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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Desmodur TP LS 2010/1

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 Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Health and Family Services.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Desmodur TP LS 2010/1****1. APPLICANT**

Bayer Australia Limited of 875 Pacific Highway PYMBLE NSW 2073 has submitted a limited notification statement in support of their application for an assessment certificate for Desmodur TP LS 2010/1.

2. IDENTITY OF THE CHEMICAL

Desmodur TP LS 2010/1 is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and details of exact import volume and customers have been exempted from publication in the Full Public Report and the Summary Report.

Other Names: aliphatic polyisocyanate

Trade Name: Desmodur TP LS 2010/1

**Number-Average
Molecular Weight:** > 1 000

**Maximum Percentage of Low
Molecular Weight Species**

Molecular Weight < 500: < 15 %

Molecular Weight < 1 000: < 10 %

**Method of Detection
and Determination:** infrared spectroscopy (IR) and Gel Permeation
Chromatography (GPC)

3. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance at 20°C
and 101.3 kPa:** colourless to yellowish viscous liquid that is nearly
odourless

Boiling Point: > 300°C

Specific Gravity:	1.12 at 20°C
Vapour Pressure:	< 110 kPa at 50°C
Water Solubility:	insoluble
Partition Co-efficient (n-octanol/water):	not provided
Hydrolysis as a Function of pH:	not provided
Adsorption/Desorption:	not provided
Dissociation Constant:	not provided
Flash Point:	> 235°C (Closed cup)
Flammability Limits:	not provided
Autoignition Temperature:	not provided
Explosive Properties:	not provided
Reactivity/Stability:	not provided

Comments on Physico-Chemical Properties

The notified polymer is stated by the notifier to be insoluble. The notifier states that the estimated half-life of the polymer is dependent on the concentration of water.

Generally, the reaction between isocyanates and water is as shown in the following equation:



The amine may go on to react with free isocyanate groups to form polyureas.

The partition co-efficient was not measured but is expected to be high due to its low solubility.

Should spillage occur, it is likely the product will remain associated with the soil or sediment compartments. Even after reaction with water, the resulting polyamines could be expected to associate with soil, as chemicals that form cations at ambient pH conditions are generally thought to sorb strongly to clay material (2).

4. PURITY OF THE CHEMICAL

Degree of Purity:	high
Toxic or Hazardous Impurities:	none
Non-hazardous Impurities (> 1% by weight):	none
Maximum Content of Residual Monomers:	very low
Additives/Adjuvants:	none

5. USE, VOLUME AND FORMULATION

The notified polymer will be fully imported into Australia for combination with other suitable polyols to formulate highly flexible coatings which have good resistance to accelerated and natural weathering. It is designed to be used in applications requiring weather resistant coatings such as automotive refinish paints, stone-chip protection systems and in the coatings of plastic.

The anticipated volumes are 10 to 100 tonnes per annum for the first five years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported in a closed system with sealed packaging. It will be stored in a warehouse until transportation by road to the customer. During transport, exposure to the notified polymer is only likely to occur in the unlikely event of an accident.

Information on potential exposure at the customer site was provided by the notifier. Following receipt of the notified polymer, the customer unloads and places it in a raw materials store. This will be done by one person and as the notified polymer remains in sealed drums exposure is likely to be negligible. The customer essentially blends the polymer with solvents and additives to achieve the required formulation. This work is conducted by an operator and a quality control officer for period of 3 hours per day, 20 days per year. The most likely route of exposure will be dermal during transfer of the notified polymer to the blending equipment, during blending with additives and batch testing of the formulation. There is also the potential for exposure to vapours, during these operations, that may have built up in the head space of the drum. Ocular exposure would only be likely to occur in the event of accidental splashing.

Once the formulation is prepared it is then canned by one operator, 3 hours per day for 20 days per year. Dermal exposure may occur during the filling of cans. Ocular exposure would only be likely to occur in the event of accidental splashing. The

formulated paint, containing the notified polymer is then dispatched to the end user.

The notifier supplied some information about the potential for occupational exposure at the end-users' facility. It is likely that the customer will transfer the paint to circulation tanks, for 1 hour per day, 200 days per year. The paint will be sprayed using hand-spray equipment and workers might perform this task for 8 hours per day, 200 days per year. The equipment will be cleaned and this would usually take 1 hour per day, 200 days per year. During each of these operations the most likely route of exposure is dermal, with some potential for inhalational exposure to vapours, as previously stated ocular exposure is only likely to occur in the event of accidental splashing.

7. PUBLIC EXPOSURE

The notified polymer will not be available to the general public. However, as it will be used in the paint industry and typically for automotive paints, the public may contact the coatings containing the notified polymer. Minimal exposure to the notified polymer is only likely to occur if the coatings are damaged. In such instances the polymer will be immobilised in the hardened coating and will be unavailable.

There is potential for minor public exposure from disposal of unused polymer, or accidental spillage during transport and storage. However, adequate measures are described by the notifier to minimise this occurring.

8. ENVIRONMENTAL EXPOSURE

The notifier has not presented any ecotoxicity results for the polymer. This is acceptable as ecotoxicity tests are not required for a polymer with NAMW of greater than 1 000, according to the Act.

The polymer is not expected to show ecotoxicity effects as a result of the high molecular weight and expected low water solubility and is therefore of low concern (3) because large polymers of this nature are not readily absorbed by biota.

While it is unlikely to cross biological membranes due to its high molecular weight the notified polymer does contain low molecular weight material (< 15% below 1 000; < 10% below 500). When formulated into paints and heat cured on final products, this low molecular weight material is unlikely to provide a hazard to the environment. Any low molecular weight species lost as overspray is expected to be trapped by waste trapping systems, and slowly cure. Disposal will be to landfill where the cured material will be immobile, or by incineration.

Release

The notified polymer is combined with other suitable polyols to formulate highly flexible coatings. Formulation is carried out at the notifiers customer plant.

The typical reformulation process undertaken involves mixing with solvent and additives, and blending to obtain suitable viscosities. Batch testing is performed

prior to filtration and filling. The formulated end product is then transported to end users.

The mixing and blending operations are done with the same equipment, which is often used continuously. As such, it is seldom cleaned. When cleaning operations are performed, the notifier states residuals of the product are in minute quantities, ie, a film of product left on the inside of mixing equipment, which may simply be wiped down with cloth and an appropriate solvent.

End use application of the paint finish to automotive parts is by air-atomisation spray. Transfer efficiencies range from 35 to 75%, depending on the application method. Resultant oversprays are trapped by high efficiency water scrubbing systems and the paint finish is removed from the scrubbers using flotation techniques. Although this minimises any release to the environment during application operations, the significant quantities of sludge captured by pollution control technology would be disposed of to landfill.

Empty containers may be disposed of after neutralising any product remaining on the walls of the containers with a mixture of isopropanol, ammonia and water. Due to the viscosity of the material, residues remaining in drums is expected to be minimal.

Fate

The fate of the polymer is either to be bound to automotive parts within or on vehicles, or disposed of by landfill/incineration, with exposure to the aquatic system expected to be extremely small. The polymer, incorporated in a paint finish, has been fully cured into a solid coating matrix on the surface of treated automotive parts. This remains with the vehicle. Any fragments or chips of the cured paint that occur will be inert and form part of the sediments.

Due to the hydrophobic nature of the polymer, residues from drums will be relatively immobile when disposed to landfill. Incineration will result in oxides of carbon and nitrogen as well as water, and is not considered to provide a threat to the environment.

Excess paints and residues from cleaning of spray equipment, scrubber apparatus, and filters, will be disposed of by landfill where the polymer would be immobilised through incorporation in the dried paint.

9. EVALUATION OF TOXICOLOGICAL DATA

The notifier has not presented any toxicological data for the notified polymer. This is acceptable for a polymer with NAMW of greater than 1 000 according to the Act.

While it is unlikely to cross biological membranes due to its high molecular weight the notified chemical contains a high percentage of low molecular weight species (< 15% below 1 000; < 10% below 500). These low molecular weight species have the potential to cross biological membranes and may lead result adverse effects such as sensitisation.

There is very low percentage of residual monomer. This chemical is considered to be toxic by inhalation and if swallowed (4). It also has the potential to cause skin, eye irritation, skin and respiratory sensitisation (4). However, it is present at a concentration below the level, for each toxic effect detailed above, that would require the notified chemical to be classified as hazardous according to Worksafe Australia's *Approved Criteria for Classifying Hazardous Substances* (5).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard during reformulation is expected to be low. It is unlikely that release of the chemical through reformulation, batch testing and cleaning operations will account for any more than 0.5% (< 500 kg) of the total chemical imported. All reformulation is carried out at one site. Assuming production occurs on 300 days of the year, this equates to a daily release of 1.7 kg, which is likely to go to sewer. With a 250 ML daily output from a city sewer, the predicted environmental concentration prior to release in receiving waters will be around 7 ppb.

The reformulated paint finish is applied by air-atomisation spray on to automotive parts. No sites of end use have been identified, but end users will typically be large automotive manufacturers. Transfer efficiencies range from 35 to 75%, depending on the application method. As a worst case, with only 35% efficiency in spraying, out of the 100 tonnes imported, up to 65 tonnes could be lost each year as a result of overspray. Assuming spraying operations are carried out on 200 days of the year, this equates to an average of 325 kg each day, which is likely to be spread over a few sites.

Overspray is expected to be trapped by either air filters or water curtains. As the paint waste trapped in the air filters is expected to dry out and cure before disposal, the hazard from this material is expected to be negligible when it is landfilled or incinerated. Any spray droplets not trapped by the air filter will dry out and polymerise to an inert particle. The water from the spray curtains will be settled out with the aid of a flocculating agent before being discharged to the sewer. Here it will be diluted by several orders of magnitude and any remaining solids may partition to the sludge in the sewage treatment works. The solids are disposed of by landfill or incineration.

Incineration of the polymer will generate oxides of carbon as well as water. The environmental hazard can be rated as negligible. As the polymer is expected to be insoluble in water, the polymer waste consigned to landfill is unlikely to leach and will stay in the landfill. Hydrolysis of the polymer is expected to be extremely slow due to the low solubility in water. The environmental hazard from the disposal of paint waste containing the polymer is rated as low.

Instructions in the Material Safety Data Sheet are adequate to limit the environmental exposure from spills etc. and therefore the environmental hazard from possible accidental spills should be low.

The overall environmental hazard from the use of the polymer is rated as low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer will be imported at estimated volumes of up to 100 tonnes per annum in the first five years. It will be incorporated into coatings which require weather resistance such as automotive refinish paints, stone-chip protection systems and in coating of plastics.

The notified polymer has a high molecular weight which will restrict transfer across biological membranes, for example skin. The polymer contains a high percentage (< 25%) of low molecular weight species with the potential to cross the skin. Residual monomer, present at a very low percentage, has the potential to cause a range of adverse effects following systemic exposure, including skin and eye irritation and respiratory sensitisation (4). Although the residual monomer is present at a concentration below the level that would require the notified chemical to be classified as hazardous according to the Approved Criteria (5), workers should be aware of its hazardous potential, especially atopic individuals. The notifier states that given the known effects, persons with hypersensitivity of the respiratory tract (those susceptible to irritant effects and asthma) are advised not to work with the notified chemical. Further guidance material is available in Worksafe Australia's Guide, *Isocyanates* (6).

The main route of exposure is likely to be dermal during operations for formulating the notified polymer into coatings etc. This includes workers filling blending tanks, batch testing, transfer of paint to drums for transport and in application of the paint. The potential for dermal exposure is moderate because of the manual nature of these operations. There is also the potential for inhalational exposure to vapours, that may have built up in the headspace of the drum during transport and storage, when workers open drums prior to dispensing the notified polymer. The notifier states that inhalational exposure will be minimised by local exhaust ventilation and that potential inhalational exposure to the residual monomer will be minimised by its very low vapour pressure. However, workers should be aware that an occupational exposure standard of 0.02 mg/m³, Time-Weighted Average (TWA) has been declared by Worksafe Australia (7). Given the concern for exposure to the potentially harmful residual monomers and low molecular weight species, protection as described in the recommendation section of the report should be employed when there is the potential for exposure to the notified chemical.

Paint products, containing the notified polymer (percentage unknown to notifier), will primarily be used in spray painting applications. Most spray painting is conducted in ventilated spray booths to prevent exposure to solvents so that exposure to the polymer is expected to be correspondingly low. The exact nature of the solvents in the paint is unknown and the MSDS for the paints should be consulted prior to use.

Although exposure to the notified chemical will be intermittent, given the potential irritant and sensitising properties of residual monomer, and the high percentage of low molecular weight species, the risk of adverse health effects from exposure to the notified polymer during transfer and blending is considered to be low to moderate. Potential exposure to the notified polymer will be minimised during paint application,

due to the reduced concentration of the notified polymer in the paint formulation and by the work practices in place to minimise exposure to solvents, contained in the paint formulation. The risk for these workers and those cleaning spray equipment is low.

The risk of adverse public health effects is expected to be negligible given that the potential for exposure is limited to the notified polymer as an inert coating of automobiles etc.

13. RECOMMENDATIONS

To minimise occupational exposure to Desmodur TP LS 2010/1 the following guidelines and precautions should be observed:

- If engineering controls and work practices are insufficient to reduce exposure to Desmodur TP LS 2010/1 to a safe level, then the following personal protective equipment which conforms to Australian Standard (AS) or Australian/New Zealand Standard (AS/NZS) should be worn;

Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (8) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (9);

Industrial clothing should conform to the specifications detailed in AS 2919 (10);

Impermeable gloves or mittens should conform to AS 2161 (11);

All occupational footwear should conform to AS/NZS 2210 (12);

Respiratory protection (selected and fitted) according to ANS/NZS 1715 (13) to comply with AS/NZS 1716 (14);

- Spillage of the notified chemical should be avoided, spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion; and
- A copy of the MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National*

Code of Practice for the Preparation of Material Safety Data Sheets (15).

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

16. REFERENCES

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2. Howard, P.H., 1991. *Handbook of Environmental Fate and Exposure Data for Organic Chemicals*. Lewis Publishers.
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4. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances* [NOHSC:10005(1994)], Australian Government Publishing Service Publ., Canberra.
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7. 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 Publ., Canberra.
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9. Standards Australia/Standards New Zealand 1992, *Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications*, Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.

10. Standards Australia 1987, *Australian Standard 2919-1987, Industrial Clothing*, Standards Association of Australia Publ., Sydney.
11. Standards Australia 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding electrical and medical gloves)*, Standards Association of Australia Publ., Sydney.
12. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear*, Standards Association of Australia Publ., Sydney, Standards Association of New Zealand Publ, Wellington.
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15. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets* [NOHSC:2011(1994)], Australian Government Publishing Service, Canberra.