File No: PLC/139

November 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

INDEX Interpolymer

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 Family Services.

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 the full public report may also be requested, free of charge, by contacting the Administration Coordinator.

Please direct enquiries or requests for full public reports to the Administration Coordinator at:

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

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

INDEX Interpolymer

1. APPLICANT

Dow Chemical (Australia) Limited of 541-583 Kororoit Creek Road, Altona, Victoria 3018 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for INDEX Interpolymer.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition, identity of non-hazardous impurities, import volume and details of uses have been exempted from publication in the Full Public Report.

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	> 1000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 2 %
Molecular Weight < 1 000:	< 5 %
Polymer Stability	polymer is expected to be stable
Reactivity	no reactive functional groups are present
Particle Size	99.99 % > 1 mm
Charge Density	no groups which can dissociate are present
Water Solubility	< 1 mg/L

Method of Detection and Determination:	Infrared spectroscopy; Differential scanning calorimetry traces for a variety of compositions have also been provided by the notifier, and serve as characterisation of the composition of the individual sample of notified polymer.

The polymer meets the criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act* (1989).

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer may be imported with a range of compositions depending on the use for which it is intended. A range is therefore stated for a number of the physical and chemical properties, covering the range of compositions.

Appearance at 20°C and 101.3 kPa:	translucent white pellets or granules
Melting Point:	120 – 140°C
Specific Gravity:	0.9 – 1.2
Vapour Pressure:	not volatile
Water Solubility:	< 1 mg/L at 25°C (see comments below)
Dissociation Constant:	no groups which can dissociate are present
Flammability Limits:	not flammable
Autoignition Temperature:	> 300°C
Explosive Properties:	not expected to be explosive
Reactivity/Stability:	expected to be stable under normal environmental conditions

Comments on Physico-Chemical Properties

Test reports have not been provided, except for determination of water solubility.

The test report for water solubility is a very brief copy of handwritten laboratory notes and does not specify the method used. However, the notifier claims to have attempted to use OECD Guideline ENV/EPOC (96) 8 but due to the physical properties of the material it was not possible to crush it as specified in the guideline. In an attempt to get some understanding of the solubility the extraction test was done with irregular agitation for 48 hours, after which the dissolved organic carbon (as total organic carbon (TOC)) was determined. The TOC was <1 mg/L in the water. This indicates that the polymer is not likely to be soluble in water.

The polymer contains no polar groups likely to confer solubility or become cationic. There are also no groups that are likely to hydrolyse.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 90 %

All residual monomers are present at 0.1 % or less and are below the concentration cutoffs for classification of the notified polymer as hazardous.

Hazardous Impurities: none

Additives/Adjuvants:

Chemical name:	talc (containing no asbestos fibres)
CAS No.:	14807-96-6
Weight percentage:	< 2 %
Regulatory controls:	national exposure standard 2.5 mg/m^3 TWA (inspirable dust) (NOHSC, 1995)
Toxic properties:	subject to debate; talc is a respiratory hazard although it has been concluded that in the absence of asbestos, it should not be considered a human carcinogen (American Conference of Government Industrial Hygienists, 1998)

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a structural polymer which may potentially replace other common thermoplastic materials. A wide variety of end uses is therefore possible.

The notified polymer may be made in a variety of compositions and blended with other polymers, and compounded with fillers, plasticisers or other additives to produce the desired properties.

The end uses which are anticipated for the notified polymer are in plastic film and sheet manufacture, paving and roofing compounds and moulded and extruded parts.

The notified polymer may be reformulated by mixing with asphalt for paving and roofing applications. The notified polymer will comprise < 10 % of the mix for paving applications, although greater concentrations may be used for roofing applications.

The anticipated import volume is more than 1 tonne per annum in the first year, and in the range 50 – 500 tonnes per annum during the next 4 years.

6. OCCUPATIONAL EXPOSURE

The notifier has provided occupational exposure information covering continuous film, pipe and sheet manufacture, moulded and extruded part manufacture, and paving and roofing applications.

Transport and Storage
The notified polymer will be imported in the form of granules, 2 – 3 mm diameter and 3 – 4 mm long. These will be packed in sealed 25 kg polyethylene bags or in 18 tonne shipping containers. The material is not dusty, but may contain a small percentage of "floss"; long fluffy strings of polymer. Bags of polymer will be transported by road, and stored in warehouses; the shipping containers will be unloaded using a vacuum system into storage silos.

The notifier indicates that due to the nature of the material, and as the polymer will be handled in sealed bags or an enclosed vacuum system, little exposure would be expected. The polymer granules are stated to comprise a slip hazard.

No details of the number of workers or anticipated exposure times were provided by the notifier.

Continuous Film, Pipe and Sheet Manufacture
This is carried out as a 24 hour per day, 5 to 7 days per week operation at large facilities, with long production runs using the same grade of polymer. At smaller facilities, the lines will run 24 hours per day, 5 days per week with shorter individual production runs. Operators will control between 1 and 5 lines for shifts of 8 to 12 hours. The processes are closed systems, particularly at larger facilities. In this case, feeding of polymer granules into the production line and handling of the end product are automated.

In smaller facilities, granules of the notified polymer will be loaded into the feed hopper from the 25 kg bags manually at 2 to 3 bags per hour. Formed product emerging from dies will be manually guided to the chilled roller or receiving area for collection of the product. Local exhaust ventilation will generally be used in this area to remove heat and hydrocarbon fumes.

The notifier states that workers loading the notified polymer into feed hoppers will wear safety glasses and body-covering clothing. While handling products in the region of the dies, workers will wear cotton gloves for protection from hot surfaces, safety glasses, body-covering clothing and hearing protection.

The rollers used to collect film or sheet will be manually changed in smaller facilities, using lifting devices.

Maintenance may be carried out by specialist personnel, or by the operators, depending on the size of the facility. Once every 6 – 12 months, the equipment will be dismantled, heated in an oven to 150 - 200°C, and softened polymer removed with a hand tool and water. The notifier states that no solvents are used and low levels of fumes will be present and a respirator will not be required. Floss buildup will be removed by hand when needed. Dust buildup on the exterior of equipment will be removed with a damp cloth; respiratory protection will only be used if high levels of dust buildup are present.

Scraps (typically < 5 %) will be transferred either manually or via an air fed system to a

7. PUBLIC EXPOSURE

Given the range of products likely to include the notified polymer, public contact with the notified polymer is likely to be frequent and widespread.

The notified polymer has a high molecular weight and low water solubility, and is therefore unlikely to cross biological membranes. It will be bound in the matrix of products containing it, and therefore systemic exposure in members of the public coming in contact with the notified polymer is likely to be negligible.

8. ENVIRONMENTAL EXPOSURE

Release

A small amount of pellets may be spilt during transfer to hoppers or silos but generally this material will be swept up and returned to the process.

Continuous Film, Pipe and Sheet and Extruded and Moulded Part Manufacture
Any waste generated during the extrusion or moulding process is mostly returned to the process, including material that has been used for quality testing. The amount of waste generated in the extrusion process is usually less than 5 % and in the moulding process it will be between 2 – 10 %. The notifier has estimated that typically 90 % of scrap generated is recycled in the manufacturing process. The amount of production waste disposed of to landfill therefore amounts to approximately 0.5 % of the material produced (i.e. 10 % of 5 %). Ultimately all of the polymer will end up in landfill on disposal of the end product articles.

Paving and Roofing
Once the polymer has been added to the bitumen it is unlikely that it will be able to be recycled. With blending and heating, the bitumen mix ingredients will become locked in an inert matrix. Any material left after application will likely be allowed to cool and set and then disposed of to landfill.

Recycling
In all applications once the product has been used by the end-user it is likely that the material will end up in a landfill. However, products, not including bitumen products, will be compatible for recycling with polystyrene (PS - which is not recycled significantly in Australia), and polyethylene (PE) resin products. This means that in the first year it is possible that 5 % will be recycled by end users with this increasing to 10 % by the end of year 5. Products made from the bitumen/asphalt will have a life expectancy of at least 10 years after which the material will be disposed of to landfill.

Fate

As described above, the majority of production waste material will be recycled in the process. Once the notified polymer has been incorporated in any of the final products the notified polymer will be incorporated in an inert matrix. Any waste generated at the end of the process is likely to be stable and the polymer will not be available to be leached out.

After the product, in whatever form, has been used by the end-user it will end up in a landfill, ie ultimately all of the imported polymer will end up in landfill. Since the polymer will be within an inert, stable matrix it should not leach out. As for polyethylene (PE) products, the degradation rate of the products will be very slow (Bartha, 1997).

Due to the large molecular weight and the low water solubility of the polymer it is unlikely to bioaccumulate (Connell, 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Once the polymer has been heated and mixed with the other ingredients in the products it will be bound in an inert matrix. Pellets lost during extrusion/moulding will generally be returned to the process, and material lost during addition to bitumen is also likely to be low. Ultimately, all of the notified polymer, in its various product forms, will end up in the environment, mostly in landfill. The likely slow degradation rate and presence in a stable matrix means that the notified polymer will not pose a hazard to the environment. However, the products themselves may cause a physical problem due to their durability and tendency to be disposed of inappropriately (Bartha, 1997).

The environmental hazard posed by the notified polymer is low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological information has been provided for the notified polymer. Therefore the substance cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999). The polymer is not reactive and non-volatile, and because of the high molecular weight is not expected to cross biological membranes. The polymer and modified bitumen containing the polymer will be solid at room temperature, and the notified polymer is therefore expected to be immobile.

Occupational Health and Safety
The major occupational hazard associated with the use of the polymer is the use of elevated temperatures in all of the processing steps above. Worker protection against the hot molten polymer or polymer modified bitumen is required. On cooling, drips and spills of polymer or bitumen will harden and immobilise the polymer.

Care should be taken while working with molten polymer to ensure that the temperature does not rise above 420°C, to avoid the formation of fumes from polymer decomposition. Should this occur, respiratory protection will be required.

Under normal conditions of use of the notified polymer, little occupational exposure is expected as the polymer is in a physical form (large granules) which precludes inhalation exposure and conventional skin contact. Once processed, eg by extrusion or injection moulding, the polymer is in solid form and immobile. Contact with the molten polymer is not expected due to the high temperatures involved. Therefore, due to its high molecular weight, low reactivity and low potential for exposure, the notified polymer is not likely to pose a significant occupational health hazard.

Talc is present in the notified polymer as a filler, at less than 2 %. There is a national exposure standard of 2.5 mg/m^3 for talc (inspirable dust) (NOHSC, 1995). The notifier has indicated that there is also an internal company exposure guideline of 0.5 mg/m^3 for respirable talc dust. The talc is bound within the polymer matrix and would not be expected to be a dust source under normal conditions of use. The polymer also contains a small proportion of hazardous residual monomer, which will normally be bound within the matrix and unavailable for exposure.

Public Health
While public contact with products manufactured using the notified polymer may be substantial, exposure will be insignificant. The high NAMW and negligible water solubility of the polymer will preclude passage across biological membranes, and hence systemic exposure in even extreme circumstances such as a child chewing on a large plastic toy, will lead to negligible systemic exposure.

The notified polymer contains small levels of residual hazardous monomer, well below the level where the notified polymer would be classified as hazardous. The preclusion of the use of the notified polymer for applications where it is in direct contact with food, or in applications where chewing on the product by small children is likely, is nonetheless appropriate as these applications may lead to some exposure to residual monomer.

Based on its physico-chemical properties and the proposed use pattern, the notified polymer is not considered to pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to INDEX Interpolymer the following guidelines and precautions should be observed:

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987); impermeable gloves or mittens should conform to AS 2161 (Standards Australia/ Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994);

- Spillage of the notified chemical should be avoided. Spillages should be swept up promptly and put into containers for disposal;

- Good personal hygiene should be practised to minimise the potential for ingestion;

- A copy of the MSDS should be easily accessible to employees.

If the conditions of use are varied from the notified use, greater exposure of the public may occur. In such circumstances, secondary notification may be required to assess the hazards to public health.

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* (NOHSC, 1994).

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 subsection 64(1) of the Act, secondary notification will be required if the polymer characteristics cease to satisfy the criteria under which it has been accepted as a Synthetic Polymer of Low Concern. Secondary notification of the notified polymer may be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

16. REFERENCES

American Conference of Government Industrial Hygienists (1998). TLVs and Other Occupational Exposure Values.

Bartha R, Yabannavar AV, Cole MA, and Hamilton JD (1997) Plastics. In Hamilton J.D and Sutcliffe R (eds): Ecological Assessment Of Polymers: Van Nostrand Reinhold.

Connell D. W. (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 (1994) 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(1999)]. Australian Government Publishing Service, Canberra.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Standards Association of Australia, Sydney.

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 (1994) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. 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.