

File No: PLC/122

November 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**RC 3642**

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*Facsimile:* (61) (02) 9577 9465

Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT****RC 3642****1. APPLICANT**

Du Pont (Australia) Ltd of 49-59 Newton Road WETHERILL PARK NSW 2164 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for RC 3642.

**2. IDENTITY OF THE CHEMICAL**

The chemical name, CAS number, molecular and structural formulae, molecular weight, low molecular weight species, spectral data, details of the polymer composition and maximum residual levels, and import volumes have been exempted from publication in the Full Public Report.

**Marketing Name:** RC 3642 (containing 86.5% of the notified polymer RC 3642)

**Characterisation as a Synthetic Polymer of Low Concern (PLC)**

The polymer has a NAMW < 1 000. All monomers except one are on the proposed list of allowable reactants for polyesters as PLC. The exception is the anhydrous form of a listed reactant. The notified polymer was accepted as a PLC on the understanding that no pendant anhydride groups were present in the polymer.

**Polymer Stability** Highly stable under normal conditions. Decomposition will occur at temperature in excess of 250°C.

**Reactive Functional Groups:** Polymer contains hydroxyl groups; hydroxyl groups are of low concern and not considered to be reactive under normal environmental conditions.

**Charge Density** No potentially cationic groups

### 3. PHYSICAL AND CHEMICAL PROPERTIES

The polymer solution is a mixture of RC 3642 and the solvents methyl ethyl ketone and toluene. Where indicated, the properties below relate to the polymer solution.

<b>Appearance at 20°C and 101.3 kPa:</b>	Clear viscous solution
<b>Melting Point:</b>	Not determined
<b>Density:</b>	1.05±0.05 g/cm <sup>3</sup> (estimate)
<b>Particle Size</b>	Not applicable for a resin solution
<b>Water Solubility</b>	Expected to be negligible
<b>Flammability Limits:</b>	Upper Explosive Limit = 11.5% (polymer solution) Lower Explosive Limit = 1.2% (polymer solution) Polymer is a combustible solid
<b>Autoignition Temperature:</b>	> 403°C (polymer solution) 340°C (product)
<b>Explosive Properties:</b>	Polymer not expected to be explosive
<b>Flash Point:</b>	23°C (product)

#### Comments on Physico-Chemical Properties

The polymer is never isolated and the data provided are for RC 3642, as an 86.5% solution of the polymer in methyl ethyl ketone and toluene. The notifier did not determine either the boiling point or vapour pressure of the notified polymer. However, the notifier stated that the polymer RC 3642 is highly stable under normal conditions, with decomposition commencing at temperatures in excess of 250°C. It is noted that the vapour pressure of the polymer is expected to be very low. However, the vapour pressure of the polymer solution would be expected to be that of the solvent mixture.

The notifier did not determine the water solubility of the notified polymer. The notifier indicates that the notified chemical is expected to be of low solubility due to its high molecular weight and hydrophobic character. The water solubility of the notified chemical is expected to be less than 1 mg/L.

The polymer contains ester linkages that may undergo hydrolysis under extreme pH. However, due to the expected low water solubility, hydrolysis is unlikely in the environmental pH range of between 4 and 9.

The notifier did not determine the partition coefficient and adsorption/desorption of the notified polymer. This is acceptable as the notified polymer is expected to be of low water solubility and to largely partition into *n*-octanol rather than water. Based on low water solubility, the polymer is expected to become associated with the organic component of soil and sediments.

It is noted that the polymer has no functional groups that are likely to dissociate. The small percentage of carboxylic acid functional groups present in the notified polymer may dissociate, exhibiting typical acidity.

#### 4. PURITY OF THE CHEMICAL

**Purity:** > 86.5%

**Hazardous Impurities:** Three of the four residual monomers are on the NOHSC List of Designated Hazardous Substances (NOHSC, 1999a). Levels of residual monomers are below 0.1%, and below the relevant concentration cut-off levels as hazardous substances.

**Additives/Adjuvants:** None

The notified polymer is imported at a concentration of 3.61% in an automotive paint formulation. The Material Safety Data Sheets (MSDS) for the notified polymer and the product contain the following solvents. All of these solvents except ethyl acetate and *n*-butyl acetate are included on the *List of Designated Hazardous Substances* (NOHSC, 1999a), and, where available, the national exposure standard is given (NOHSC, 1995).

<i>Chemical name:</i>	xylene (mixed isomers)
<i>CAS No.:</i>	1330-20-7
<i>Weight percentage:</i>	up to 30 % in polymer formulation
<i>Regulatory Controls:</i>	national exposure standard 80 ppm TWA, 150 ppm STEL
<i>Toxic properties:</i>	R20/21 Harmful by inhalation and in contact with skin R38 Irritating to skin

<i>Chemical name:</i>	<i>n</i> -butyl acetate
<i>Weight percentage:</i>	up to 25 % in polymer resin solution
<i>CAS No.:</i>	123-86-4
<i>Regulatory Controls:</i>	national exposure standard 150 ppm TWA, 200 ppm STEL
<i>Toxic properties:</i>	eye and mucous membrane irritant (American Conference of Government Industrial Hygienists, 1998)

<i>Chemical name:</i>	n-butanol
<i>Synonyms:</i>	n-butyl alcohol
<i>CAS No.:</i>	71-36-3
<i>Weight percentage:</i>	up to 5 % in polymer formulation
<i>Regulatory Controls:</i>	there is a national exposure standard for trimethylbenzenes of 50 ppm TWA
<i>Toxic properties:</i>	R20 harmful by inhalation
<i>Chemical name:</i>	methyl ethyl ketone
<i>CAS No.:</i>	78-93-3
<i>Weight percentage:</i>	up to 5 % in polymer resin solution
<i>Regulatory Controls:</i>	national exposure standard 150 ppm TWA, 300 ppm STEL
<i>Toxic properties:</i>	R36/37 irritating to eyes and respiratory system
<i>Chemical name:</i>	toluene
<i>CAS No.:</i>	108-88-3
<i>Weight percentage:</i>	up to 10 % in polymer resin solution
<i>Regulatory Controls:</i>	national exposure standard 100 ppm TWA, 150 ppm STEL
<i>Toxic properties:</i>	R20 harmful by inhalation

## 5. USE, VOLUME AND FORMULATION

The notified polymer is intended for use as a binder resin in automotive paints. It will not be manufactured or reformulated in Australia but will be imported as an ingredient in an automobile paint formulation (containing approximately 3.61% of the notified polymer in a mixture of solvents). The maximum annual import volume is 1 000 kg in the first 5 years. Initially the paint is expected to be used by the heavy vehicle industry.

## 6. OCCUPATIONAL EXPOSURE

The notifier indicates that end use exposure would be consistent across the automotive spray painting industry. The notified polymer will be imported in 0.95 L or 3.78 L Dangerous Goods approved cans. The product is stored in a Dangerous Goods approved warehouse and transported in small lots to the customer facility. Individual product containers are not opened before arrival at the end use site and use by licensed spray painters.

At the customer facility, the spray painter will measure the appropriate amounts of the different components required in a particular formulation into an open container and pour this

mixture into a spray gun. The notifier states that weighing is carried out in a well ventilated area and operators will wear gloves and eye protection. The spray paint will contain 3.61 to 2.6% notified polymer.

The spraying of the automobile will be carried out in a laminar flow downdraft spray booth which is designed to rapidly remove aerosol particles and solvent vapour from the atmosphere. Several possible booth designs may be used. In a dry floor booth, the overspray will be collected in filters contained in the floor of the booth; any unremoved particulates will reach the exhaust stack with the solvent vapours. In a wet floor booth, overspray will collect in a pool of water below the grill floor or in a wet scrubber in the exhaust and will be removed with a filter. The residual solids will be disposed of to secure landfill. The spray booths are subject to AS/NZS/4114.1:1995 *Spray Painting Booths – Design, Construction and Testing* and AS/NZS/4114.1:1995 *Spray Painting Booths – Selection, Installation and Maintenance*. Spray painters will wear personal protective equipment at all times; faceshield, gloves and overalls and a supplied air respirator.

Residual paint mixture will be washed from the equipment manually, using recycled paint solvent, and the washings will be disposed of by solvent recyclers. The cleaning area has exhaust ventilation and workers will wear gloves and protective eye wear.

Once residual final paint mixture has dried, the notified polymer will be irreversibly bound within the cured matrix and not separately available for either exposure to workers, or for dermal absorption.

## **7. PUBLIC EXPOSURE**

Automotive paints containing the notified polymer will be sold only to licensed professional spray painters and will not be available to the general public. The potential for public exposure to the notified polymer during transport and coating operations or from disposal is assessed as negligible. Although members of the public will make dermal contact with automobiles coated with products containing the notified polymer, exposure will be negligible because of the cured state of the notified polymer in the coatings.

## **8. ENVIRONMENTAL EXPOSURE**

### **Release**

There is potential for release of the notified polymer during the paint formulation and the paint application. The paint is applied to automotive surfaces with approximately 50-80% efficiency in spray booths with control measures, such as a filtering system and masking materials, in place. Cleaning of the spray gun and mixing equipment will generate waste that will be collected and disposed of in the same manner as wastewater from the spray booth.

During coating application it is expected that up to 500 kg per year of notified polymer waste will be produced by year 5.

Five percent of container contents are estimated to remain in the 'empty' containers after use. This equates to 50 kg of the notified polymer per year by year 5.

A further 50 kg per year of the notified polymer by year 5 will remain as residues in spray equipment.

### **Fate**

Once applied to the metal panels of heavy vehicles the notified polymer will be incorporated in a hard, durable, inert film and will not present a significant hazard. Any fragments, chips and flakes of the lacquer will be of little concern as they are expected to be inert. At the end of their useful life, the polymer coated metal panels are likely to be either recycled for steel reclamation or placed into landfill. During steel reclamation, the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon.

The solid waste generated in the formulation and application of the coating will be disposed of to landfill, or incinerated. The sprayed paint will be catalysed with an isocyanate activator. Therefore, all overspray will become crosslinked and become totally insoluble due to high molecular weight. Leaching of the crosslinked notified polymer from landfill sites is unlikely, given the expected low solubility of the substance and very high molecular weight. Under these conditions the notified polymer waste would be slowly degraded to carbon dioxide through abiotic and bacteriological processes.

Mixing equipment and spray equipment will be washed with solvent that is collected and sent to solvent recycling. The resulting dried solid residues will be also disposed of to landfill.

The notified polymer is not expected to cross biological membranes, due to the expected low solubility, high molecular weight and strong adsorption to soil. Chemicals with these characteristics are not expected to bioaccumulate (Connell, 1989).

## **9. EVALUATION OF TOXICOLOGICAL DATA**

No toxicology data were submitted.

## **10. ASSESSMENT OF ENVIRONMENTAL EFFECTS**

No ecotoxicology data were submitted. This is acceptable because the polyester has NAMW < 1000 and there is minimal release to water.

## **11. ASSESSMENT OF ENVIRONMENTAL HAZARD**

The notified polymer cross-links with other paint components to form a very high molecular weight and stable film that adheres firmly to the primer layer to which it is applied. The

notified polymer is part of this surface coating and share the fate of the vehicle panel. The paint will slowly deteriorate under the action of UV light, but deterioration is expected to be negligible over the life of the heavy vehicle surface. When the vehicle panel is recycled, the notified polymer would be destroyed through incineration.

The notifier has put forward a concise account of the life cycle of the notified polymer from importation to end-use as an automotive binder resin. No repackaging of the notified polymer will occur and it will only be supplied to licensed professional spray painters who will prepare the end use formulation with pigments and activator on site directly prior to use. Paint residues and overspray will be collected and disposed of to landfill. Equipment washings will be mixed with solvent and sent for solvent recycling. Solid residues will be disposed of to landfill. The paint film will contain the notified polymer as part of a crosslinked matrix. The final fate of the notified polymer be the same as the final fate of the vehicle. That is either sent to landfill or for recycling where the polymer will be incinerated to produce water vapour and oxides of carbon.

In the event of accidental spillage of the polymer solution into waterways, the polymer is not expected to disperse into the water, but settle out onto sediments. If the polymer is spilt on land, either during usage or transport, it is expected to become immobilised in the soil layer. Contaminated soil can then be collected and disposed of to landfill. The small container sizes would also limit any hazard in the event of a spill.

Given the above, environmental exposure and the overall environmental hazard is expected to be low.

## **12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS**

No toxicological data on the notified polymer was submitted. The residual hazardous monomers are well below the cut-off concentrations for hazardous substances. Based on the high molecular weight of the notified polymer and its chemical structure, it is unlikely to be classified as a hazardous substance according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999b). During end use, the notified polymer will crosslink by reaction with isocyanate hardener. In the cured state on automobiles, the notified polymer or its impurities are not likely to pose a toxicological hazard.

Both solvents methyl ethyl ketone and toluene listed on the MSDS for the notified chemical are on the NOHSC *List of Designated Hazardous Substances* (NOHSC, 1999a) but are present below the hazardous substances cut off concentration. Both have a NOHSC exposure standard, that is included in the MSDS.

According to the MSDS provided for the imported product AD 144 Centari 1K Binder containing 3.61% of notified polymer, the product will produce adverse health effects, such as mucous membrane and respiratory irritation, adverse effects on kidney, liver and central nervous system. Symptoms and signs may include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness. These effects are



expected to relate mainly to the solvents N-butyl acetate, ethyl acetate, N-butanol and xylene, rather than the notified polymer.

#### *Occupational Health and Safety*

There would be no occupational exposure to the notified polymer in the transport and storage of the imported product unless the packaging were breached. The greatest exposure is in the use and disposal of the paints. The spray painters who will be exposed to the notified chemical will be fully TAFE trained.

The final paint mix containing the notified polymer at 3.61 to 2.6%, could contain a wide variety of additional ingredients. This is likely to introduce human health hazards because, apart from a range of potentially toxic solvents, there may be components containing resins with pendant isocyanate groups. The spraying procedure also produces a dense aerosol of paint particles which would adversely affect human health even in the absence of additional hazardous components. It is also probable that professionals involved in the spray painting industry will use a number of different paint formulations.

For these reasons, the notified polymer must be assessed for the contribution it makes to the hazards associated with use of the spray paints. The presence of many potential and actual hazardous substances in the formulation requires the use of stringent engineering controls, such as a correctly constructed and maintained spray booth, and a high level of personal protective equipment, such as impermeable overalls, gloves, full face shield or goggles during mixing and cleaning. A respirator should be used during spraying operation. The use of the paint containing the notified polymer should be in accordance with the NOHSC *Draft National Code of Practice for Spray Painting* (National Occupational Health and Safety Commission, 1991). The level of protection from exposure afforded by the standard protective measures will provide adequate protection from the notified polymer, which is likely to be less intrinsically toxic than most of the solvents, pigments and other paint resins.

Once the applied final paint mix has hardened, the polymer will not be separately available for exposure or absorption.

There are NOHSC exposure standards for n-butyl acetate, n-butanol, ethyl acetate and xylene, identified as ingredients in the pre-prepared paint AD 144 Centari 1K Binder (National Occupational Health and Safety Commission, 1995). The employer is responsible for ensuring that these exposure standards, and exposure standards pertaining to other final paint mix additives, are not exceeded in the workplace.

The paint components containing the notified polymer are flammable due to their solvent content. Precautions must be taken to avoid sources of ignition, e.g. use of earthing leads. Operators should wear antistatic overalls and footwear.

Similar considerations apply in the disposal of the polymer. The wastes containing the notified polymer may be hazardous substances on the basis of the solvent and other resin content, and the precautions used on the basis of these additional materials should be adequate for protection from the notified polymer. In addition, much of the polymer will be crosslinked, hardened and immobilised by the time of disposal.

### *Public Health*

The notified polymer, RC 3642, will be used only in automobile coatings. Although members of the public will make dermal contact with automobiles coated with products containing the notified polymer, exposure will be negligible because of the cured state of the notified polymer in the coatings, from which the notified polymer is not likely to be bioavailable. Based on this information and the polymer's expected low toxicity, it is considered that the notified polymer will not pose a significant hazard to public health when used in the proposed manner.

### **13. RECOMMENDATIONS**

To minimise occupational exposure to RC 3642 the following guidelines and precautions should be observed:

- Handling the paint containing the notified polymer should be in accordance with the NOHSC *Draft National Code of Practice for Spray Painting* (National Occupational Health and Safety Commission, 1991) including the use of safety goggles, respirator, industrial clothing, impermeable gloves or mittens and occupational footwear;
- Employers should ensure that NOHSC exposure standards for all of the components of the final paint mix are not exceeded in the workplace;
- 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;
- A copy of the MSDS should be easily accessible to employees.

If the conditions of use are varied from the notified use (as a coating for automobile bodies), greater exposure of the public may occur. In such circumstances, further information may be needed to assess the risk to public health.

### **14. MATERIAL SAFETY DATA SHEET**

The MSDS for AD 144 Centari 1K Binder Binder and RC 3642 were provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994).

These MSDS were provided by the applicant as part of the notification statement. They are 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 may be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.



## 16. REFERENCES

Connell DW (1989) General characteristics of organic compounds which exhibit bioaccumulation. *Bioaccumulation of Xenobiotic Compounds*. CRC Press, Boca Raton, USA.

National Occupational Health and Safety Commission (1991) Draft National Code of Practice for Spray Painting. Canberra, Australian Government Publishing Service.

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

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