File No SAPLC/1

October 2005

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Fusabond EP

This Self 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 the Environment and Heritage. The data supporting this assessment will be subject to audit by NICNAS.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at:

Library
Australian Safety and Compensation Council
25 Constitution Avenue
CANBERRA ACT 2600
AUSTRALIA

To arrange an appointment contact the Librarian on TEL + 61 2 6279 1162 or email ascc.library@dewr.gov.au

This Full Public Report is 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:	334 - 336 Illawarra Road MARRICKVILLE NSW 2204, 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

Fusabond EP

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
DuPont (Australia) Ltd (ABN: 59 000 716 469)
168 Walker Street
NORTH SYDNEY NSW 2060

NOTIFICATION CATEGORY
Self Assessment: Polymer of Low Concern

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication include the following or any inference of the following:
Chemical Name
Other Names
Molecular Formula
Structural Formula
CAS Number
Polymer Constituents
Use
Volume of import
Molecular weight
Quantity of finished product using notified chemical
Detailed technical function of notified chemical

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
USA, Canada, Korea

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Fusabond EP

MOLECULAR WEIGHT (MW)
Number Average Molecular Weight (Mn) >10,000

3. COMPOSITION

PLC CRITERIA JUSTIFICATION

Criterion	*Criterion met*
Molecular Weight Requirements	Yes
Functional Group Equivalent Weight (FGEW) Requirements	Yes
Low Charge Density	Yes
Approved Elements Only	Yes
Stable Under Normal Conditions of Use	Yes
Not Water Absorbing	Yes
Not a Hazard Substance or Dangerous Good	Yes

The notified polymer meets the PLC criteria.

4. INTRODUCTION AND USE INFORMATION

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

Fusabond EP and blends are resin modifiers and will be imported into Australia by FCL of poly lined 25 kg kraft paper bags or 500 kg boxes through the ports of Melbourne or Sydney. It will be transported as FCL and warehoused in a dangerous goods compliant warehouse for sale to resin compounding firms.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	<200	<300	<500	<500	<500

USE

Fusabond EP is a maleic anhydride grafted resins and can be used as coupling agents between polymers - mainly polyolefins such as polyethylene and polypropylene - and fillers, in order to increase the filler acceptability of polymers. Typical levels of Fusabond are in the range of 1-5 weight % based on the entire compound. Fillers that show an affinity to Fusabond maleic anhydride grafted resins include flame-retardant fillers, such as alumina trihydrate (ATH) and magnesium hydroxide ($Mg[OH]_2$). Improvement in properties also can be seen when Fusabond is used in combination with common fillers such as calcium carbonate. In finished parts Fusabond EP may be typically diluted between 20 times (to 5%) and 100 times (to 1%) by a parent polymer.

Addition of Fusabond modifiers typically improves the strength, flexibility Impact, thermal stability, flexibility, melt strength, filler adhesion, improved recycling, pigment or FR carrier levels at levels that do not negatively impact other physical properties.

5. PROCESS AND RELEASE INFORMATION

5.1. Operation Description

The notified polymer will be imported as Fusabond EP and used in manufacturing of locally compounded as property enhancing additive into resin blends for numerous industrial molding and extrusion applications requiring improved adhesive and filler acceptance properties. Fusabond EP may be blended into polyvinylchloride; acrylonitrile/butadiene/styrene terpolymers, polyethylene or polypropylene resins and enables additional filler content to be added.

The Fusabond EP and blends will be sold as imported packed in poly lined 25 kg kraft paper bags, or potentially 500 kg cardboard box on pallet depending on customers equipment and specification. Deliveries may be by the 25 kg bag, pallet (40 x 25 kg bags) or Poly lined bulk box (typically 500 kg).

Fusabond EP will be sold to either: a) resin compounding firms or b) end users manufacturing firms with two-stage compounding/final extrusion machines. The compounding of Fusabond EP uses highly similar

equipment to final end use and uses the most concentrated form of the polymer, representing the greatest risk to workers and the environment.

Fusabond EP should be stored in a humidity controlled, heated drying room or dehumidifying dryer for a minimum of 24 hours at 50ºC to ensure moisture does not affect molding quality. Once dried the resin is loaded into the drying hopper either manually or by suction where the Fusabond EP resides until gravity fed into the compounding machines pre-heating chamber at a ratio of 1: >15 with a metered amount of base resin (non hazardous). It is then screw fed into the heating chamber immediately prior to the mixing chamber where both polymers are melted and physically mixed to form an even blend before being extruded and chopped, pelleted and bagged as a proprietary resin blends for use by injection and extrusion moulders.

6. EXPOSURE INFORMATION

6.1. Summary of Occupational Exposure

Fusabond EP as supplied by DuPont in the form of polymer beads are considered Not Hazardous according to the criteria of NOHSC. Skin contact will be the primary route of potential exposure resulting in mechanical abrasion.

Compounding Fusabond EP requires heating the resin and molding machine above 90-140ºC; care should be taken to protect the hands and other exposed parts of the body when handling molten polymer or recently molded parts.

Transport and warehouse workers may come into dermal and ocular contact with the notified polymer through accidental breakage of the poly lined, kraft paper bag. The solid clear to translucent white to straw yellow pellets of Fusabond EP provide a potential slipping hazard and in limited circumstances may cause physical abrasion when the inert pellets touch the skin or eyes.

Workers will use mechanical assistance or vacuum transport to transfer the polymer pellets from the suppliers bag or box to the molding devices drying/holding hopper set at minimum of 50ºC with a recommended residence time of 24 hours to ensure elimination of atmospheric moisture. The product is fed into the automatic moulding machine. An exhaust/filter system situated to above the machine inlet and outlet to capture any off gassing created by a small amount (> 0.1%) of polymer naturally degrading in the molding equipment prior to extrusion. Workers operating molding equipment should wear heat resistant gloves, eye protection and heat resistant industrial clothing. The high pressures and temperature (90-140ºC) at which the molding equipment operates requires caution by operators and maintenance staff to prevent injury from hot polymer or hot parts before they cool.

Workers following the MSDS recommendations for PPE will be protected from any hazards from hot polymer or the associated molding machinery.

6.2. Summary of Public Exposure

The notified polymer is intended for use as a polymer modifier used in small portions and blended molding resin. Fusabond EP will only be available to the general public in its final molded form.
In finished parts Fusabond EP has been diluted between 20 and 100 times by a parent polymer. The majority of parts and articles using Fusabond EP will be engineering parts with little or no contact with the users skin. The blending of Fusabond EP with other water insoluble polymers results in molecules of the two species being entangled and will be effectively and unavailable to become water soluble and cause systemic toxicity.

6.3. Summary of Environmental Exposure

6.3.1. Environmental Release

Manufacturing of Polymer Compound for Extrusion or Molding:

The manufacture polymer compound requires the mixing of a base resin with the Fusabond EP resin modifier producing a diluted blend of Fusabond EP in a base resin. The blended resin compound has new and desired physical properties. In the blending process there is potential for small releases of Fusabond EP due to residual Fusabond and base resin in the extruder used to create the mixed blend. Typically the waste polymer for disposal will be the 1-2 kg charge in the extruder required to “flush out” any residual polymers left by the previous use of the extruder.

The expected release to the environment will be:

- ➞ Initial 2 kg purge to start-up the compounding extrusion process.
- ➞ 2 kg purge to changeover the extruder to new polymer at the end of run. Both purges will contain only 5% Fusabond modifier. Estimating Fusabond purge waste = 25 kg per annum.
- ➞ Any substandard or defective molding will be recycled therefore almost zero release
- ➞ Residual pellets in the bag or box used to supply the Fusabond EP resin. A worst case would have waste in packaging = 100 kg
- ➞ In a worst case scenario where the polymer is not recycled (as recommended) with significant residuals in packaging the total release to the environment to be land filled as refuse is 25 kg + 100 kg = 125 kg per annum. Good housekeeping and recycling this waste maybe < 10 kg per annum.
- ➞ The above volume may be disposed as an extender into low quality PVC, polyethylene, or polypropylene molding depending on the type of resin into which the Fusabond EP was blended.

Manufacturing of moulded industrial or articles:

During manufacture by compounding, extrusion or injection molding, there is potential for small releases through sprue waste. The polymer of the sprue is cut or broken from the moulded article and ground down into pellets to be recycled. Typically the waste polymer for disposal will be the 2 kg charge in the extruder required to "flush out" any residual polymers.

The model is identical to the above and expected release to the environment will be:

- ➞ 2 Kg purge to changeover the extruder to new polymer at the end of run provides
- ➞ Any substandard or defective molding will be recycled therefore zero release
- ➞ Residual pellets in the bag or box used to supply the resins with additive of Fusabond EP resin would be 100 kg Fusabond EP.
- ➞ In a worst case scenario where the polymer is not recycled (as recommended) the total release to the environment to be land filled as refuse is estimated at 125 kg per annum. With recycling the total polymer land filled may be as low as < 10 kg per annum.
- ➞ The above volume may be disposed as an extender into low quality PVC, polyethylene, or polypropylene molding.

.

Adding total losses in polymer compound manufacture and molding the loss to the environment will be between < 10 kg and 250 kg per annum based on maximum usage figures.

6.3.2. Environmental Fate

Solubility is critical to creating systematic toxicity to the aquatic environment. The polymer is not water soluble as a 100% polymer and would be significantly more constrained in a blend. If released to water, the polymer would partition to sediments attaching to sediments or the organic fraction of soil. The high molecular weight and insolubility underpin a predicted low potential for bioaccumulation.

The dispersed use pattern combined with the volume lost to the environment will be exceedingly low. The notified polymer contains no hydrolysable groups in the environmental pH range. In landfill, solid wastes containing the polymer will be immobile and will not be expected to leach into the aquatic compartment, but should slowly degrade by biotic and abiotic processes and become associated with the soil matrix.

7. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20ºC and 101.3 kPa	Translucent pellets.
Melting Point/Glass Transition Temp	90 - 100°C
Density	0.93 - 0.94g/cm3
Water Solubility	1 ± 1.6 mg/L at 20ºC (negligible water solubility).
Dissociation Constant	The polymer is expected to be anionic throughout the environmental pH range.
Particle Size	Not applicable as not particulate
Reactivity	Not an oxidiser. Not expected to be reactive under normal environmental conditions.
Degradation Products	At recommended processing temperatures, small amounts of fumes may evolve from the resins. When resins are

overheated, more extensive decomposition may occur. Adequate ventilation should be provided to remove the fumes from the work area.

CO and CO_2 are typically released when Fusabond EP compound is burnt. Typically Fusabond does not degrade until the temperature is considerably greater than 180°C.

8. HUMAN HEALTH IMPLICATIONS

8.1. Toxicology

No toxicological data was submitted.

8.2. Human Health Hazard Assessment

The notified polymer meets the criteria for a PLC and can therefore be considered to be of low hazard. The Fusabond EP polymers inherent insolubility in use and molecular size prevent the polymer creating systematic toxicity to humans by the skin. The same properties prevent absorption through the gastrointestinal tract.

9. ENVIRONMENTAL HAZARDS

9.1. Ecotoxicology

No ecotoxicological data were submitted. The polymer contains no functional groups that are known to be ecotoxic. Based on the negligible solubility the polymer there is no mechanism to become ecotoxic and offer a low ecological hazard.

9.2. Environmental Hazard Assessment

Poly non-ionic polymers of MW >> 1000 are of low concern to the aquatic environment. The insolubility the notified polymers in the environmental pH range mean that it will not be readily released into the aquatic environment and will not be available to be transported across cellular boundaries.

The environmental risk presented by the notified polymer is expected to be low, based on the low hazard and aquatic exposure.

10. RISK ASSESSMENT

10.1. Environment

The majority of the notified polymer will be incorporated into the internal parts of a molded object and hence will be mostly unavailable for exposure to the environment. Wastes generated during article manufacture are expected to be minimal. Estimated at a maximum of 0.08 tones per annum, mostly as a compounded resin. Waste from molding will be preferably disposed of by recycling or alternately by landfill in a dispersed manner as a solid insoluble polymer form thereby minimising the environmental risk. Waste containing the notified polymer may also be disposed by incineration to recover fuel value.

At end of life the used polymer will be typically disposed to landfill where it will slowly degrade and become associated with the soil matrix. All degradation products are expected to be relatively inert and non-ecotoxic. The polymer is unlikely to be available to produce a risk of ecotoxicity and if released has functional groups that are considered low risk.

The environmental risk posed by use of the notified polymer is expected to be low, based on the low hazard and aquatic exposure.

10.2. Occupational Health and Safety

The OHS risk presented by the notified polymer is expected to be low, based on low hazard of polymer meeting the definition of PLC due to high MW and low solubility combined with low opportunity for exposure, engineering controls and personal protective equipment used by workers.

10.3. Public Health

The general public will use the articles manufactured using Fusabond EP as a resin modifier blended with insoluble polymers. The expected properties of the polymer conform to the definition of a PLC with High Molecular weight inhibiting crossing of cellular boundaries, no reactive groups, and very low solubility. These properties do not present an unreasonable risk to human health.

11. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

11.1. Environmental Risk Assessment

The polymer is not considered to pose a risk to the environment based on its reported use pattern.

11.2. Human Health Risk Assessment

11.2.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

11.2.2. Public health

There is Negligible Concern to public health when used in the proposed manner.

12. MATERIAL SAFETY DATA SHEET

12.1. Material Safety Data Sheet

The notifier has provided MSDS in accordance with the schedule item B 12 of the *ICNA Act*. The accuracy of the information on the MSDS remains the responsibility of the applicant.

13. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- No specific engineering controls, work practices or personal protective equipment are required for the safe use of the notified polymer itself, however, these should be selected on the basis of all ingredients and high temperature processes in the manufacture thermoplastic extrusion and molding.
- Extrusion/injection molding equipment should have extractor fans off take cowls positioned over the machine inlets and output heads as small amounts of thermally degraded polymer form hot gases that should be exhausted from the building.

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

- Personal protective equipment required during extruder operation are:
  - Eye protection (safety glasses or goggles) used according to AS/NZS 1336 (1997) and manufactured to performance AS/NZS 1337 (1992)
  - Impermeable gloves conforming to AS/NZS 2161 (2000)
  - Industrial clothing AS 2919 (1987) and footwear conforming to AS/NZS 2210 (1994)
  - Breathing protection when working above a hot extruder ie maintenance according to AS/NZS 1715 (1994) and manufactured to performance AS/NZS 1716 (2003).
- A copy of the MSDS should be easily accessible to employees.

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

Environment

- The following control measures should be implemented by the molder/manufacturer to minimise environmental exposure during product manufacture using the notified chemical:
  - Undertake work in designated areas only
  - Collect all wastes and recycle where possible, otherwise contain in open drums and allow material to be recycled, burnt or dispose of to landfill.

- The following control measures should be implemented by end users to minimise environmental exposure during use of the notified polymer:
  - Exhaust ventilation of all drying hoppers and molding machines
  - Do not empty polymer waste into general refuse
  - Ensure no residual pellets remain in packaging before disposal.

Disposal

- Spill clean-up with broom or vacuum
- Disposal of scrap presents no special problems and can be by incorporation with polyethylene waste for low quality molding, use as molding machine purge, landfill as a non hazardous waste or incineration in a properly operated incinerator. Disposal to landfill should comply with local, state, and federal regulations using only approved waste management contractors.

Emergency procedures

- Spills/release of the notified polymer should be swept into a pile and shovelled into suitable container for disposal. Large volumes of spilt paint require dyking.
- Do not allow spills to enter watercourses or drains.
- Organize emergency training on an annual basis.

13.1. Secondary Notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under subsection 64(1) of the Act; if
  - the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

or

(2) Under subsection 64(2) of the Act:
  - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.