File No: LTD/1521

May 2011

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)**

# FULL PUBLIC REPORT

## Polymer in Vibrathane EP1251/8

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of Sustainability, Environment, Water, Population and Communities.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth Street, Surry Hills NSW 2010.

This Full Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:


| | |
|---|---|
| Street Address: | Level 7, 260 Elizabeth Street, SURRY HILLS NSW 2010, AUSTRALIA. |
| Postal Address: | GPO Box 58, SYDNEY NSW 2001, AUSTRALIA. |
| TEL: | + 61 2 8577 8800 |
| FAX | + 61 2 8577 8888 |
| Website: | www.nicnas.gov.au |


**Director**
**NICNAS**

# TABLE OF CONTENTS

# FULL PUBLIC REPORT

## Polymer in Vibrathane EP1251/8

### 1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Chemtura Australia Pty Ltd (ABN: 18 005 225 507)
Unit 302, 14 Lexington Drive, Bella Vista, NSW, 2153

NOTIFICATION CATEGORY
Limited: Synthetic polymer with Mn ≥ 1000 Da.

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: chemical name, CAS number, molecular and structural formulae, molecular weight, analytical data, degree of purity, polymer constituents, use details, manufacture/import volume, site of manufacture/reformulation and identity of manufacturer/recipients.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows: Melting Point / Boiling Point, Vapour Pressure, Water Solubility, Hydrolysis as a Function of pH, Partition Co-efficient, Absorption / Desorption, Dissociation Constant, Particle Size, Flammability Limits, Auto-ignition Temperature, Explosive Properties

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
USA

### 2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Polymer in Vibrathane EP1251/8 (product containing the notified polymer)

OTHER NAME(S)
Isocyanate-terminated polyether

MOLECULAR WEIGHT
Mn Value >1000 Da

ANALYTICAL DATA
Reference IR & GPC spectra were provided.

### 3. COMPOSITION

DEGREE OF PURITY >70%

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS

| | | | |
|---|---|---|---|
| *Chemical Name* | Diphenylmethane diisocyanate (MDI) | | |
| *CAS No.* | 101-68-8 | *Weight %* | 10 – 30% |
| *Hazardous Properties* | R40 Limited evidence of a carcinogenic effect.<br>R20 Harmful by inhalation.<br>R48/20 Harmful: danger of serious damage to health by prolonged exposure through inhalation.<br>R42/43 May cause sensitisation by inhalation and skin contact.<br>R36/37/38 Irritating to eyes, respiratory system and skin. | | |

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (>1% by weight)

None

ADDITIVES/ADJUVANTS
None

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
Once the polymer is cured, then all ingredients will be trapped within the polymer matrix.

DEGRADATION PRODUCTS
The notified polymer is considered stable, however, if exposed to moisture, the reactive isocyanate (-NCO) groups will react with water to form a urea-capped polyether and carbon dioxide.

## 4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20°C AND 101.3 kPa: Clear straw-coloured viscous liquid (Vibrathane EP1251/8)

| Property | Value | Data Source/Justification |
|---|---|---|
| Melting Point (glass transition temperature) | -55°C | For the product Vibrathane EP1251/8 |
| Boiling Point | -- | Not determined |
| Density | 1010 kg/m$^3$ at 23°C | For the product Vibrathane EP1251/8 |
| Vapour Pressure | Not measured | Vapour pressure is expected to be low, based on the high molecular weight of the notified polymer (>1000 Da) |
| Water Solubility | Not determined | The notified polymer is expected to react with water to form an insoluble polymer mass and carbon dioxide. |
| Hydrolysis as a Function of pH | Not determined | The notified polymer contains isocyanate end-groups that will react with water. The polymer backbone is expected to be stable to hydrolysis under environmental conditions due to limited solubility. |
| Partition Coefficient (n-octanol/water) | Not determined | Could not be determined as the notified polymer reacts with water. However, the notified polymer will not cross biological membranes due to the high molecular weight. |
| Adsorption/Desorption | Not determined | Could not be determined as the notified polymer reacts with water to form an insoluble polymeric mass that is expected to be relatively immobile in soil. |
| Dissociation Constant | Not determined | The polymer does not contain any dissociable functionality. |
| Particle Size | Not measured | The notified polymer is liquid at room temperature |
| Flash Point | >110°C at 101.3 kPa | For the product Vibrathane EP1251/8 |
| Flammability Limits | Not measured | The notified polymer is not likely to be highly volatile |
| Autoignition Temperature | Not determined | Expected to be high as the flash point was found to be greater than 110°C |
| Explosive Properties | Expected to be non-explosive | Based on the structural similarity of the notified polymer to other non-explosive polymers |

DISCUSSION OF PROPERTIES
For full details of tests on physical and chemical properties, refer to Appendix A.

*Reactivity*
The notified polymer is expected to be reactive via isocyanate groups. Vibrathane EP1251/8, the product containing the notified polymer, is designed to react with a curative to form solid polyurethane articles. Vibrathane EP1251/8 will react with water to form a stable urea-capped polyether, and release carbon dioxide gas.

*Dangerous Goods classification*
Based on the submitted physical-chemical data in the above table the notified polymer is not classified according to the Australian Dangerous Goods Code (NTC, 2007). However, the data above do not address all Dangerous Goods endpoints. Therefore, consideration of all endpoints should be undertaken before a final decision on the Dangerous Goods classification is made by the introducer of the polymer.

## 5. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notifier has stated that the notified polymer will be both imported and manufactured locally over the next 5 years. The concentration of the notified polymer in product Vibrathane EP1251/8 will be >70%.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

| *Year* | *1* | *2* | *3* | *4* | *5* |
|---|---|---|---|---|---|
| Tonnes | 10 – 100 | 10 – 100 | 10 – 100 | 10 – 100 | 10 – 100 |

PORT OF ENTRY
Sydney, NSW

IDENTITY OF MANUFACTURER/RECIPIENTS
The notified polymer will be manufactured at one site in Sydney. The product containing the notified polymer will also be warehoused at one site in Sydney and will be supplied to one company in Melbourne.

TRANSPORTATION AND PACKAGING
The product containing the notified polymer (Vibrathane EP1251/8) will be packaged and supplied in 200L steel drums and transported by road either from the manufacturing site in Sydney or from the port entry in Sydney to the warehousing site in Sydney. These drums will be transported by road to the end use site in Melbourne.

USE
The product containing the notified polymer (>70%) is cured to form solid, inert polyurethane articles for use in mining and industrial applications.

OPERATION DESCRIPTION
*Storage & transportation of the notified polymer*
The product containing the notified polymer at >70% will be both imported and manufactured locally over the next five years. When imported, the product will be loaded onto a vehicle for transportation from shipping containers and transported to the warehouse for storage. Similarly, the product from the local manufacturing facility will also be transported on vehicles to the warehouse for storage.

*Manufacturing of the notified polymer*
The basic requirement is the use of a three cubic metre steam-heated, water-cooled, agitated vacuum 'mixing tank', to produce a 2-3 metric tonne batch of notified polymer over a six-hour cycle. This is carried out by one trained 'mixing tank operator', with the technical support of a quality control chemist, and an experienced production supervisor. Around 30 batches will be manufactured over the course of a year.

In the first stage, chemicals from the drums are directly loaded into the mixing tank, via the use of a suction pump on the mixing tank. Following the filling of the mixing tank with all the ingredients, the mixing tank operator will then oversee the manufacturing process of the notified polymer.

The second stage of the process involves filling the product containing the notified polymer (liquid isocyanate capped notified polymer and residual MDI) into 200L drums, under a blanket of nitrogen via gravity feed. An air exhaust system removes any fumes during filling, to ensure the safety of the operator. The drums are loaded onto pallets (four drums per pallet) and transferred to the adjoining warehouse for temporary storage until they are transported by road to the main warehousing site, and then to the end use site.

A quality control chemist will carry out the initial quality control testing while the product is still in the mixing tank. Follow-up quality control testing is also carried out at the time of drum filling by the quality control chemist.

It is also a normal practice to allow any tank residues to drain fully into a bucket over a period of 20-30 minutes after packaging, to allow draining of the small amount of the product adhered to the walls of the tank. This residue is allowed to cure with moisture before being disposed of into the site's solid waste. Although the mixing tank is not rinsed between batches, the filter and housing are washed with acetone between each batch.

*Use of notified polymer*
For the end-use operations of moulding finished articles (three operations per day), the product containing the notified polymer will be supplied in 200 L drums. These drums are heated (unopened) in an oven to 50°C, and connected to the low-pressure plural component dispensing machine via a permanent enclosed hose with transfer occurring by vacuum feed.

Mixing of the dispensed product with a curative is performed in a closed vessel, with vapours being removed by an extraction system in the roof over the work area. The mixed product containing the notified polymer with a curative is used for final moulding articles. The material cures in the mould and is demoulded as a solid polyurethane article. After use, water is added to the spent drums to convert any residual polymer to a stable polyurea.

## 6. HUMAN HEALTH IMPLICATIONS

### 6.1 Exposure assessment

#### 6.1.1 Occupational exposure

NUMBER AND CATEGORY OF WORKERS

| *Category of Worker* | *Number* | *Exposure Duration (hours/day)* | *Exposure Frequency (days/year)* |
|---|---|---|---|
| *Storage & transportation of notified polymer* | | | |
| Port of entry workers | 2 | 4 | 6 |
| Warehouse workers | 2 | 1 | 30 |
| Transport workers | 2 | 1 | 30 |
| *Manufacturing of notified polymer* | 1 | 8 | 30 |
| Mixing tank operator | 1 | 8 | 30 |
| Quality control chemist | 1 | 2 | 30 |
| Production supervisor | 1 | 8 | 30 |
| *Use of notified polymer* | | | |
| Machine operators | 3 | 8 | 200 |

EXPOSURE DETAILS
*Storage & transportation of notified polymer*
Worker exposure to the notified polymer during importation, transportation and storage in sealed drums is not expected, except in the unlikely event of an accident where the packaging may be breached. Workers are expected to wear cotton work wear with long sleeves and long pants, and steel-capped boots to prevent any exposure to the notified polymer.

*Manufacturing of the notified polymer*
There is a possibility of dermal, ocular, and inhalation exposure of the operator and production supervisor to the notified polymer during the cooking process, and also during filling of drums with the product containing the notified polymer at >70%. As suction will be used in the loading of the raw material into the mixing tank and the cooking process is also expected to be a closed process, limited potential dermal and ocular exposure to the operator will be mainly through drips and spills. Exposure will be further minimised by the requirement to wear cotton overalls, steel-capped safety boots, safety glasses with side shields and protective gloves when manufacturing the notified polymer.

The filling of drums with the product containing the notified polymer is performed under gravity. The fill nozzle goes into the drum through a small opening, minimizing workers' exposure to the notified polymer during filling of the drums. Furthermore, workers use appropriate personal protective equipment (PPE) such as full-face respirators, gloves, protective overalls, and safety glasses with side shields to minimize workers exposure.

Inhalation exposure to the notified polymer would be limited by its low volatility at processing temperatures. However, workers are also equipped with suitable full-face respirators to minimise inhalation exposure to the isocyanate-based materials.

Dermal and ocular exposure to the quality control chemist during testing of the product containing the notified polymer is possible, most likely through accidental skin and eye contact. Inhalation exposure to the notified polymer would be limited by its low volatility at testing temperatures and the small quantities used for testing. Nevertheless, quality control testing is carried out in a laboratory fume hood to minimise any chance of inhalation exposure. Similarly, the requirement to wear gloves, a laboratory coat, and safety glasses with side shields is also expected to minimise any potential for skin and eye exposure.

*Use of the notified polymer*
There is a possibility of dermal, ocular and inhalation exposure during various procedures for the end use of the notified polymer, such as heating drums, dispensing notified polymer, mixing, and end-use operations of moulding finished products. Worker exposure to the notified polymer is expected to be limited as drums will be heated unopened, dispensing is an enclosed process, and mixing of the dispensed product with a curative is performed under semi-automated conditions, with vapours being mitigated by an extraction system in the roof over the work area. Furthermore, the requirement of workers to wear gloves, protective overalls, and safety glasses with side shields is expected to further reduce the potential for skin and eye exposure, while the potential for exposure to vapours will be mitigated by an extraction system in the roof over the work area. Workers are also supplied with suitable full-face respirators to minimise any chance of inhalation exposure if spillage occurs.

Once reacted with curative, the notified polymer will not be present in the articles.

### 6.1.2. Public exposure
The product containing the notified chemical will only be available to industrial end users and will not be sold to public. Furthermore, end use articles will also be for use in mining and industrial applications. Therefore, the general public will not be exposed to the notified polymer or to the articles containing it in reacted form.

## 6.2. Human health effects assessment
No toxicity data were submitted for the notified polymer.

Based on the high molecular weight (>1000 Da) of the notified polymer, the potential for the notified polymer to cross the gastrointestinal (GI) tract by passive diffusion or to be dermally absorbed after exposure is limited. However some species with molecular weight <1000 Da are present.

It noted that the notified polymer will be synthesised intentionally to yield an excess MDI as a residual monomer at 10-30% concentration. Therefore, in the absence of toxicological data on the notified polymer, the known general hazards of isocyanates, in particular the hazards associated with MDI, have been considered to represent the hazards associated with the synthesis and the use of the notified polymer.

MDI is classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004), and assigned the risk phrases R40 (Limited evidence of a carcinogenic effect), R20 (Harmful by inhalation), R48/20 (Danger of serious damage to health by prolonged exposure through inhalation), R36/37/38 (Irritating to eyes, respiratory system, and skin), and R42/43 (May cause sensitisation by inhalation and skin contact). Therefore, based on these risk phrases, it can be concluded that isocyanates are considered highly reactive and are known to be hazardous to human health.

The main hazards posed by isocyanates include respiratory sensitisation in the form of asthma, as well as decreased respiratory function with the possibility of interstitial fibrosis and pulmonary oedema (Tillman, 2007). Isocyanate exposure is the most common cause of occupational asthma around the world (Mapp *et al*., 1988; Bernstein, 1996) and no specific treatment is available for individuals who are sensitised. Individuals with a history of respiratory conditions such as asthma and hay fever may be more likely to develop isocyanate sensitivity (NOHSC, 1990). Polymeric isocyanates are less volatile and contain less free isocyanate, and are therefore expected to be less of an inhalation hazard. However, the UK Employment Medical Advisory Service believes polymeric isocyanate aerosols are capable of causing respiratory sensitisation similar to monomer vapours, and reports have shown that inhalation of relatively non-volatile isocyanates in the form of dusts and spray-mists could cause adverse respiratory effects (HSIS, 2008). Isocyanates may also cause respiratory sensitisation by skin contact (US EPA 2010).

Isocyanates may be irritating to the skin and eyes and splashes in the eyes may lead to severe chemical conjunctivitis (NOHSC, 1990). In addition, isocyanates may cause skin sensitisation from repeated or prolonged exposure (Kirk-Othmer, 1995). The potential for these effects is likely to be reduced due to the high molecular weight of the notified polymer.

***Health hazard classification***
Based on the presence of the isocyanate functional group in the notified polymer, the notified polymer is classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004) with the following risk phrase:.

Xn; R42 May cause sensitisation by inhalation.

Based on NOHSC classification of MDI, the product Vibrathane EPI251/8 containing the notified polymer at >70% and the concentration of MDI as a residual monomer at 10-30%, will be classified as follows:

R40: Limited evidence of a carcinogenic effect
R20: Harmful by inhalation
R48/20: Danger of serious damage to health by prolonged exposure through inhalation
R36/37/38: Irritating to eyes, respiratory system, and skin
R42/43: May cause sensitisation by inhalation and skin contact

### 6.3. Human health risk characterisation

#### 6.3.1. Occupational health and safety
As the notified polymer will be synthesized intentionally with higher concentration of MDI as a residual monomer at 10-30% concentration, the known general hazards of isocyanates, in particular the hazards associated with MDI, have been considered to represent the hazards associated with the synthesis and use of the notified polymer.

Workers exposed to isocyanates may have a concentration-dependent risk of developing respiratory diseases such as bronchial asthma (Baur *et al*., 1994) and often the only treatment for sensitised individuals is to completely remove the worker from the workplace to avoid exposure (Bernstein, 1996). Therefore, measures should be in place to avoid workers developing respiratory sensitisation. The potential for skin sensitisation and skin and eye irritation also exists.

Inhalation exposure to the notified polymer would be limited by the low volatility of the notified polymer at processing temperatures, however higher temperatures could be generated during the exothermic reaction of the isocyanate with the curative during end use. Workers are equipped with suitable full-face respirators to minimise any chance of inhalation exposure during the synthesis of the notified polymer and respirators are also available in case of spillage during the use of the product containing the notified polymer. Furthermore, the engineering controls in the work areas at both sites are expected to minimise worker inhalation exposure to the notified polymer during manufacture and use.

During manufacturing and use of the notified polymer, dermal and ocular exposure will be minimised by the use of engineering controls and PPE. The risk of spillage during filling is reduced by using gravity feed transfer.

Precautions in place to control exposure to MDI should also protect workers from exposure to the notified polymer.

Therefore, based on the use of engineering controls, safe work practices and PPE, the risk to workers during the manufacturing and use of notified polymer is not considered to be unreasonable.

#### 6.3.2. Public health

The product containing the notified polymer will only be available to industrial end users and will not be sold to the general public. Furthermore, as the product containing the cured notified polymer will be used in mining and industrial applications only, the general public is unlikely to come into contact with the notified polymer. Therefore, as exposure to the public is not expected, the notified polymer does not pose an unreasonable risk to the public.

## 7. ENVIRONMENTAL IMPLICATIONS

### 7.1. Environmental Exposure & Fate Assessment

#### 7.1.1 Environmental Exposure

RELEASE OF CHEMICAL AT SITE

Any release of the notified polymer or its component materials at the site of manufacture is anticipated to be less than 1 kg per batch (approximately 0.05%). The notified polymer waste generated during manufacturing arises predominantly from the final draining of the reactor kettle and small spillages on the tops of drums during filling. The recovered material is not re-used as it has been exposed to moisture in the air, compromising the quality of the product. It is normal practice to allow this residue to cure with moisture before being disposed of into the site's solid waste, which is eventually disposed of to landfill, as a stable polyurea. While the kettle is not rinsed between batches, the filter and housing are washed with acetone between each batch. The washings are disposed of to the liquid waste on site and collected by a chemical waste disposal service for off-site treatment. By the time the notified polymer reaches this stage, it is likely to have fully cured.

It is estimated that <0.02% each year may be lost to the waste system through spillage. The notifier's procedures for dealing with spills are well documented and involve the use of a decontaminating solution that promotes the reaction of the notified polymer with water and subsequent disposal to landfill.

Overall annual releases of the notified polymer at the site of manufacture are expected to be very small (0.1%). Wastes and residues will be disposed of to landfill or solvent waste treatment plants. However, due to the reactivity of the isocyanate functionalities with moisture, it is expected that the notified polymer will be fully reacted and cured (in a solid form) when disposed of.

RELEASE OF CHEMICAL FROM USE
Vibrathane EP1251/8, the product containing the notified polymer, is used directly from the shipping drums in a plural component dispensing machine to form solid, inert polyurethane articles for use in mining and industrial applications. Water is added to the spent drums to convert any residual polymer (<1kg per drum, 0.5%) to a stable polyurea. Any residues remaining in the machine will contain only reacted notified polymer. It is expected that any residues from use will be disposed of to landfill. Release of the notified polymer to the aquatic environment is not expected during use.

RELEASE OF CHEMICAL FROM DISPOSAL
The majority of the notified polymer will be irreversibly incorporated in the inert polyurethane matrix of manufactured articles that are expected to be disposed of to landfill at the end of their useful life.

### 7.1.2 Environmental fate

The vast majority of the notified polymer will be incorporated into inert polyurethane articles. Any residues or wastes of the notified polymer are expected to have reacted with water in the atmosphere and/or waste stream to form an inert (solid) urea-capped polyether. The notified polymer is expected to be incorporated within an inert polymer matrix when disposed of to landfill and in this form it is not expected to be mobile or bioavailable. The notified polymer is not expected to be readily biodegradable but due to its high molecular weight it is not expected to bioaccumulate. It is expected to eventually degrade by biotic and abiotic processes in landfill to form water and oxides of carbon and nitrogen.

### 7.1.3 Predicted Environmental Concentration (PEC)

The notified polymer is not expected to be disposed of to the aquatic compartment in significant quantities, based on the intended use and likely disposal pathway. Therefore, the predicted environmental concentration (PEC) was not calculated.

## 7.2. Environmental effects assessment

No ecotoxicity data were submitted. The notified polymer is expected to crosslink and solidify on reaction with water. Therefore, in the unlikely event that the notified polymer is released to the aquatic compartment, it is not likely to be bioavailable and is expected to be of low concern to the aquatic environment.

### 7.2.1 Predicted No-Effect Concentration

A predicted no-effect concentration (PNEC) was not calculated as low potential for aquatic exposure is expected, based on the reported use pattern.

## 7.3. Environmental risk assessment
The Risk Quotient, Q (= PEC/PNEC), has not been calculated since a PEC is not available.

The notified polymer will be used in the manufacturing of polyurethane articles. The majority of the notified polymer is expected to be incorporated within an inert polymer matrix of manufactured articles and in this form it is not expected to be mobile or bioavailable. On the basis of the expected low hazard of the cured material to aquatic organisms and low potential for exposure to the aquatic environment, the notified chemical is not expected to pose an unacceptable risk to the environment.

## 8. CONCLUSIONS AND REGULATORY OBLIGATIONS

**Hazard classification**
Based on the information provided, the notified polymer is classified as hazardous according to the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] with the following risk phrase:

Xn; R42 May cause sensitisation by inhalation

The classification of the notified polymer using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations 2009) is presented below. This system is not mandated in Australia and carries no legal status but is presented for information purposes.

| | ***Hazard category*** | ***Hazard statement*** |
|---|---|---|
| Respiratory sensitisation | 1 | May cause allergy or asthma symptoms or breathing difficulties if inhaled |

**Human health risk assessment**
Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unreasonable risk to the health of workers.

When used in the proposed manner, the notified polymer is not considered to pose an unreasonable risk to public health.

**Environmental risk assessment**
On the basis of the assumed low hazard of the cured material and the reported use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

**Recommendations**

REGULATORY CONTROLS
Hazard Classification and Labelling

- Safe Work Australia, should consider the following health hazard classification for the notified polymer:
  - Conc. ≥ 1%: R42 may cause sensitisation by inhalation

Health Surveillance

- As the notified polymer contains isocyanate functional groups, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a history of isocyanate sensitivity, asthma or other pulmonary condition and who may be adversely affected by isocyanate exposure.

Material Safety Data Sheet

- The MSDS provided by the notifier should be amended as follows to meet the Safe Work Australia classification for MDI:
  - Add the following risk phrases to Section 2 (Hazard Identification).
    R40: Limited evidence of a carcinogenic effect
    R48/20: Danger of serious damage to health by prolonged exposure through inhalation

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following isolation and engineering controls to minimise occupational exposure to the notified polymer during manufacturing and use of the notified polymer:
  - Ventilation system including local exhaust ventilation where inhalation exposure could occur.
  - Automated processes, where possible.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer during manufacturing and use of the notified polymer:
  - Keep containers securely sealed and check regularly for spills and leaks.
  - Avoid inhalation of vapours, mists and aerosols.
  - Avoid contact with skin and eye.
  - Wash hands after handling the notified polymer, or containers and equipment containing it.

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer during manufacturing and use of the notified polymer:
  - Gloves
  - Overalls
  - Safety glasses
  - Appropriate respiratory protection for cleaning and maintenance workers, and for any process where inhalation exposure may occur.

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- Atmospheric monitoring should be conducted to measure workplace concentrations during manufacturing and use of the notified polymer. The Safe Work Australia exposure standard for isocyanates is 0.02 mg/m$^3$ (TWA) and 0.07 mg/m$^3$ (STEL).

- A copy of the MSDS should be provided to employees.

- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Disposal

- The notified polymer should be disposed of to landfill.

Emergency procedures

- Spills or accidental release of the notified polymer should be handled by physical containment, collection and subsequent safe disposal.

**Regulatory Obligations**

*Secondary Notification*

This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
  - the polymer has a number-average molecular weight of less than 1000;

or

(2) Under Section 64(2) of the Act; if

- the function or use of the polymer has changed from production of articles for use in mining and industrial applications, or is likely to change significantly;
- the amount of polymer being introduced has increased from 100 tonnes/annum, or is likely to increase, significantly;
- the method of manufacture of the polymer in Australia has changed, or is likely to change, in a way that may result in an increased risk of an adverse effect of the polymer on occupational health and safety, public health, or the environment;
- additional information has become available to the person as to an adverse effect of the polymer on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

## APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

**Melting Point** -55ºC

| | |
|---|---|
| Method | OECD TG 102 Melting Point/Melting Range. |
| Remarks | Glass transition temperature |
| Test Facility | Chemtura Corp. (date not indicated) |

**Density** 1010 kg/m$^3$ at 23ºC

| | |
|---|---|
| Method | OECD TG 109 Density of Liquids and Solids. |
| Remarks | Pycnometer method. Density for the product Vibrathane EP1251/8 was calculated from the specific gravity results. |
| Test Facility | Chemtura Corp. (2008a) |

**Viscosity** 465 cPa @ 70ºC

| | |
|---|---|
| Method | Determined using a Brookfield Viscometer |
| Remarks | Determined for the product Vibrathane EP1251/8 |
| Test Facility | Chemtura Corp. (2008b) |

**Flash Point** >110ºC at 101.3 kPa

| | |
|---|---|
| Method | EC Directive 92/69/EEC A.9 Flash Point. |
| Remarks | Closed cup. Determined for the product Vibrathane EP1251/8. |
| Test Facility | Chemtura Corp. (2008c) |

## BIBLIOGRAPHY

Baur, X., Marek, W., Ammon, J., Czuppon, A.B., Marczynski, B., Raulf-Heimsoth, M., Roemmelt, H., Fruhmann, G. (1994) Respiratory and Other Hazards of Isocyanates. Int Arch Occup Environ Health. **66**:141-152.

Bernstein, J.A. (1996) Overview of Diisocyanate Occupational Asthma. Toxicol. **111**:181-189.

Chemtura Corp. (Date not indicated). Vibrathane EP1251/8: Melting point. Chemtura Corporation, 199 Benson Rd, Middlebury, CT 06749, USA

Chemtura Corp. (2008a). Vibrathane EP1251/8: Specific gravity and density measurements. 21 May 2008. Chemtura Corporation, 199 Benson Rd, Middlebury, CT 06749, USA

Chemtura Corp. (2008b). Vibrathane EP1251/8: Viscosity. 23 May 2008. Chemtura Corporation, 199 Benson Rd, Middlebury, CT 06749, USA

Chemtura Corp. (2008c). Vibrathane EP1251/8: Flash point. 22 May 2008. Chemtura Corporation, 199 Benson Rd, Middlebury, CT 06749, USA

HSIS (2008) Isocyanates Exposure Standard Documentation. Safe Work Australia. Accessed online 1st September, 2010.

Kirk-Othmer Encyclopedia of Chemical Technology, 4th edition (1995) M Howe-Grant (ed). Vol 14, p.902 (Richter RH and Priester RD contributors). New York, John Wiley and Sons.

Mapp, C.E., Boschetto, P., Dal Vecchio, L., Maestrelli, P., Fabbri, L.M. (1988) Occupational Asthma due to Isocyanates. Eur. Respir. J. **1**:273-279.

NOHSC (1990) Isocyanates. National Occupational Health and Safety Commission. Australian Government Publishing Service, Canberra.

NOHSC (1994) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (2003) National Code of Practice for the Preparation of Material Safety Data Sheets, 2nd edition [NOHSC:2011(2003)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (2004) Approved Criteria for Classifying Hazardous Substances, 3rd edition [NOHSC:1008(2004)]. National Occupational Health and Safety Commission, Canberra, AusInfo.

NTC (National Transport Commission) 2007 Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG code), 7th Edition, Commonwealth of Australia

Tillman, C. (ed.) (2007) Principles of Occupational Health & Hygiene: an Introduction, p.241. Allen & Unwin, Sydney.

United Nations (2009) Globally Harmonised System of Classification and Labelling of Chemicals (GHS), 3rd revised edition. United Nations Economic Commission for Europe (UN/ECE), <http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html >.

US EPA (2010) TSCA New Chemicals Program (NCP) Chemical Categories. Washington, D. C., http://www.epa.gov/oppt/newchems/pubs/npcchemicalcategories.pdf