail Salons
- Boat Building
- Painting and Paint Stripping
- Timber Treatment
- Hairdressing
- Dry Cleaning
- Collision Repair
- Joinery / Furniture Makers
- Municipal Swimming Pools

The HSNO Act supports the use of alternative, lower-hazard products through the Group Standards approvals, and through the section 28A rapid assessment provisions. Some of the industries that have traditionally used solvents and volatile chemicals are choosing to use lower-hazard substances. For example, there is increasing use of vegetable-based inks in the printing industry, and water-based "enviro-paints" in the painting and building sectors. However, many industries continue to use significant quantities of potentially harmful solvents and volatile chemicals in their processes.

The following sections summarise the available data and information on the harm caused by exposure to solvents and volatile chemicals in the workplace. Section 2.2 summarises the available data, and Section 2.3, 2.4 and 2.5 uses case studies to illustrate some of the issues.

2.2 Evidence of Harm

There are limited data available on the harm caused by exposure to solvents and volatile chemicals in the workplace. Incidents resulting from exposure to these substances are recorded in several databases, including the ERMA New Zealand Incidents Database, the Department of Labour's Incidents Database and Environmental Science and Research's (ESR's) Chemical Injury Surveillance System. The data is gathered from various sources, including:

- Medical reports, when a person seeks medical attention and a chemical is identified in the cause of the symptoms
- Coroner reports, when a chemical is identified in a cause of death
- The media
- The New Zealand Fire Service
- HSNO Act enforcement agencies, including the Department of Labour and Territorial Authorities

Incidents reported seldom identify the specific substances involved. Therefore the number of incidents involving solvents and volatile chemicals can not be accurately determined.

2.2.1 ERMA New Zealand Incidents Database

ERMA New Zealand was advised of 14 incidents involving a solvent, chlorine or ammonia, in the July 2007 to June 2008 year. These are summarised as follows:

- Solvent spill from a drum pierced by a fork lift.
- "Chlorine poisoning" at a municipal swimming pool. Five children hospitalised.
- Vehicle accident resulting in several containers of chemicals rupturing. Reported to have included "chlorine".
- Leak of "chlorine" into stormwater system. Spill diverted to the sewerage system.
- Chlorine gas leak at a chicken processing factory. One person hospitalised, eleven people treated by paramedics.
- Leak of "ammonia" into a stream. Resulted in significant environmental impact with more than 1000 eels found dead.
- "Ammonia gas" leak at a coolstore. No injuries.
- "Ammonia" leak at a coolstore. Six workers hospitalised.
- "Ammonia" leak from a refrigerator at a meat processing plant.
- "A cloud of ammonia" from a freezing works. [Assumed related to refrigeration plant]
- "Anhydrous ammonia" leak at a coolstore.
- "Ammonia" leak at a coolstore. Two injuries reported.
- "Ammonia gas" leak at a paua processing factory, from refrigeration plant. Gas dissolved in water discharged to stormwater system.
- A container of "ammonia byproduct" fell and was run over in a cargo room at an airport. One worker was treated for inhalation problems by ambulance staff.

The number of ammonia gas leaks from refrigeration systems, which make up half of the incidents reported, is a concern. Refrigeration systems are regulated by the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations (1999),

and as a consequence, anhydrous ammonia, used in refrigeration systems, is excluded from a number of the HSNO Act controls. Refrigeration systems are being subjected to scrutiny at the present time, mainly as a consequence of the Icepak coolstore incident at Tamahere in April 2008. ERMA New Zealand has been:

- Peer reviewing parts of an Institution of Professional Engineers New Zealand (IPENZ) Practice Note on Cold Store Engineering,
- In discussion with the Institute of Refrigeration, Heating and Air Conditioning Engineers of New Zealand (IRHACE) regarding approved handler and approved filler training,
- In discussion with the Department of Labour and the Ministry for the Environment about the adequacy of the controls that are in place for refrigeration systems.

Additional guidance material for ammonia and refrigeration systems may be an outcome of these discussions.

2.2.2 Department of Labour's Incidents Database

The Department of Labour was advised of at least 10 incidents involving toxic effects of solvents and volatile chemicals in the July 2007 to June 2008 year. Incidents involving ammonia were not included in the database search. The 10 incidents are summarised as follows:

- Fumes from mixing general purpose disinfectant and detergent at a meat processing plant. One worker hospitalised.
- Solvent leak from a drum, possibly Methyl Ethyl Ketone. One worker reported headache and eye pain.
- Chlorine gas in a drum inhaled by employee when he was preparing to clean the drum. One worker hospitalised.
- Possible carbon monoxide poisoning from working in a warehouse with a LPG forklift. Four workers injured.
- "Chemicals" sprayed on hot equipment. One worker affected by fumes.
- One worker hospitalised after working near an area that had been sprayed with a refrigeration insulation spray.
- Either Hydrogen Sulphide or lack of oxygen at a geothermal power station. Two workers hospitalised.
- Fumes from mixing Sodium Cyanide and EnstripS (and possibly water). One worker rendered unconscious.
- Methyl Bromide inhaled. Employee felt unwell.

- Fumes from swimming pool chemicals.
- Six employees at poultry processing factory short of breath, possibly from inhaling chlorine gas.
- Exposure to chlorine gas after chlorine tablets exploded.

2.2.3 ESR's Chemical Injury Surveillance System

Environmental Science and Research (ESR) collect information on chemical injuries on behalf of the Ministry of Health. Data in this section were recorded by ESR's Chemical Injury Surveillance System and cover the period 1 July 2001 to 30 June 2008. The data is limited to injuries or deaths where the chemical involved was categorised as one of the following:

- solvent,
- chlorine,
- ammonia,
- toluene,
- resin,
- benzene,
- white spirits, or
- a common alternative chemical names for the above substances.

These substances were identified as commonly used solvents and volatile chemicals that people are likely to come in contact with in their workplaces or in their daily lives. Some of these substances are also commonly used as substances of abuse. The Chemical Injury Surveillance report for 2007 indentified that just over half of all chemical injury deaths and hospitalisations were from deliberate misuse. Similar results have been seen in previous years. Substance abuse and self harm are difficult to manage under the HSNO Act, as they involve deliberate breach of hazardous substance controls. Deliberate misuse of a solvent or a volatile chemical falls outside the scope of this report, and every attempt has been made to exclude, or to specifically identify, those incidents in the data presented here.

It is difficult to distinguish chronic health effects from acute injuries in the data available.

Deaths from chemical injury

The substances listed above contributed to the deaths of three people between July 2001 and June 2008. All three deaths involved toluene and were a result of substance abuse.

Hospitalisations from chemical injury

Between July 2001 and June 2008 there were 263 hospitalisations where exposures to one or more of the substances listed above were identified in the diagnosis[6]. Approximately 65 percent of the people hospitalised were male. This data excludes incidents of deliberate misuse where possible. The data may include incidents where the exposure occurred in a location that cannot be categorised as a workplace.

Exposure to an unspecified solvent or to chlorine contributed to the majority of hospitalisations; 43 percent from unspecified solvent and 40 percent from chlorine. Ammonia contributed to 8 percent of hospitalisations (see Figure 11).

The distribution of the hospitalisation data by age group (see Figure 12) shows the 0-4 year age group had the highest number of hospitalisations, with 24 percent of the total, most of which are due to an unspecified solvent exposure. The 10-14 year age group had a large number of hospitalisations due to chlorine exposure. This may be attributed to incidents at municipal swimming pools, which often involve a large number of cases for the one event.

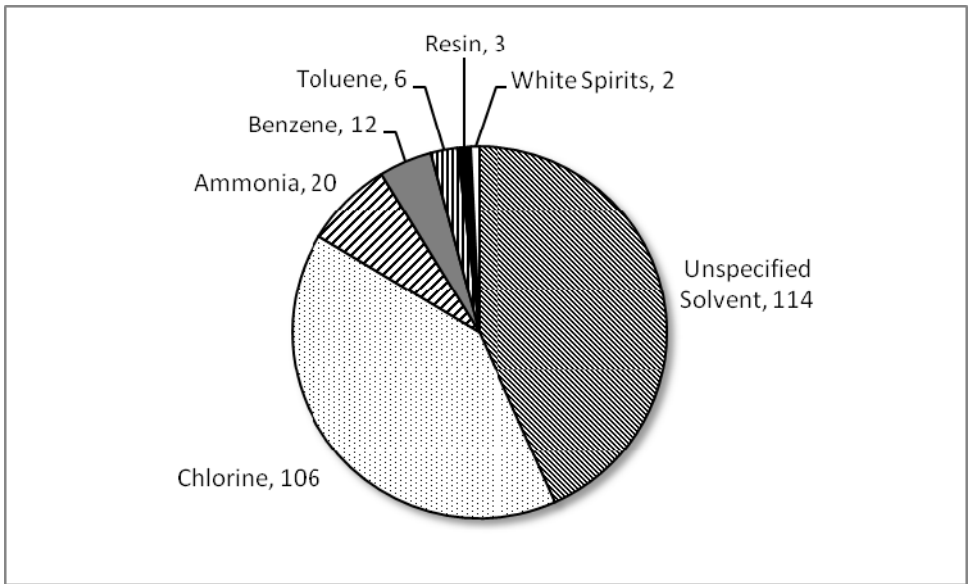

Figure 11: Number of hospitalisations where exposure to a substance of concern was identified in the diagnosis; by substance; Jun 2001-Jul 2008

[6] The search included the first six diagnosis fields, of which there may be up to 20 for any one hospitalisation.

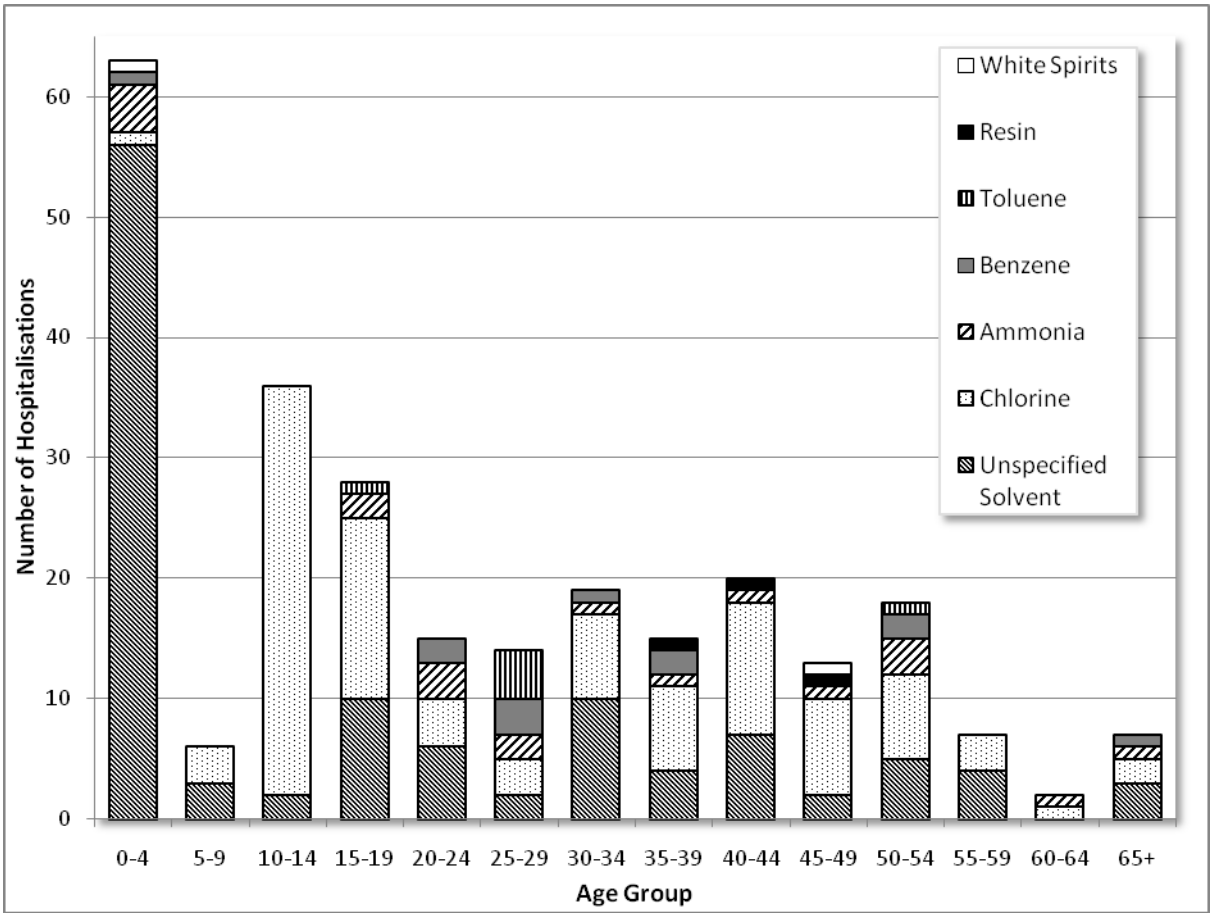

Figure 12: Number of hospitalisations where exposure to a substance of concern was identified in the diagnosis; by age group; Jul 2001-Jun 2008

Eighty-three of the 263 cases were identified as specifically work-related (see Figure 13). Over half of these involved chlorine, and two-thirds of the people affected were male. There were many fewer cases involving a solvent when compared to the total numbers in Figure 11, which possibly reflects the influence of intentional solvent abuse on the data. It also does not include the high numbers of hospitalisations from exposure to a solvent in the younger age groups. Unfortunately no data were available on the distribution of these injuries among different industries, however many were identified as occurring in an industrial or construction area.

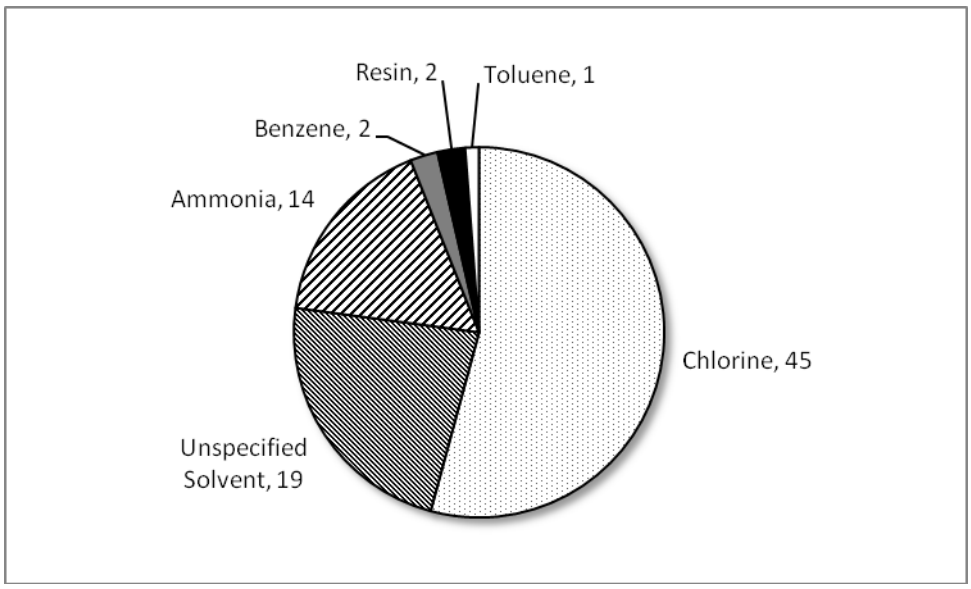

Figure 13: Number of hospitalisations where exposure to a substance of concern at a workplace was identified in the diagnosis; by substance; Jul 2001-Jun 2008.

The data were also analysed for any long-term trends over the seven year data period. Figure 14 shows the number of hospitalisations for each of the substances of concern for each financial year. The graph shows a steady decrease in the total number of cases up until 2006, when there is a marked increase. This is due to an increase in the number of cases involving both unspecified solvents and chlorine, but it is unclear what may have caused these increases. There is no clear long-term trend in the number of solvent cases, whereas there is an increase in chlorine cases in the last two financial years. This may be due again to swimming-pool incidents, as two or three incidents can create a large number of poisonings. The other substances are represented in too small numbers to show a trend, with the exception of ammonia, which has decreased since a large number of cases in 2001/02.

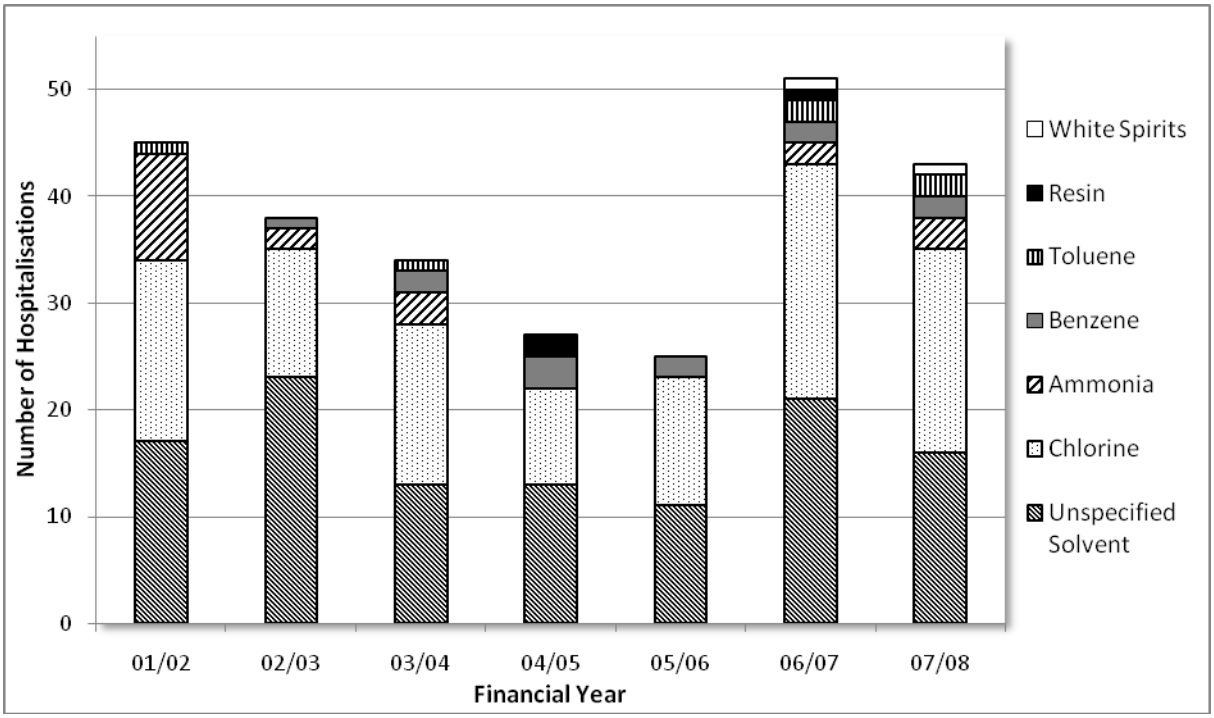

Figure 14: Number of hospitalisations where exposure to a substance of concern was identified in the diagnosis; by financial year; Jul 2001-Jun 2008

Public Health Unit Data

Some Public Health Units report emergency department data separately to ESR. This is not captured in the NZHIS system as the patients are not admitted to hospital. This data is fairly limited, as only some PHU's report, and they have not done so consistently over the last eight years. Therefore, this data was not analysed in much detail, but the following cases are noted:

- Most cases reported were either chlorine or ammonia related and affected adults;
- Two cases of poisoning by white spirit were reported, both in the 0-4 year age group;
- There was one case of timber preservative poisoning, again in the 0-4 year age group.

Conclusions

There are many injuries occurring in the workplace from exposure to chlorine gas. Chlorine gas exposure also leads to a high number of hospitalisations in children, which can be attributed to exposure at swimming pools.

Ammonia has been a common cause of injury in the past. It is still a major cause of hospitalisation for workplace related injuries.

Males are over-represented in injury data. This may be due to the use of solvents in industries with traditionally male roles.

A high number of young children are hospitalised due to exposure to solvents. There is likely to be a higher number which are not admitted to hospital and therefore are not captured in this data. These incidents may not occur at workplaces, and might be occurring mostly in the home.

2.3 Case Study: Nail Salons

Methyl methacrylate (MMA) is an industrial solvent that was approved under the HSNO Act in 2004. The use of MMA in cosmetics has been recognised to be dangerous to both workers and clients of nail salons.

MMA has been used as a nail hardener in acrylic nails, sculpting the hardened surface into nail shapes that are then painted. It costs less than alternative, less hazardous products. However, it can pose a risk to the nail technicians who are regularly inhaling the vapours, and can damage a client's fingernail beds and surrounding skin.

Figure 15: A nail technician wears a mask to protect herself from solvent fumes

The Cosmetics, Toiletry and Fragrances Association (CTFA) of New Zealand voluntarily banned the use of MMA in nail salons, setting a higher safety standard for workplaces. ERMA New Zealand supported CTFA's initiative, and due to concerns about human health effects, banned the use of MMA in cosmetics under the Cosmetic Products Group Standard in July 2006.

The solvent has also raised concern internationally, and it has been banned in Canada and in 30 states of the United States of America. The European Union does not have a formal ban, but follows the principle that only cosmetic products that do not cause damage to human health should be on the market.

MMA is not a banned substance in New Zealand and is still used in a variety of applications including fibreglass, medical and dental industries. Importers of MMA are not required to notify ERMA New Zealand about the quantity they are importing.

The Department of Labour (DoL) and the Ministry of Health (MoH) are the enforcement agencies responsible for enforcing the ban on MMA use in nail salons. Concerns raised by some nail salon clients has driven DoL to inspect salons for the illegal use of MMA, and to increase the level of industry awareness of the risks posed by the use of MMA in cosmetics.

This enforcement action has led to the prosecution of a nail salon in December 2008 for illegal use of MMA. Successful prosecutions of this type will help to support greater awareness within industry and encourage an increase in the level of compliance with the controls on industrial chemicals.

2.4 Case Study: Boat Building Industry

Key Messages

- There is a considerable risk to the health of boat builders who are exposed to hazardous substances.
- The most significant harm arises from chronic exposure to solvents, which is not readily measured.
- Lack of data presents difficulties for monitoring the effectiveness of the HSNO Act regime in protecting the health and safety of boat builders from solvents.
- It will be important for government agencies and industry to continue communications in order to improve industry-specific knowledge on health and safety management and monitoring.

Solvents and volatile chemicals are controlled under the Hazardous Substances and New Organisms (HSNO) Act 1996. The Department of Labour (DoL) is the primary agency for

ensuring the controls are followed. DoL has made boat builders a target industry in their Airborne Strategy because of their exposure to solvents and volatile chemicals.

Central and local governments have worked closely with boat builders in the past, starting successful consultation projects and gathering data on health and safety. Even with these initiatives, there seems to be a lack of knowledge of the risks within the industry and a lack of specific, targeted information being passed on to the boat builders from regulatory agencies. Furthermore, data for monitoring any improvements made to workplace health and safety in the last decade are negligible.

The main concern raised by government agencies is long-term use of hazardous substances. Without proper safety management, daily use of solvents and volatile chemicals at work creates a high probability that boat builders will be exposed to hazardous amounts of these substances. Agencies also face difficulties in identifying and communicating with smaller boat building companies.

Given these challenges, government agencies are currently developing plans to address the gaps in information and to continue to strengthen cooperation and communication between agencies and industry.

The New Zealand Boat Building Industry

According to the last census completed in 2006 by Statistics New Zealand, there are about 2,050 boat builders employed in New Zealand. The industry grew rapidly from 2000 until 2005 in response to international demand around the America's Cup. Due to the international pull and publicity, the number of apprentices in boat building work also increased. However, since 2005 the number of boat builders has decreased. It is believed that boat builders are leaving for other construction-type jobs at a higher rate than from other industries because of poor working conditions, like chronic chemical exposure (DOL "Skill Shortage," 2006).

Boat Building Solvent and Volatile Chemical Use

Solvents and volatile chemicals are used in almost every process of building a boat. Fibreglass composite boat building is one of the main styles of production in New Zealand (Ruttenberg, 2001). There are multiple ways to create the hull of the boat using fibreglass, but all involve using resins with fibreglass to harden and shape the structure.

Most boat builders use unsaturated polyester resins. Unsaturated polyester resins contain the solvent styrene, a volatile organic compound. Styrene emits strong odours that have been shown to be harmful airborne emissions and cause adverse health effects on the central

nervous system, such as headaches, fatigue, dizziness, confusion, drowsiness, malaise, difficulty concentrating and intoxication (US OSHA, 2008).

Continual exposure can lead to a disorder called Chronic Solvent Neurotoxicity (CSN). Symptoms of CSN include memory loss, tiredness, and personality changes (NOHSAC, 2004). Data on CSN in the boat building industry is limited, so it has been hard to demonstrate statistically a linkage between solvents and CSN.

However, case studies completed by DoL and the National Occupational Health and Safety Advisory Committee (NOHSAC) on CSN are quite compelling.

- DoL's *Aftermath* report (2002) linked a fibreglass boat builder's significant health problems and a personality change to years of solvent work.
- NOHSAC's *Technical Report* (2004), using the Notifiable Occupational Disease System [NODS], showed that boat building was one of the three most common occupations represented in cases of CSN in New Zealand (Spray Painters 39 percent; Printers 16 percent; Boat Builders 9 percent of 76 verified cases) between 1993 and 1997.
- A study published in the *New Zealand Medical Journal* in 2001 found that almost 1/3 of respondents [boat building employees] thought they had "some sort of health problem related to their job" (Ruttenberg, 2001).

Other solvents used throughout the production process cause health issues, as well. Solvents used for surface preparation, coating, painting, and cleaning can contain a mixture of volatile organic compounds that release hazardous air emissions and are damaging to human skin. Boat builders are in close contact with these substances.

Without proper personal protective equipment, workers can be subject to irritant contact dermatitis as a result of skin contact with solvents and uncured polyester resins (Ruttenberg, 2001). A Waitakere City Council study found that there was a high rate of eye injury for boat builders in the region (Taylor, *Cleaner* Production, 2004). This could possibly be linked to volatile organic compound emissions and lack of Personal Protective Equipment (PPE) use.

Even on the basis of older studies, it is recognised that boat builders who are exposed to hazardous substance face considerable risk.

Hazardous Substance, Health, and Safety Monitoring

Lack of data presents difficulties for monitoring the effectiveness of the HSNO Act in protecting the health and safety of boat builders, the community, and the environment from solvents. The majority of research on the boat building industry falls between the years 1992

and 2004, with a 2001 *New Zealand Medical Journal* report currently being the data most relied upon.

By its very nature, chronic disease from exposure to solvents is not readily measured. Therefore, knowing how effective interventions may be requires firstly monitoring exposure that could lead to chronic disease. Acute effects are already able to be monitored by hospital data, but these harms are small compared to the harms arising from chronic disease.

Industry has acknowledged the need to reduce the exposure to solvents and volatile chemicals of boat builders. In the last eight years, industry discussions with DoL and the Waitakere City Council have found that the boat building industry is seeking advice on the health and safety practices for hazardous substances and is looking for ways to improve. Enforcement agencies realise that education is greatly needed for their own staff, in order to effectively provide health and safety information to the boat builders.

Challenges for Boat Builders and Government Interventions

Solvents and volatile chemicals, like styrene, are controlled under the HSNO Act, however gathering data and providing accessible health and safety information to the boat building industry so that workers can comply with the regulations have been a challenge. This has been recognized by DoL as an area where Industry, Health and Safety in Employment (HSE) Act 1992 enforcement officers, and HSNO enforcement officers can improve working conditions and employee knowledge. Below are examples of challenges identified and the activities underway to address them:

Boat builders say it is difficult to understand and comply with the regulations:

The few studies targeting the boat building industry in the past decade found that boat builders have a difficult time complying with regulations because they do not know where to find information, or they find information provided too complicated.

The older reports and the more recent informal consultations with boat building companies suggest that it is difficult for the average builder to comply with all of the health and safety measures relating to hazardous substances (DoL, *Industry Summary*, 2007). These problems arose because:

a) The codes of practices are not specific to the work of boat builders, and they are looking for clear guidance from regulatory agencies.

b) Material Safety Data sheets are being supplied to most workplaces, but are infrequently used during the health and safety management process. Generally, managing risks in the workplace has been difficult for employers to understand and hard to complete.

c) OSH guidelines and codes of practice relating to solvents and fibreglass manufacturing were produced over ten years ago and may be out of date.

d) PPE is the most common control used, however not all employers insist that workers use PPE and durable equipment is not always purchased.

e) Air monitoring is not a standard practice. Therefore, workers are exposed to unknown risks, and there is little data to monitor workplace exposure.

Figure 16 below shows the result of a 2007 New Zealand and Australia fibre-composite manufacturing industry study. The survey results depict areas of weakness in compliance (DoL, *Industry Summary*, 2007).

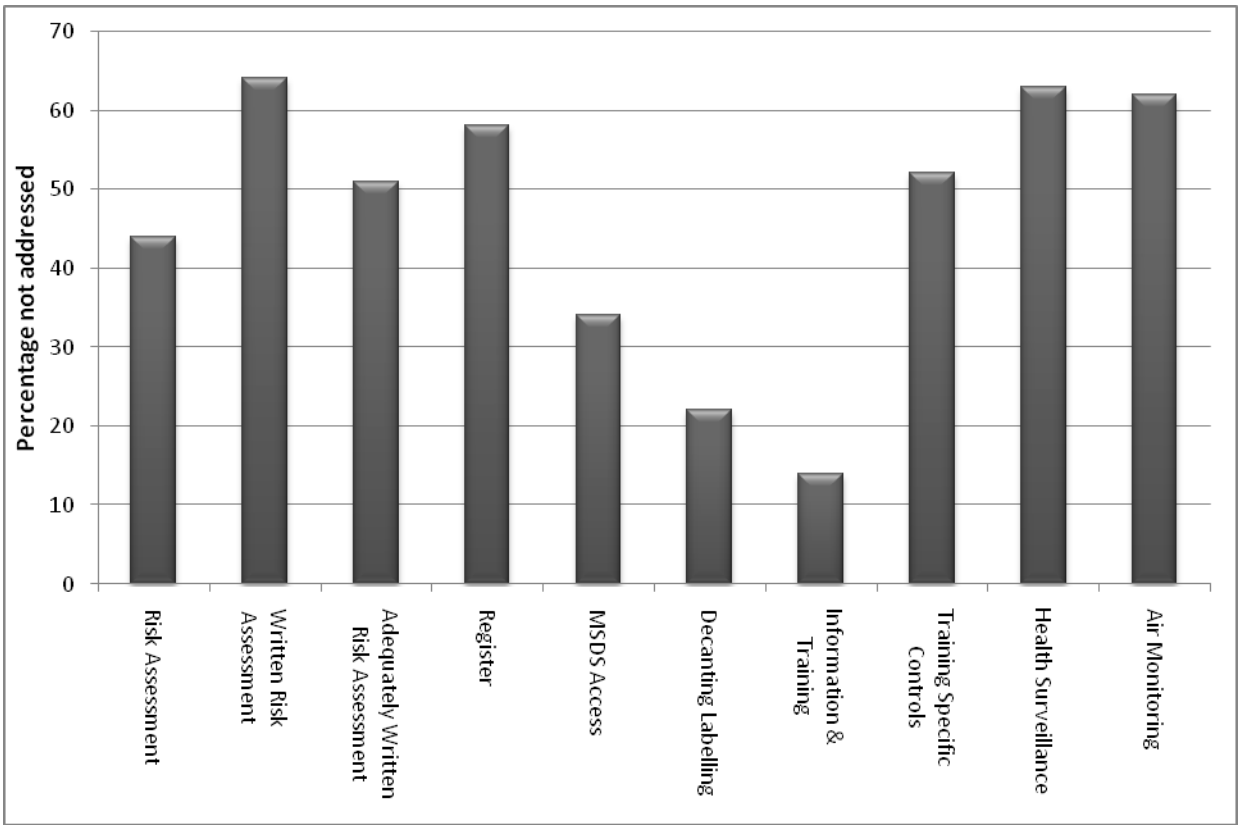

Figure 16: Percentage of health and safety interventions not addressed by fibre composite manufacturing workplaces in New Zealand (107 workplaces surveyed).

How government is addressing these challenges

a) DoL has targeted boat builders specifically as part of their Airborne Strategy (DoL, "Ministerial Inquiry," 2004). Over the last two years, the DoL's focus has been on a better understanding of vulnerable workers across sectors, particularly in high risk industries such as manufacturing and construction. DoL now wants to build on this work in partnership with stakeholders, including industry, business and unions, and focus on those most at risk (DoL, "Snapshot of Progress," 2007). Boatbuilding has been specifically targeted in these plans.

b) Regional activities have also been important to improvement in the boat building industry in the past. Waitakere City Council has facilitated a boat building working group and boat building stakeholder information group since 2000. These two groups represent companies, related industries, and other regional councils. These groups provided time for information sharing and consultation (Taylor, "Partnership Project," 2005). Waitakere City Council is currently taking a more indirect role in the boat building working group, so there is little more information on its progress beyond the 2005 and 2004 reports.

c) Industry groups have also had input into local council activities. In 2004, the Waitakere City Council reviewed the health and safety knowledge of targeted boat building companies. This occurred one year after the boat building working group and boat building information group produced the "Health, Safety, and the Environment Guide for the Boat Building Industry" with Marine Industry New Zealand. Although there were varying degrees of use by the companies, it was appreciated guidance on health and safety management. Furthermore, the manual has been included in the apprentice training certificate programme, strengthening the safety knowledge of boat builders that are entering into the workplace (Taylor, *Cleaner Production*, 2004).

d) The Accident Compensation Corporation and DoL have also targeted boat builders in their "Work Safe" programme. This programme is an attempt to provide basic instructions for following health and safety regulations, including hazardous substances.

e) From anecdotal evidence gathered during industry conversations, New Zealand boat building workplaces are moving towards low-styrene emission resins and are testing other processes that contain more air emissions (DoL, *Industry Summary*, 2007). However, currently these changes are still too expensive to be a feasible choice for the majority of companies.

f) There are continued opportunities to strengthen future HSNO Act activities in this area. Section 97B of the HSNO Act provides for officers appointed under the HSE Act to enforce the HSNO Act provisions in any place of work. ERMA New Zealand and DoL are both addressing this, and therefore addressing some of the problems noted in the boat building industry, through a range of general initiatives. ERMA New Zealand has made workplace solvents and volatile chemicals a target area in the hazardous substance risk reduction strategy, while DoL has targeted boat building in their airborne strategy.

g) ERMA New Zealand is also in the process of reassessing the hazard classification of styrene. This is an important step for updating safety standards. Styrene is believed to have a lower carcinogenic effect than previously controlled for, which is positive. It also must be noted that the remaining risk management controls placed on styrene have been shown to still be necessary.

In order to better understand the extent of harms to workers in this sector, it will be important to update and gather new health and safety information to address the gaps in monitoring indicators. Government agencies involved with the HSNO Act and workplace health and safety have recognized the challenge solvents and volatile chemicals present, and must continue the process of communication among agencies and industry.

References

Department of Labour 2003. *Aftermath*. DoL and ACC, Wellington.

Department of Labour 2006. "Boat Builder Occupational Skill Shortage Assessment." DoL, Wellington.

Department of Labour, Queensland Government, Government of South Australia, WorkCover NSW, Tasmania, WorkSafe Victoria, Worksafe 2007. *Industry Summary Report Hazardous Substances in the Manufacturing Industry: Fibre-Composite Boat Building Sector.*

Department of Labour 2004. "Ministerial Inquiry into the Management of Certain Hazardous Substances in Workplaces." DoL, Wellington.

Department of Labour 2007. "Snapshot of Progress, Workplace Health and Safety Strategy for New Zealand to 2015." DoL, Wellington. http://www.whss.govt.nz/snapshot06-07/WHSS-Strategy-Snapshot06-07-monotone.pdf.

Market New Zealand 2008. "Boat Manufacturing and Marine Industry Profile." www.Marketnewzealand.com/MNZ/aboutNZ/sectors/14375/15948.aspx.

NOHSAC 2004. *The Burden of Occupational Disease and Injury in New Zealand: A Technical Report*. NOHSAC, Wellington.

David Ruttenburg 25 May 2001. "Hazards Associated with the Boat Building Industry New Zealand." *New Zealand Medical Journal*, 222.

Kelly Taylor 2004. *Cleaner Production Boat Building Project*. Waitakere City Council. http://www.waitakere.govt.nz/Abtcit/ec/clnprod/pdf/survey-report.pdf.

Kelly Taylor and Kevin Honeybun 2005. "Patience, Partnership and Persistence, the Lessons from a Partnership Project." Waitakere City Council and ACC Thinksafe.US Department of Labor, OSHA 2008. "Safety and Health Topics: Styrene." OSHA, Washington DC. http://www.osha.gov/SLTC/styrene/index.html.

2.5 Case Study: Light Organic Solvent Preservatives (LOSPs) in the Timber Treatment Industry

Key Messages

- Timber treatment workers, suppliers, builders and, to a lesser extent, occupants of houses and offices built with LOSP timber face potential adverse health effects from the solvents used in the treatment process.
- These effects can be prevented or managed by allowing the solvent to evaporate before the timber is handled.
- Current industry guidelines for managing the risks from solvent in LOSP timber are deficient and are not consistently complied with.
- The timber treatment industry has primary responsibility to identify solvent evaporation limits that are safe for downstream users of the timber, and for complying with those limits.
- The timber treatment industry has proposed a review of its guidelines.
- Increased enforcement by the Department of Labour may reduce the extent of non-compliance evident in the timber treatment industry.

What are LOSPs?

Light Organic Solvent Preservatives, or LOSPs, are timber treatment preparations that contain combinations of fungicides, insecticides, and termiticides incorporated in a solvent carrier. The preservatives used in LOSP formulations in New Zealand include:

- tin-based products, bis-(tri-n-butyltin) oxide and bis-(tri-n-butyltin) naphthanate;
- copper naphthenate;
- iodo propynyl butyl carbamate (also known as iodocarb);
- permethrin, cypermethrin, and deltamethrin; and
- mixtures of tebuconazole and propiconazole with permethrin.

The New Zealand and Australian Standards specify that only white spirits or mineral turpentine can be used in LOSP formulations (NZS 3640:2003 and AS 3530:1988). In New Zealand the solvent is normally white spirits. A pamphlet from the Ministry of Forestry, published in 1987, noted that kerosene was also commonly used. We are not aware if kerosene is used in LOSP currently, but note that its use would not comply with the Standards.

The HSNO Act and LOSP

White spirits and mineral turpentine have HSNO Act approval. When these solvents are mixed with preservatives, the resulting LOSP formulations also require a HSNO Act approval. There are many approved LOSP formulations on the market.

HSNO Act approvals set controls to manage any health and environmental effects from the use and storage of the timber treatment chemicals. These include controls to manage effects from flammability and toxicity of the solvent. For example, the toxicity controls include workplace exposure limits and requirements for protective clothing and equipment for workers.

Treated timber is a manufactured article and therefore does not require HSNO Act approval. Residual preservative and solvent can remain in and on the timber for some time, depending on the treatment process. Until the solvent evaporates completely there is a potential risk to the health of people who are exposed to the timber. The time taken to evaporate depends on the volatility of the hydrocarbon components of the solvent, and the conditions in which the treated timber is stored. For example, white spirits will evaporate more slowly at a lower temperature than at a warmer temperature, more slowly from closely packed stacks of timber than from a single length in the open air, and very slowly or not at all from timbers wrapped in plastic or encased by plasterboard in a completed wall.

Why are LOSPs used?

The other timber treatment formulations used in New Zealand are waterborne and tend to swell the timber during treatment. Waterborne timber treatment preservatives used in New Zealand include:

- Chromated copper arsenates (CCA)
- Borates
- Copper azole
- Alkaline copper quarternary (ACQ)

LOSP treatment does not swell the timber and therefore is a popular choice for use in pre-cut timber components, such as weatherboards and window joinery, and in engineered wood products such as plywood. LOSP is also the most popular treatment for "Hazard Class H3.1" timber, which is timber that is likely to be exposed to the weather but will not be in contact with the ground (NZS 3640:2003).

The rise and rise of LOSP treated timber

In 1987 LOSP treated timber made up just over 1 percent per annum of all timber treated in New Zealand (Ministry of Forestry, 1987).

Following "leaky building" concerns about the weather tightness of homes built in the late 1990s, changes were made to the New Zealand Building Code and to the New Zealand Standard for Timber Durability (ConsumerBuild website; NZS 3602:2003). The changes required a greater proportion of treated timbers be used in house framing than had been required before.

Except for house piles, some critical exposed timbers and decking timbers, H3.1 timber is the highest level of treatment required in typical house construction. Lower hazard class timbers include timber treated with less toxic, waterborne Borate preservatives. A strict interpretation of the Standard NZS 3602:2003 would require approximately 5 percent of the framing in houses be treated to H3.1 standard (ERMA, 2007). However, industry report up to 35 percent of framing timber is actually being treated to H3.1, which is mostly LOSP treated (Inwood International, 2008). Several timber suppliers and builders also noted an increase in CCA treated H3.2 timber being used in residential and commercial interiors (pers. comm. various industry representatives, January 2009).

The building industry may be over-specifying H3.1 and H3.2 timber in response to "leaky building" liability fears, or in response to more risk averse consumers. There is currently not an upper limit placed on the quantity of active substance or level of treatment of timber used in residential and commercial interiors.

Health concerns

In 2007 and 2008 there were a number of media reports about health effects from using LOSP treated timber, in which some builders and carpenters were reported to have experienced headaches, nausea, chronic fatigue, skin rashes, welts, nose bleeds and one as having coughed up blood (e.g. Bay of Plenty Times, 9 November 2007; Progressive Building, January 2008; Build, September 2008). Most reports linked these health effects with the use of tin-based preservatives, but some also identified situations when framing timbers arrived on building sites without having properly "flashed off". "Flash off" is the industry term for allowing the residual solvent to evaporate after treatment.

A report to ERMA New Zealand (Graham, 2008) investigated the potential hazards from handling and use of tin-based treated timber. The report concluded that residual solvent could disguise the influence that tin preservative has on adverse effects. The solvent could contribute to potential for skin irritation, but "*most other potential hazards are relatively minor and easily addressed through ensuring adequate drying times*".

Official statistics of incidents where people have reported adverse health effects that can be attributed to the treatment or use of LOSP timber are almost non-existent. The Department of Labour received two notifications of harm related to the use of LOSP timber in the past 12 months, but both notifications were withdrawn by the complainant. Anecdotal reports from industry representatives suggest there were a significant number of health complaints from builders three or four years ago, at the height of the building "boom" and when LOSP timber was first used in structural framing. However, there are few recent anecdotal reports of health complaints associated with LOSP timber, which might be due in part to the current economic situation, resulting in treated timber sitting in the treater's yards for longer, and an overall reduced demand for timber in general. Despite this lack of data, timber suppliers and builders groups remain concerned that the underlying causes of the health problems associated with LOSP treated timber have not been mitigated and that builders would welcome a change to safer alternatives (pers. comm. various industry representatives, January 2009; Department of Building and Housing, 2008).

Flash off and the Best Practice Guideline

Effective drying of the freshly treated timber is a critical step in mitigating health effects, it appears that the key to preventing adverse health effects lies in the flash off process. The requirements for flash off are given in the timber treatment industry's Best Practice Guideline (NZTPC, 2005) as follows:

5.2.3.7 To reduce the health risks posed by residual solvent in timber packets following treatment, LOSP treated timber shall be held in fillet (every layer) for a minimum of four (4) days in a well ventilated area. Alternative methods may be used to reduce residual solvent to equivalent levels. Plastic wrap shall be left off timber during this period to ensure solvent dissipation."

A review of the Guideline, and specifically of the requirements for flash off, was proposed at a government agency/industry representative meeting held in December 2007 (ERMA, 2007). A working party has been established comprising LOSP treaters and suppliers, and it is expected that initial results from practical research projects on LOSP flash off will be reported in April 2009 (TPC News, August 2008; pers. comm. Kevin Hing, NZTPC, 26 November 2008). This research is important to inform the revision of the Guideline.

Compliance with the Best Practice Guideline

Quality assurance in the New Zealand timber treatment industry is provided by two treatment audit agencies, New Zealand Timber Preservation Council (NZTPC) and AsureQuality (previously named AgriQuality). NZTPC claims to represent approximately 80 percent of the timber preservers in New Zealand and is the proprietor of the quality assurance trademark "WOODmark" (NZTPC website; pers. comm. Kevin Hing, NZTPC, 26 November 2008). NZTPC does not represent New Zealand's largest preserver, Carter Holt Harvey, who produce approximately 50 percent of all radiata pine products in New Zealand. There is no legal requirement for a timber preserver to join a quality assurance programme.

NZTPC requires that all treatment plants licensed to use the WOODmark brand comply with the requirements as set out in the Best Practice Guideline (www.nztpc.co.nz/aboutLicenseeship.php). The Guideline is endorsed by the Department of Labour as a statement of preferred practice, but is not an approved Code of Practice under the Health and Safety in Employment Act 1992 (NZTPC, 2005). Similarly, the Guideline is recognised by ERMA New Zealand as representing best practice for the safe and responsible management of timber treatment chemicals, but is not an approved Code of Practice under the HSNO Act.

AsureQuality's Timber Treatment Programme ensures compliance to NZS3640:2003, and the Occupational Safety and Health (OSH) Approved Code of Practice for the Safe Use of Timber Preservatives and Antisapstain Chemicals (OSH, 1994). Department of Labour states the Best Practice Guideline replaces the OSH Code of Practice. Specific flash off times are not given in the Code of Practice. However AsureQuality have stated that "*compliance enables both the supplier and the buyer to be assured that timber treatment, environmental management systems and health and safety practices are adhered to recognised standard levels*" (www.agriquality.com/auditing_and_inspection/forestry/export_certification.cfm).

Comments from treatment plants and building groups in a Department of Building and Housing survey (DBH, 2008) indicate that the Best Practice Guideline flash off requirements are not consistently complied with. NZTPC say in their October 2007 newsletter that the WOODmark brand gives assurance that LOSP timber has been flashed off in accordance with the Guideline (NZTPC, 2007). However in the same newsletter article NZTPC propose developing a notice for treaters to use with each packet of LOSP treated timber, that would indicate whether the timber has been flashed off in accordance with the Guideline, or whether further flash off is required. Notices like these are understood to be used by some treaters currently, and an anecdotal report confirms that the notice does sometimes indicate that further flash off is required, in which case the treater has not complied with the Guideline.

A number of building industry representatives contacted as part of this case study commented they are concerned that there is little consequence for treaters who do not comply with the flash off requirements in the Best Practice Guideline. NZTPC audit timber treatment plants on a quarterly cycle, but warn the treaters in advance of the visit. Department of Labour's (DoL) "Workplace Regional Delivery Plan" for hazardous substances for 2008 to 2009, identified that solvents in the timber industry are a priority and that "*Inspections are to concentrate on the timber processing sites to ensure treated timber is filleted and flashed off in accordance with the Best Practice Guide. The objective is to ensure compliance with the Best Practice Guide".* However, DoL only intends to make an inspection if there is a received notification of harm (pers. comm. Ross Hodder, DoL, 29 January 2009). DoL received two notifications of harm related to the use of LOSP timber in the past 12 months, but did not make an inspection of the treatment plants involved since both the notifications were withdrawn by the complainants. It is understood that DoL made no unannounced visits to timber treatment plants in the past 12 months.

Change ahead for LOSP?

Building industry representatives have noted a significant decline in demand for LOSP treated timber in the last 12 months, coincident with a drop in activity in the building industry in general due to the economic recession (pers. comm. various industry representatives, late 2008 – early 2009). NZTPC noted a decline in the use of tin-based preservatives in LOSP formulations, with approximately 80 percent of H3.1 timber now treated with tebuconazole and propiconazole LOSP, and only 20 percent with tin-based formulations. The LOSP "azole" formulations (using tebuconazole and propiconazole) are known to be less toxic than tin-based preservatives but are still incorporated in a solvent carrier. We note that the move away from tin was largely a market-driven decision since the price of tin increased significantly between 2006 and 2008 (pers. comm. Kevin Hing, NZTPC, 26 November 2008; London Metal Exchange, www.lme.co.uk/tin_graphs.asp). It should be noted that if tin

prices were to fall again there could be a return to tin-based preservatives. Incidentally, tin prices have fallen steadily between July 2008 and January 2009.

A change to an alternative, less toxic solvent might make a positive change to the health of workers involved with LOSP treated timber. However the current Standards (NZS 3640:2003 and AS 3530:1988) would have to be amended to allow for the use of any alternative solvents. Any consideration of alternative solvents must consider the longer term effects on the health of house occupants, as well as on workers who use LOSP timber.

Other changes in LOSP timber use might come from less over-specifying of H3.1 timber where lower hazard class timber would meet the standard's requirements. However the trend is still toward over-specifying, with risk-averse consumers and litigation-fearing specifiers using increasing volumes of higher hazard class timber, H3.2 CCA, in interiors.

There is work being done in the industry toward developing a waterborne Borate treatment process that would meet the durability requirements for H3.1 timber (TPC News, August 2008). However this development is likely to be at least a year away, and would require a change to the Building Code before such timber could be used commercially.

Summary and Conclusions

In the building industry there is potential for adverse health effects from exposure to timber treatment chemicals at all levels, from the treaters, the suppliers and the builders, and to a lesser extent to the eventual occupants of houses and offices built with the timber.

A key to protecting the health and safety of people who are exposed to or work with LOSP timber lies in ensuring the solvent fraction of the timber treatment formulation has evaporated to a safe level before it is used. The industry's Best Practice Guideline sets out requirements for evaporation of solvent from LOSP treated timber. This case study has identified that:

- The Guideline is not explicitly a mandatory document that all treaters must comply with, either as a mandatory control under any HSNO Act approval or otherwise. However, it was developed by the industry and therefore should represent industry best practice, which is a requirement under the Health and Safety in Employment Act.
- The Guideline's requirements do not clearly state who holds responsibility for achieving sufficient evaporation of the solvent: the treater, the merchant, the builder, or all? The timber treatment plant should be identified as being primarily responsible.
- The Guideline's requirements are neither detailed nor specific about how to achieve sufficient evaporation of the solvent in LOSP treated timber.
- The Guideline's four day evaporation requirements may not represent a limit that is "safe" for the downstream user of the timber.

- The Guidelines are not consistently being complied with in regard to solvent evaporation.
- The timber treatment audit agencies' methods of compelling treatment plants to comply with the Guidelines may not be consistently effective.
- Department of Labour intends to make inspections of specific treatment plants only if a person is sufficiently sick to have reported the incident to the Department.
- Department of Labour made no unannounced visits to timber treatment plants in the past 12 months.

Additionally, there is a current trend toward over-specifying the treatment level for interior timber framing, with risk-averse consumers and litigation-fearing specifiers using increasing volumes of higher hazard class timber.

The purpose of the HSNO Act is to "*protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances...*" In the building industry the HSNO Act is not effectively preventing or managing the adverse effects of the substances used to treat timber. The bullet-point list above might inform a set of actions, for industry and regulators, which could be taken to more effectively achieve the purpose of the HSNO Act.

The proposed review of the Best Practice Guideline will be an important step. However, without a greater number of compliance inspections, there is unlikely to be a significant improvement in compliance with the Guideline.

There is a clear conflict between the health of timber merchants, builders and occupants of buildings, and consumers' and building industry's response to the "leaky building" problems, evidenced by the trend toward using more highly treated timbers in homes and offices. A variety of actions would contribute to addressing this issue, including imposing a maximum treatment limit on timbers used in interiors, and raising consumers', specifiers' and merchants' awareness of the downside of over-specifying.

References

AsureQuality website: www.agriquality.co.nz

AS 3530:1988 Australian Standard: *Solvents – Mineral turpentine and white spirits*

Bay of Plenty Times, 9 November 2007, *Wood has builders coughing blood*, p5

Build, September 2008, *Jane Cuming's roller-coaster ride*, p72

ConsumerBuild, *Background to the problem*. http://www.consumerbuild.org.nz/publish/leaky/leaky-background.php. Retrieved 18 December 2008.

Department of Building and Housing, 2008, *Timber Treatment Survey: A report to the Department of Building and Housing on the results of a survey of the building industry into the use of treated framing*, Sue Clark, 29 April 2008.

Environmental Risk Management Authority, 2007, *Industry/Government Agency Group on Health issues relating to LOSP Treated Timber*, Minutes of meeting Wednesday 5 December 2007, 1.00 – 2.30pm, ERMA New Zealand, Level; 1 BP House.

Graham, B., 2008, *Tin-based wood preservatives: Review of international regulatory status and the potential hazards from handling and use of the treated timber*, Graham Environmental Consulting Ltd Report to ERMA New Zealand, March 2008.

Inwood International, February 2008, *Turning point*, p38

Ministry of Forestry, 1987, *Health hazards associated with the use of commercially treated timber*, T. Thorpe, V R Ward, Government Printer, Wellington, New Zealand.

New Zealand Timber Preservation Council Inc. 2005, *Best Practice Guideline for the safe use of timber preservatives and antisapstain chemicals*

New Zealand Timber Preservation Council Inc. Newsletter, Issue 28, October 2007

New Zealand Timber Preservation Council website: www.nztpc.co.nz

Occupational Safety and Health Services, 1994, *Approved Code of Practice for the Safe Use of Timber Preservatives and Antisapstain Chemicals*, Department of Labour.

TPC News, August 2008, *LOSP Working Group*, p2-3

NZS 3640:2003 New Zealand Standard, *Chemical Preservation of Round and Sawn Timber*

Progressive Building, January 2008, *Not so flash*, p7

Part 3

Indicator Data

The following section is based on data from a set of key indicators that has been collected annually since 2001.

In past monitoring reports we have used background monitoring in the form of an indicator framework as the primary method of monitoring the effectiveness of the HSNO Act. This background monitoring consists predominantly of indicators that use incident, effects and compliance data allowing trends and changes to be monitored over time. The indicator framework has worked adequately, but is reliant on the quality and availability of data for each indicator. These data can be unreliable or it may be difficult to derive from them HSNO specific conclusions; so the monitoring framework was modified.

This change in approach allows greater flexibility in prioritising the areas to be monitored and to work with data which more adequately assesses the effectiveness of the HSNO regime. However, the data for each indicator are still collated annually so that they can be drawn upon as and when required.

Some fundamental problems have been identified with the indicator data. Some data sources do not possess the level of detail required to adequately inform appropriate actions. Some datasets have changed since they were first used and are no longer useful for long term trend analysis. Other data may not be available in any given year due to resourcing or other constraints at the source agency or other unforeseen problems.

The following table lists the indicator data that have been collected from various sources over the last seven years. There are some gaps where information may have been unavailable at the time of publication. Some data have been updated since the year they were first collected so may differ from figures shown in previous monitoring reports. Any trends identified in the numbers shown should be treated with caution and are presented here for information purposes only.

Acronyms used for data sources:

ERMA NZ = Environmental Risk Management Authority New Zealand
ESR = Institute of Environmental Science and Research
MAF = Ministry of Agriculture and Forestry
NZFS = New Zealand Fire Service
NZHIS = New Zealand Health Information Service within the Ministry of Health
DoL = Department of Labour
Stats NZ = Statistics New Zealand

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Hazardous substance Imports and Exports										
Gross weight of hazardous substances imported into New Zealand	Stats NZ	27	P	1,321,355 tonnes	2,275,708 tonnes	8,784,382 tonnes	9,550,062 tonnes	9,302,164 tonnes	9,314,878 tonnes	9,474,277 tonnes
Gross weight of hazardous substances exported from New Zealand	Stats NZ	28	P	89,105 tonnes	Information unavailable	Information unavailable	Information unavailable	905,383 tonnes	810,105 tonnes	2,886,400[b] tonnes
Hazardous substance incidents										
Total number of incidents (vehicle and non-vehicle) involving hazardous substances attended by the NZ Fire Service	NZFS	21	P and S	1826	2078	1831	1,926	1,696	1819	1852
Total number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service	NZFS	22	P and S	1079	1167	1175	1,178	1065	1326	1283
Total number of incidents involving hazardous substances reported to ERMA New Zealand	ERMA NZ	23	P and S	227	230	216	223	194	237	278

[a] ERMA New Zealand indicator reference number

[b] The significant rise in exports for the 2007/08 year can be attributed mainly to an increase of over 50 percent of crude oil exports, due to the start of export of oil from the Tui Oil Field.

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where civilian injuries were recorded[c]	NZFS	7	S	57	31	22	22	29	19	27
Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where civilian fatalities were recorded[c]	NZFS	8	S	1	1	1	0	2	2	0[d]
Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects on human health were recorded	ERMA NZ	9	S	59	48	30	22	42	57[e]	71[e]
Number of incidents involving hazardous substances reported to ERMA New Zealand where human deaths were recorded	ERMA NZ	10	S	2	1	1	0	0	6[e]	2[e]
Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where environmental contamination was recorded	NZFS	15	S	1249	523	411	424	436	594	467

[c] Only includes injuries from fire-related incidents.

[d] There was one reported fatality of a fireman which is not defined as a civilian fatality.

[e]Data includes reports sourced from the media, which in previous years were omitted.

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects to the environment were recorded	ERMA NZ	16	S	60	67	28	63	64	98[e]	129[e]
Hazards in the Workplace										
Number of cases of diseases affecting the lungs resulting from hazardous substance use in the workplace	DoL	5	S	82	64	46	60	46	Information unavailable	Information unavailable
Number of cases of poisoning or toxic effects relating to workplace exposure to hazardous substances	DoL	6	S	92	71	27	66	54	Information unavailable	Information unavailable
Public Health Effects										
Number (and rate) of hospitalisations for accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for children aged 0-4 years	NZHIS	1	S	2001: 126 (44.4 per 100,000 population)	2002: 152 (54.4 per 100,000 population)	2003: 103 (35.2 per 100,000 population)	2004: 118 (44.6 per 100,000 population)	2005: 178 (63.2 per 100,000 population)	2006: 156 (54.5 per 100,000 population)	Information unavailable
Number (and rate) of hospitalisations for accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for Māori children aged 0-4 years	NZHIS	2	S	2001: 27 (35.6 per 100,000 population)	2002: 39 (52.1 per 100,000 population)	2003: 21 (28.0 per 100,000 population)	2004: 27 (41.9 per 100,000 population)	2005: 38 (49.0 per 100,000 population)	2006: 32 (40.5 per 100,000 population)	Information unavailable

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Number (and rate) of deaths from accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for the total population	NZHIS	3	S	1999: Information unavailable	2000 : 12 (0.33 per 100,000 population)	2001: 6 (0.15 per 100,000 population)	2002: 12 (0.33 per 100,000 population	2003: 21 (0.52 per 100,000 population)	2004: 16 (0.39 per 100,000 population)	Information unavailable
Number (and rate) of deaths from accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for the Māori population	NZHIS	4	S	1999: Information unavailable	2000: 3 (0.45 per 100,000 population)	2001: 0	2002: 5 (0.81 per 100,000)	2003: 10 (1.64 per 100,000 population)	2004: 6 (0.96 per 100,000 population)	Information unavailable
Number (and rate) of hospitalisations for hazardous substance related injuries[f]	ESR	11	S	Information unavailable	Information unavailable	Information unavailable	2004: 6896 (184.5 per 100,00 population)	2005: 7358 (196.9 per 100,000 population)	2006: 8061 (200.1 per 100,000 population)	2007: 8606 (213.6 per 100,000 population)
Number (and rate) of hospital emergency department attendances for hazardous substance related injuries	ESR	12	S	Information unavailable	Information unavailable	Information unavailable	Information unavailable	Information unavailable	Information Unavailable	Information Unavailable
Number (and rate) of deaths related to hazardous substance injuries	ESR	13	S	Information unavailable	2002: 124 (3.3 per 100,000 population)	2003: 231 (6.2 per 100,000 population)	2004: 202 (5.4 per 100,000 population)	2005: 113 (3.0 per 100,000 population)	2006: 81 (2.0 per 100,00 population)	2007: 80 (2.0 per 100,000 population)

[f] These figures are quoted from ESR's Chemical Injury Surveillance Report which has a broader definition of a hazardous substance and includes therapeutic drugs and alcohol.

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
New Organism Incidents										
Number of incidents involving approved new organisms (including GMOs) reported to ERMA New Zealand where adverse effects on human health were recorded	ERMA NZ	14	S	0	1	0	0	2	3	1
Number of incidents involving approved new organisms (including GMOs) reported to ERMA New Zealand where adverse effects to the environment were recorded	ERMA NZ	20	S	0	0	0	0	0	0	0
Hazardous substances applications and approvals										
Number of hazardous substances reassessed	ERMA NZ	24	R	3	0	0	0	1	4	4
Number of hazardous substances reassessed and stricter controls imposed	ERMA NZ	25	R	0	0	0	0	0	2	3
Number of hazardous substances reassessed and declined	ERMA NZ	26	R	0	0	0	0	0	0	0
New organism and GMO approvals										
Number of approved new organisms (including GMOs) subsequently declared as unwanted organisms under the Biosecurity Act 1993	ERMA NZ	19	P	0	0	0	0	0	0	0

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Hazardous substance compliance and containment										
Number of breaches of containment involving approved hazardous substances	ERMA NZ	38	P and S	0	0	0	0	0	0	0
Number of compliance orders issued by enforcement agencies	ERMA NZ	31	R	203 (NO and HS)	Information unavailable	Information unavailable	55	16[g]	Information unavailable	82[g]
Number of prosecutions taken	ERMA NZ	32	R	0	Information unavailable	Information unavailable	3	0	0	0
Number of inspections where no further actions were required as a proportion of total inspections made	ERMA NZ	33	R	98% (NO and HS)	Information unavailable	Information unavailable	99.20%	99.7%	100%	98.4%
Number inspections where a compliance order was issued as a proportion of total inspections made	ERMA NZ	34	R	0.01% (NO and HS)	Information unavailable	Information unavailable	0.74%	0.3%	Information unavailable	1.6%
Number of inspections where a prosecution was taken as a proportion of total inspections made	ERMA NZ	35	R	0%	Information unavailable	Information unavailable	0.40%	0%	0%	0%

[g] Excludes infringements issued by the Police

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
New organism (including GMO) compliance and containment										
Number of breaches of containment involving approved new organisms (including GMOs) that did not result in an escape or release	ERMA NZ	36	P and S	4	5	3	1	0	3	2
Number of breaches of containment of an approved new organism (including GMOs) that resulted in the release or escape	ERMA NZ	37	P and S	0	2	1	4	8	5	1
Number of unauthorised developments of GMOs	ERMA NZ	39	P and S	0	0	0	0	0	2	0
Number of intentional releases of unapproved new organisms (including GMOs)	ERMA NZ	40	P and S	2	2	1	4	1	5	1
Number of compliance orders (or Biosecurity Act equivalents) issued by enforcement agency (MAF)	ERMA NZ	31	R	203 (NO and HS)	Information unavailable	1 CSR[h]	49 CARs[i]; 1 CSR	75 CARs; 10 CSRs	98 CARs; 15 CSRs	49[j] CARs; 8 CSRs

[h] CSR = Critical Situation Report

[i] CAR = Corrective Action Request

[j] See section 1.4 for discussion on New Organism compliance trends.

Indicator Short Description	Data Source	Indicator[a] Number	Level P=Pressure S = State R=Response	Year 2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08
Number of prosecutions taken	ERMA NZ	32	R	0	Information unavailable	Information unavailable	1	1	0	1
Number of inspections where no further actions were required as a proportion of total inspections made	ERMA NZ	33	R	98% (NO and HS)	Information unavailable	Information unavailable	81%	63%	65%	77%
Number inspections where a compliance order (or Biosecurity Act equivalent) was issued as a proportion of total inspections made	ERMA NZ	34	R	0.01% (NO and HS)	Information unavailable	Information unavailable	19%	37%	35%	23%
Number of inspections where a prosecution was taken as a proportion of total inspections made	ERMA NZ	35	R	0	Information unavailable	Information unavailable	0	0%	0%	0%