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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in RP2847

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Polymer in RP2847

1. APPLICANT

Akzo Nobel Pty Limited of 51 McIntyre Road SUNSHINE VIC 3020 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Polymer in RP2847.

2. IDENTITY OF THE CHEMICAL

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

Marketing Name:	RP2847 Adcote 1140 RO2847

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	>1 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	0.1%
Molecular Weight < 1 000:	0.1%
Residual Monomer/Reactants:	All <1%
Reactive Functional Groups:	The polymer contains no reactive functional groups.
Charge Density	Polymer contains no charged groups.
Method of Detection and Determination:	Infrared Spectroscopy (IR) and Gel Permeation Chromatography (GPC)

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 polymer is imported in solution as a drab olive liquid at 40% (w/w) in methyl ethyl ketone (MEK). The properties listed below are those of the polymer.

Appearance at 20°C and 101.3 kPa:	Solid resin
Melting Point:	78°C
Density:	1.22 g/cm³
Vapour Pressure:	Not volatile
Water Solubility:	<1.0 mg/L at 25°C
Particle Size:	<70μm (see comments below)
Reactivity:	Polymer is not designed to be reactive under normal conditions of use.
Polymer Stability	Stable under normal environmental conditions.

Comments on Physico-Chemical Properties

Water solubility was not determined. The notifier estimates that the notified polymer has low water solubility based on the characteristics of similar polymers. Also, the polymer has been designed with a hydrophobic structure. Thus, the polymer is not expected to have significant water solubility.

In the context of this assessment, the particle size distribution of the notified chemical is not important as the polymer is imported in solution

The notifier claims that the polymer is chemically and environmentally inert, as a constituent of industrial coatings. While the notified substance contains ester linkages which are inherently susceptible to hydrolytic cleavage, it is noted that:

1. The polymer contains no charged groups and functionality capable of being readily ionised;

2. The polymer is hydrophobic and the ester groups are not expected to hydrolyse under normal environmental conditions due to the expected low solubility in water.

Once the polymer is applied to the metal substrate it is cured within the resin matrix of the paint film rendering it effectively inert. This will preclude contact between any potentially reactive functionality of the polymer with water or other reactants in the environment. Hence the possibility for either hydrolysis in the environmental pH range (4-9) or other reactions would be extremely small.

4. PURITY OF THE CHEMICAL

Degree of Purity:	high
Maximum Content of Residual Monomers:	<1.0%
Hazardous Impurities:	None known
Non-hazardous Impurities (> 1% by weight):	None known
Additives/Adjuvants:	None

5. USE, VOLUME AND FORMULATION

The notified polymer will be imported as a 40% (w/w) solution in MEK. The polymer solution will be blended with other additives to form paint products containing 2.0 % (w/v) notified polymer.

The notified polymer will be used as an adhesion-promoting additive in heat cured coil coatings.

The import volume for the notified polymer is 1.2 tonnes/year (3 tonnes/year polymer solution) for the next five years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported in 200L sealed drums as a 40% (w/w) solution in MEK. Following importation, the polymer solution is transported to the notifer's site where it is stored in a bunded area prior to subsequent reformulation into paint products. The paint products contain 2% notified polymer. Storage and transport workers are unlikely to be exposed to the notified polymer unless the packaging is breached.

Formulation

The following table describes the categories of workers with potential exposure to the notified polymer and the maximum exposure during paint formulation:

Categories of workers	Number of workers	Maximum exposure
Paint Plant Operator	20	12hours/day; 8 days/month
Maintenance Personnel	2	8 hours/day; 2 days/month
Lab Technician	4	12hours/day; 4 days/month
Development	10	Not provided

At the notifier's site, paint plant operators will add the notified polymer and other additives to a mixing vessel to produce paint products. Depending on the drum size, the ingredients can be added directly into the mixer via a pipeline, by vacuum pump to a closed vacuum vessel, or poured directly through an inspection or loading port on the mixing vessel.

Paint plant operators will also collect laboratory samples during paint manufacture. Samples are collected through the inspection ports and transferred to the laboratory in sealed containers for quality control testing by laboratory technicians.

Finally, the operators drum off the formulated paint product in 200L drums through a closed filtering system. Filled drums are warehoused for distribution to customers for coating applications.

Paint plant operators may experience dermal, inhalation and eye exposure to the polymer solution when manually adding ingredients into the mixing vessel. Dermal exposure may also occur when collecting samples for laboratory testing and drumming off formulated paint products. The notifier stated that local exhaust ventilation is provided in the paint manufacture to remove solvent fumes. The notifier indicated that paint operators would wear personal protective equipment such as gloves, goggles, overalls and, if necessary, a respirator.

Maintenance personnel are responsible for emergency and routine maintenance on vessels, pumps, pipelines and valves. Worker exposure to drips and spills may occur while connecting and disconnecting pumps and during routine maintenance of equipment. The notifier stated that personal protective equipment would be worn.

Laboratory technicians may have intermittent dermal exposure to the notified polymer when conducting laboratory tests. Similarly, research and development (R&D) personnel may be intermittently exposed to small quantities of the notified polymer while conducting product development testing. Laboratory and R&D workers would be expected to wear standard laboratory equipment comprising laboratory coat and safety glasses.

Paint Application

The following table describes the categories of workers with potential exposure to the notified polymer and the maximum exposure during paint application:

Categories of workers	Number of workers	Maximum exposure
Forklift Drivers	6	1 hr/day; 26 days/year
Coating Operators	12	8 hrs/day; 26 days/year

At the customer's site, the paint product will be stored in a bunded area. Coating operators may thin the paint product using an air stirrer before application. Solvent is added until the desired viscosity is achieved. After mixing, the paint product is pumped into a paint tray and applied by roller coating to a continuous coil of flat strip. The application process is controlled from a panel removed from the application site, which results in no splashing or oversprays. Once coating is finished, the coated article is baked in a fully enclosed forced air oven.

Coating operators may experience dermal, ocular and inhalation exposure to the polymer solution during thinning and application of the paint product. During these activities, workers will wear personal protective equipment such as gloves, goggles, overalls and if necessary, a respirator. Local exhaust ventilation is used during set-up, application and baking of the paint system. The coating room is also equipped with fume extraction system.

Once the coated article is baked, the polymer is cured and not separately available for exposure or absorption.

7. PUBLIC EXPOSURE

There is low potential for public exposure to the notified polymer during reformulation, storage, transport or disposal. The notified polymer will be a component of paint products, which will be used only for industrial applications. Heat curing the paint film containing the notified polymer will make it inert. In this form, the notified polymer is not expected to leach from the coated external coils.

8. ENVIRONMENTAL EXPOSURE

Release

The notifier estimates that 4.4 % (52.8 kg annually) of the notified polymer is lost during reformulation at the notifier's site. This consists of:

a) residue on filters and cleaning materials which are discarded to landfill (6 kg per annum);

b) wash solvent residues which are reclaimed in the on-site solvent recovery unit and subsequently discarded to landfill (6 kg per annum);

c) drum residues which are disposed of by licensed drum recyclers (36 kg per annum); and

d) test samples, which are highly diluted and reclaimed in the on-site solvent recovery unit, or disposed of via authorised waste disposals (4.8 kg per annum).

Under normal conditions, the polymer or the paint formulation containing the polymer are not expected to be released to the environment during storage and transportation. The Material Safety Data Sheet (MSDS) contains adequate instructions for handling and disposal of the notified polymer in case of accidental spill.

Fate

Spills and washings obtained from cleaning of equipment at the formulation plant are collected and removed by a licensed waste disposal company and discarded to landfill. The 200L drums containing approximately 1% notified polymer as residue are also sent to a licensed waste disposal company and are not recycled.

In the case of accidental spill where uncured paint product containing the new polymer is released, the notified polymer is expected to associate with the organic component of soils and sediments and become assimilated into these materials, because of its predominantly hydrophobic nature. Biological membranes are not permeable to polymers of very large molecular size and as such, bioaccumulation of the notified polymer would not be expected if quantities of the uncured polymer were to be released into the water compartment.

Any of the notified polymer that is released to the sewer would be entrained within particles and flakes of the insoluble cured polymer matrix (paint), and is expected to become associated with the sewer plant sludge. This could be either deposited into landfill or be incinerated.

Once applied to the surfaces of the coils, the notified polymer will be incorporated in a hardened paint matrix and bound to those surfaces. Any fragments, chips and flakes of the dried paint will be of little concern as they are expected to be inert. The coils coated with the polymer are likely to be either recycled for steel reclamation or be placed into landfill at the end of their useful life. During steel reclamation, the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon. When deposited into landfill the organic components of the cured paint including the new polymer would be inert and immobile, but could nevertheless be expected to be very slowly degraded through the biological and abiotic processes operative in these facilities.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted for the notified polymer.

The MSDS for the notified polymer in solvent MEK documents anticipated health effects which are attributed to the solvent. The health effects resulting from exposure to the polymer solution include shortness of breath, confusion, visual disturbances, drowsiness, central nervous system effects (dizziness, nausea, headache and sleepiness) and unconsciousness by all routes of exposure, corneal injury or damage, skin irritation or allergic contact dermatitis, nose and throat irritation, gastrointestinal irritation, vomiting and abdominal pain.

The following animal toxicity data on MEK have been reported in the Registry of Toxic

Effects of Chemical Substances (RTECS) (Micromedex Inc, 1999):

Oral LD_{50} (rat):	2 737 mg/kg
(mouse):	4 050 mg/kg
Dermal LD_{50} (rabbit):	6 480 mg/kg
Inhalation LC_{50} (mouse):	32 g/m^3 over 4 hours
(rat):	23 500 mg/m^3 over 8 hours
Skin Irritation (rabbit):	Mild to moderately irritant

90 Day Intermittent Inhalation Exposure to 5 000 ppm/6 hours (rat) - Target organs: liver, kidney, ureter and bladder

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notifier estimates that 4.4 % (maximum of 52.8 kg/annum) of the notified polymer could be released as a consequence of reformulation at the notifier's site. Most of the release will be disposed of to landfill or by incineration.

The polymer is unlikely to present a hazard to the environment after it has been incorporated into the paint and applied to the coils and cured. Such painted articles will be consigned to either metal reclamation plants or landfill at the end of their useful lives and the paint containing the notified substance will share their fate.

The main environmental hazard would arise through spillage in transport accidents that may release small quantities of the polymer to drains and waterways. However, the polymer should quickly become immobile on association with the soil or sediment layer.

The low environmental exposure of the polymer as a result of the proposed use indicates the overall environmental hazard should be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard Assessment
The polymer has low levels (<1%) of residual monomers and it does not contain reactive functional groups likely to undergo further reaction. The notified polymer has a NAMW of greater than 1 000, which should preclude transport across biological membranes.

The toxicity of the imported solution containing the notified polymer is attributed to the presence of the solvent MEK. MEK is irritating to eyes and respiratory system (R36/37), and is on the NOHSC List of Designated Hazardous Substances with a cut-off concentration of ≥20% (National Occupational Health and Safety Commission, 1999b). The polymer solution containing the notified polymer is therefore classified as hazardous according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and

Safety Commission, 1999a) because it contains >20% MEK, and will require labelling with the above risk phrases. Health hazard information for MEK is summarised in the MSDS.

The polymer distribution of the notified polymer, as manufactured, comprises polymer particles less than 70µm; however, as the notified polymer is imported in solution, no respiratory health risks are envisaged under normal use.

In accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (Federal Office of Road Safety, 1998), the polymer solution is classified as a dangerous good (Class 3) because of the solvent content. MEK has the risk phrase R11-Highly Flammable on the NOHSC List of Designated Hazardous Substances. The required precautions should be taken during transport, storage and handling.

Occupational Health and Safety

The formulation of paint containing the notified polymer is carried out in a closed mixing vessel. There is potential for paint operators to be exposed by skin contact and inhalation to the MEK-polymer solution during the manual addition of ingredients to the mixer and, to any spills of the finished paint during the filtering and filling of containers. Due to the presence of solvents such as MEK, local exhaust ventilation is provided during these processes and personal protective equipment including goggles, gloves and overalls is recommended. Reaction vessels may be cleaned, however they may be reused without cleaning for the production of compatible polyesters. Maintenance workers may be exposed to small amounts of the notified polymer if equipment repairs are required. Laboratory and R&D personnel may be exposed to small quantities of polymer during testing. Due to the expected low toxicity of the notified polymer and the control measures provided to minimise exposure, the risk of adverse health effects arising from exposure to the notified polymer during paint formulation is expected to be low.

During paint application, coating operators may be exposed to the notified polymer by skin contact and inhalation when making up the spray paint. Due to the presence of solvents, local exhaust ventilation is provided during this operation and the use of personal protective equipment including goggles, gloves and overalls is recommended. Given the expected low toxicity and control measures in operation, the health risk from exposure to the notified polymer would be low. Application of the paint and baking occurs under remote control and worker exposure would not be expected. Once curing is complete, the notified polymer is bound to the painted surface and is not bioavailable.

Exposure to the notified polymer by transport and storage personnel is not expected, unless spillage occurs.

Separate regulatory controls exist for MEK. It is a hazardous substance, a dangerous good and has a NOHSC exposure standard (150 ppm TWA, 300 ppm STEL) that should not be exceeded in the workplace.

Public Health

There is very low potential for public exposure to the notified polymer arising from its use as an adhesion-promoting agent in heat cured external coil coatings. Heat curing cross-links the notified polymer into the coating film rendering it effectively inert. Based on this

information and the low hazard of the polymer, it is considered that the notified polymer will not pose a significant risk to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to polymer solution containing the notified polymer the following guidelines and precautions should be observed:

- Respirators should be selected and fitted in accordance with Australian/New Zealand Standard (AS/NZS) 1715 (Standards Australia/Standards New Zealand, 1994a) to comply with AS/NZS 1716 (Standards Australia/Standards New Zealand, 1994b); Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with AS/NZS 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.1 (Standards Australia, 1990); impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia, 1998); and all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c);

- Spillage of the notified polymer should be avoided. Spillages should be cleaned up promptly with absorbents which should 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.

Employers should ensure that the NOHSC exposure standard for MEK of 150 ppm TWA and 300 ppm STEL (National Occupational Health and Safety Commission, 1995) is not exceeded in the workplace.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the polymer solution containing the notified polymer was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 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 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

Federal Office of Road Safety (1998) Australian Code for the Transport of Dangerous Goods by Road and Rail. Canberra, Australian Government Publishing Service.

Micromedex Inc (1999) Registry of Toxic Effects of Chemical Substances (RTECS), *Micromedex Tomes CPS System - CD ROM*, 42:1999.

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

National Occupational Health and Safety Commission (1995) 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. Canberra, Australian Government Publishing Service.

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

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

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

Standards Australia (1990) Australian Standard 3765.1-1990, Clothing for Protection against Hazardous Chemicals Part 1 Protection against General or Specific Chemicals. Sydney, Standards Association of Australia.

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

Standards Australia (1998) Australian Standard 2161.2:1998, Occupational Protective Gloves, Part 2: General Requirements. Sydney, Standards Association of Australia.

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

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

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

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