File No: NA/876

February 2001

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Morfree 403A

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (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 National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, National Occupational Health and Safety Commission, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

Street Address: 92 -94 Parramatta Rd CAMPERDOWN NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, SYDNEY NSW 2001, AUSTRALIA
Telephone: (61) (02) 9577 9514 FAX (61) (02) 9577 9465

Director
Chemicals Notification and Assessment

TABLE OF CONTENTS

FULL PUBLIC REPORT

Polymer in Morfree 403A

1. APPLICANT

Rohm and Haas Australia Pty Ltd of 969 Burke Road CAMBERWELL VIC 3124 (ACN 004 513 188) and Coates Brothers Australia Pty Ltd of 323 Chisholm Road AUBURN NSW 2144 (ACN 000 079 550) have submitted a limited notification statement in support of their application for an assessment certificate for 'Polymer in Morfree 403A'.

2. IDENTITY OF THE CHEMICAL

The chemical name, molecular and structural formula, molecular weight, spectral data, and details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

Marketing Name: Morfree 403A (containing the notified polymer and a 45% intentional excess of 1,1'-methylenebis[4-isocyanatobenzene] (MDI)).

3. PHYSICAL AND CHEMICAL PROPERTIES

The following physicochemical data are from Morfree 403A polymer solution containing the notified polymer and MDI, unless otherwise stated.

Appearance at 20°C & 101.3 kPa: Amber coloured viscous liquid.

Boiling Point: 172°C (MDI).

Specific Gravity: 1.18 (MDI).

Vapour Pressure: 1.3×10^{-7} kPa at 20°C (MDI).

Water Solubility: Not determined (see comments below).

Partition Co-efficient (n-octanol/water): Not determined (see comments below).

Hydrolysis as a Function of pH: The notified polymer contains urethane groups that may undergo hydrolysis under extreme temperature and pH.

Adsorption/Desorption:	Not determined (see comments below).
Dissociation Constant:	The notified polymer does not contain any groups that can undergo dissociation.
Particle Size:	The notified polymer is imported as a solution.
Flash Point:	93.3°C.
Flammability Limits:	Not determined.
Autoignition Temperature:	Not determined.
Explosive Properties:	The notified polymer is stable and is not explosive.
Reactivity/Stability:	Not reactive.

3.1 Comments on Physico-Chemical Properties

Although no water solubility data is provided, the notifier expects the solubility of the notified polymer to be insignificant due to the high molecular weight and the high proportion of hydrophobic monomers. It would also be difficult to measure in view of the reactive isocyanate groups.

The notified polymer contains terminal isocyanate groups that may undergo reaction with water, suggesting that the notified polymer will be slightly susceptible to hydrolysis. The remainder of the notified polymer contains urethane and ester linkages that could be expected to undergo hydrolysis under extreme pH. However, in the environmental pH range of 4 to 9, significant hydrolysis of the urethane and ester linkages is unlikely.

The partition coefficient has not been determined due to its expected low water solubility, and the likely hydrophobic nature.

No adsorption/desorption tests were conducted for this notification. The notifier expects the notified polymer to be immobile in soil due to the high molecular weight, monomer composition and expected low water solubility.

Although no dissociation tests were conducted, the notifier expects that the notified polymer will not undergo dissociation, as it does not contain any relevant functional groups.

Despite the notified polymer containing terminal isocyanate functional groups, classified as highly reactive functional groups, it is expected to remain stable under ambient conditions. The notified polymer is designed to cross-link with other polymers and laminating components

4. PURITY OF THE CHEMICAL

Degree of Purity: Approximately 55%.

Additives/Adjuvants:

Chemical name:	Methylene bisphenyl isocyanate
Synonyms:	MDI
CAS No.:	101-68-8
Weight percentage:	Approximately 45%
Toxic Properties:	May cause sensitisation by inhalation; Irritating to eyes, respiratory system and skin; Harmful by inhalation (NOHSC, 1999a). The NOHSC exposure standard for isocyanates is 0.02 mg/m^3 (TWA) and 0.07 mg/m^3 (STEL) with "Sen" notation (NOHSC, 1995).

Maximum Percentage of Low Molecular Weight Species

Molecular Weight < 500:	<0.1%
Molecular Weight < 1 000:	<0.1%

5. USE, VOLUME AND FORMULATION

The notified polymer is a component of a two pack laminating adhesive for polymer and/or aluminium film used to package dry food.

The notified polymer will not be manufactured in Australia, but will be imported as a component in the product Morfree 403A. The estimated import quantity of the notified polymer is approximately 1.5 tonnes in the first year increasing to 5 tonnes per annum in 5 years.

Morfree 403A is formulated as a polymer solution and packed in 20 L pails.

6. OCCUPATIONAL EXPOSURE

Transport and storage

The notifier estimated that 5 waterside workers and 4-6 transport drivers and warehouse workers will be involved in the transport and storage of the product containing the notified polymer. These workers could be exposed to the notified chemical only in the event of an accident where the packaging is breached.

Laminating machine operator

At the laminating site, Morfree 403A is poured manually from 20 L pails into a mixing vessel of 20-50 L capacity. It will be pumped into a second mixing vessel and mixed with another component of the adhesive system through a mixing nozzle. The blended adhesive

containing notified polymer is transferred by gravity from the mixing nozzle to the laminating machine rollers. The blended adhesive is applied by the gravure coating process where two polymers and/or aluminium film are laminated together with the adhesive between the films. Following completion of a run, unused adhesive in the laminating machine tray or reservoir is transferred to a waste drum manually. The adhesive residues on the machinery are washed off manually using rags and solvent.

There will be 2-4 laminating machine operators who may be exposed to the product containing the notified polymer and the blended adhesive. The maximum potential exposure for laminating machine operators is estimated to be 6-8 hours per day, 30 days per year. The main routes of occupational exposure to the polymer will occur through skin and eye contact. Laminating machinery operators wear safety glasses, impervious gloves (butyl rubber or nitrile), overalls and safety boots during blending and transfer of the adhesive, and cleaning of the laminating machines. The Material Safety Data Sheet (MSDS) for Morfree 403A recommends the use of respiratory protection while ventilation is inadequate. Blending vessels are situated in a bunded area with local exhaust ventilation, while laminating machinery is either fitted with exhaust ventilation ducts above the adhesive tray or in a wall or ceiling adjacent to the machinery.

7. PUBLIC EXPOSURE

It is expected that during transport, storage, and application, exposure of the public to the notified polymer will be minimal, except in the event of an accidental spill. The notified polymer will enter the public domain as packaging for dried food. Consequently, public exposure to the packaging is likely to be high, but public contact with the notified polymer in a dried adhesive layer sandwiched between two layers of polymer and/or aluminium film is likely to be limited.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

The notifier has estimated the amounts of the notified polymer solutions may be lost from the formation and use of the adhesive:

Spills:	less than 25 kg/annum
Residues in the import containers:	less than 13.75 kg/annum
Equipment cleaning:	less than 15 kg/annum
Unused blend:	less than 25 kg/annum

The total amount of notified polymer that may be wasted during its use is likely to be less than 79 kg/year when 5 tonnes of the notified polymer are imported.

It is likely that the spilt Morfree 403A containing the notified polymer and the associated clean-up materials will be disposed of to landfill.

The blending and laminating equipment will be cleaned daily with rags and solvents, which will be collected in the empty importation drums, along with any unused blended adhesive.

The drums will then be collected by licensed waste contractors for disposal. The waste solvent and any liquid adhesive and Morfree 403A will be incinerated. The empty drums and any solid Morfree 403A or adhesive will then be disposed of to landfill.

The majority (approximately 98.5%) of the notified polymer will be incorporated into dry food packaging.

8.2 Fate

Any liquid adhesive or waste notified polymer will be collected in the empty importation pails along with waste solvent and will then be incinerated. Any solid material containing the notified polymer, including spill clean-up, will be disposed of to landfill by licensed hazardous waste contractors. It is unlikely the polymer will leach from the landfill but rather associate with soil.

The majority of the notified polymer, which is contained in packaging, will ultimately make its way into domestic landfill as household garbage. The packaging material will not degrade readily but will ultimately degrade due to chemical and biological actions at which stage it is likely that any degradation products will associate with the soil and would not be leached out by water.

The polymer is not expected to cross biological membranes, due to its molecular weight and predicted low water solubility, and should not bioaccumulate (Connell, 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological data were not provided for assessment.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Ecotoxicological data were not provided for assessment.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Minimal release to the aquatic environment is expected during the use of the notified polymer in the formulation of the laminated adhesive. Small quantities of the notified polymer, derived from either spills or residue waste, will ultimately be released to landfill. In landfill, the polymer is unlikely to be mobile in the soil environment and would be expected to slowly degrade to carbon dioxide gas through abiotic and biotic processes. The environmental hazard of the notified polymer in landfill is expected be low. If incinerated, the polymer would be rapidly destroyed and converted to water vapour and oxides of carbon nitrogen.

Release to the aquatic environment is expected through the disposal of food packaging to domestic landfill but this will be minimal. As the packaging gradually degrades the resulting end polymer is likely to associate with the soil, where it is unlikely to be leached out.

The MSDS has outlined the correct procedure to be followed if the material is accidentally released onto soils or into waterways.

The notified polymer's molecular weight and expected low water solubility should prevent bioaccumulation.

The overall environmental hazard is therefore expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological information has been provided for the notified polymer. The notifier indicated that the notified polymer is hazardous due to the presence of MDI according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b).

The product Morfree 403A is a hazardous substance with risk phrases of R20 (Harmful by inhalation), R42 (May cause sensitisation by inhalation) and R36/37/38 (Irritating to eyes, respiratory system and skin) because of the presence of MDI. The MSDS for Morfree 403A lists a number of potential health effects, namely irritating to eyes, mouth, throat, gastrointestinal and respiratory tracts, skin and respiratory sensitisation, diarrhea, nausea, vomiting, and damage to lung and respiratory system, eyes, skin and immune system. These relate mainly to MDI rather than the notified polymer. MDI also has a NOHSC Exposure Standard.

Occupational health and safety

There is little potential for significant health risk to the notified polymer in the transport and storage of the product containing this polymer.

Potential exposure to the polymer in Morfree 403A will be during the blending and transfer of adhesives, and when cleaning equipment. Exposure to the notified polymer via inhalation is expected to be minimal due to its low volatility. Exposure is most likely to be by skin contact. However, laminating machine operators are instructed to wear safety glasses, impervious gloves (butyl rubber or nitrile are recommended in the MSDS), coveralls and safety boots when handling Morfree 403A and blended adhesives. Respirator will be worn when required. In addition, blending vessels are situated in a bunded area with local exhaust ventilation. Laminating machinery is either fitted with exhaust ventilation ducts above the adhesive tray, or in a wall or ceiling adjacent to the machinery. The adverse health risk due to the notified polymer to these workers is considered to be low.

MDI in the imported polymer solution may cause systemic toxicity via inhalation, irritation to skin, eyes and respiratory system and respiratory sensitisation. It is the employer's responsibility to maintain atmospheric levels of MDI below the NOHSC exposure standard of 0.02 mg/m^3 (TWA, equivalent to 0.12 mg/m^3 MDI) and 0.07 mg/m^3 (STEL, as -NCO). However, it is noted that the ACGIH TLV for MDI is 0.051 mg/m^3 (TWA) (ACGIH, 2000). The risk of occupational asthma from repetitive exposure to isocyanates is well known. Therefore, respiratory protection during decanting and machine clean-up is indicated. The use of self-contained breathing apparatus should be considered to prevent worker exposure. Precautions to prevent exposure must be taken by all personnel, but especially those who either have had prior contact with isocyanates or suffer from any form of compromised

respiratory function (NOHSC, 1990). Health surveillance is recommended for isocyanates under State and Territory hazardous substances legislation.

The notified polymer becomes unavailable for absorption once it is incorporated in the laminated material. The health risk for workers in the food packaging industry, and in the distribution and retailing snack food is considered to be negligible.

The notified polymer has been used commercially in Europe and USA for a number of years. No adverse health effects resulting from human exposure to the notified polymer have been observed or reported.

Public health

It is expected that public exposure to the notified polymer in its liquid state will be limited, except in the rare event of an accidental spill. The notified polymer used in an adhesive in food packaging will be encapsulated within an inert, very high molecular weight film matrix, rendering the notified polymer biologically unavailable. Public contact with the notified polymer in dried food packaging is further limited as the adhesive containing the notified polymer is sandwiched between two layers of polymer and/or aluminium film, restricting any dermal contact. Consequently the public hazard from exposure to the notified polymer through all phases of its life-cycle is considered to be low.

13. RECOMMENDATIONS

To minimise occupational exposure to "Polymer in Morfree 403A" the following guidelines and precautions should be observed:

- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;
- A copy of the MSDS should be easily accessible to employees.

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b), workplace practices and control procedures consistent with State and Territory hazardous substances regulations must be in operation.

For products and formulations containing free MDI the following guidelines and precautions should be observed:

- Employers should ensure that NOHSC exposure standards are not exceeded in the workplace;
- Health surveillance should be conducted in the workplace in accordance with the NOHSC *National Model Regulations for Control of Workplace Hazardous Substances* (National Occupational Health and Safety Commission, 1994a);
- Safety goggles, chemical resistant industrial clothing and footwear and impermeable gloves should be used during occupational use of products containing the notified

polymer; where engineering controls and work practices do not reduce vapour and particulate exposure to safe levels, an air fed respirator should also be used;

- Guidance in selection of goggles may be obtained from Australian Standard (AS) 1336 (Standards Australia, 1994) and Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); for industrial clothing guidance may be found in AS 3765.2 (Standards Australia, 1990); for impermeable gloves or mittens in AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998); for occupational footwear in AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994a); for respirators in AS/NZS 1715 (Standards Australia/Standards New Zealand, 1994b) and AS/NZS 1716 (Standards Australia/Standards New Zealand, 1994c) or other internationally acceptable standards.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the product containing notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994b).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, the director must be informed if any of the circumstances stipulated under subsection 64(2) of the Act arise, and secondary notification of the notified chemical may be required. No other specific conditions are prescribed.

16. REFERENCES

ACGIH (2000), 2000 TLVs and BEIs.

Connell DW (1990) General characteristics of organic compounds which exhibit bioaccumulation. In Connell D. W., (Ed) Bioaccumulation of Xenobiotic Compounds. CRC Press, Boca Raton, USA.

National Occupational Health and Safety Commission (1990) Worksafe Australia Guide - Isocyanates. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994a) National Model Regulations for Control of Workplace Hazardous Substances [NOHSC:1005(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994b) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1995) Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC:1003(1995)]. In: Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999a) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999b) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia.

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Standards Association of Australia/ Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1715-1994, Use and Maintenance of Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994c) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia/Standards Association of New Zealand.