File No: PLC/114

August 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

LS5122 Alkyd/Acrylic Resin

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

LS5122 Alkyd/Acrylic Resin

1. APPLICANT

Akzo Nobel Pty Ltd of 115 Hyde Rd YERONGA QLD 4104 has submitted a polymer of low concern notification statement in support of their application for an assessment certificate for LS5122 Alkyd/Acrylic Resin.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and the identities of residual monomers, which are present at well below the concentration cutoff levels for classification of the polymer as hazardous, have been exempted from publication in the Full Public Report.

Trade Name:	LS5122 Alkyd/Acrylic Resin

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	>1000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	< 5 %
Molecular Weight < 1 000:	< 10 %
Polymer Stability	The polymer is expected to be stable
Reactivity	The polymer does not contain any reactive functional groups
Particle Size	The polymer will not be isolated in solid form

Charge Density	The polymer will not be charged under normal environmental conditions
Water Solubility	The polymer is stated to have a solubility of <1 ppm
Method of Detection and Determination:	The polymer is characterised by GPC and identified by IR spectroscopy. A reference spectrum has been provided.

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

Appearance at 20°C and 101.3 kPa:	amber coloured liquid
Melting Point:	28.5°C
Specific Gravity:	1.0117 –1.031 at 25°C
Vapour Pressure:	not determined – see below
Water Solubility:	< 1 mg/L at 25°C
Partition Co-efficient (n-octanol/water):	not determined – see below
Hydrolysis as a Function of pH:	not determined – see below
Adsorption/Desorption:	not determined – see below
Dissociation Constant:	not determined – see below
Flammability Limits:	Upper Explosive Limit = 7.0 % Lower Explosive Limit = 1.0 % (for the solvent, xylene)
Autoignition Temperature:	> 317°C (for the solvent, xylene)
Explosive Properties:	not expected to be explosive

Reactivity/Stability:	expected to be stable under normal environmental conditions

Comments on Physico-Chemical Properties

Water solubility was not determined. The notifier claims that the notified polymer is estimated to have a low solubility in water based on the knowledge of similar polymers. Also, the polymer has been designed to be hydrophobic, with hydrophobic ingredients used in both the alkyd and the acrylic components. Thus, the polymer is not expected to have significant water solubility.

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

- the polymer contains no charged groups and functionality capable of being readily ionised;
- the polymer is hydrophobic and the ester groups are not expected to hydrolyse under environmental conditions due to the expected low solubility in water;
- once the polymer, which forms part A of a blended product, is blended it is cured within the resin matrix of the paint film rendering it inert; and
- this will preclude contact of any potentially reactive functionality of the polymer with water, or other reactants in the environment, therefore the possibility of hydrolysis in the environmental pH range (4 - 9) or other reactions would be extremely small.

4. PURITY OF THE CHEMICAL

Degree of Purity:	60 - 88 % in industrial coating
Toxic or Hazardous Impurities:	Hazardous adjuvants and residual monomers are detailed below.
Non-hazardous Impurities (> 1% by weight):	none

Maximum Content of Residual Monomers:

The following residual monomers have not been exempted from publication in the Full Public Report owing to the sensitising potential of the monomers and the close approach of the additive concentrations to the cutoff level for the polymer to be classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances* (Approved Criteria) (National Occupational Health and Safety Commission, 1999).

Chemical Name	*CAS No.*	*Weight %*
2-propenoic acid, 2-methyl-, methyl ester	80-62-6	0.86
2-propenoic acid, butyl ester	141-32-2	0.12

Additives/Adjuvants:

Chemical name:	xylene
CAS No.:	1330-20-7
Weight percentage:	up to 30 % in polymer resin solution
Toxic properties:	R20/21 Harmful by inhalation and in contact with skin R38 Irritating to skin NOHSC exposure standard 80 ppm TWA, 150 ppm STEL

Chemical name:	ethylbenzene
CAS No.:	100-41-4
Weight percentage:	up to 10 % in polymer resin solution
Toxic properties:	R20 Harmful by inhalation NOHSC exposure standard 100 ppm TWA, 125 ppm STEL

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as one part of a polyurethane industrial coating which will be used in severe industrial environments, such as oil storage tanks, pipelines and structural steel works.

The polymer will be manufactured in Australia. The polyester will initially be produced and solvent will be added to form an 80 % (w/w) intermediate solution. The intermediate polyester will be transferred to drums, then charged to a sealed reactor with second stage

monomers to produce the notified polymer. The end product will be a 70 % (w/w) solution of the notified polymer. This will be transferred to 205 L drums for transfer to another site for reformulation.

The polymer solution will be reformulated into paints by the addition of solvents, fillers, colourants and binders, to a final concentration of notified polymer of 30 %. The reformulation will occur in 1000 L open floor pots. The paints containing the notified polymer will be packed into 4 L and 10 L epoxy lined steel cans.

Prior to paint application, Part A, containing the notified polymer, will be mixed with Part B in the proportion of 4:1. The final mix applied to the industrial structures will contain 24 % notified polymer. The polyurethane coatings will be applied via brushes, rollers or airless spraying.

It is estimated that 10 tonnes per annum will be manufactured during each of the first five years.

6. OCCUPATIONAL EXPOSURE

Polymer Manufacture

The polymer manufacture, when commenced, will involve 10 reactor operators for up to 8 hours per day, 10 - 15 days per year. The reactants for the first stage polymer (polyester intermediate) will be added to an enclosed 1000 L reactor, and solvent added when the end point is reached; the resultant polymer solution will be filled into 205 L steel drums by gravity feed and pumps. The first stage polymer will then be added to a second enclosed 1000 L reactor, where second stage monomers are added to produce the notified polymer, and the filling process will be repeated. During the filling process, there is potential for dermal exposure to the polymer solution in the form of drips and spills. As the polymer solution will be viscous, the formation of aerosols is unlikely.

Maintenance personnel, QC operators and development personnel will also be exposed to the notified polymer in the manufacture stage, along with transport and storage workers. An estimated 2 maintenance workers may be exposed dermally to the polymer in repairing breakdowns of equipment. Up to 6 scientific staff may be exposed to the notified polymer in small quantities during QC procedures and development.

Paint Manufacture

The solution of the notified polymer in 205 L drums will be transferred to 1000 L open floor pots for reformulation into paints. The drum bung will be removed, and the solution poured into the pot using drum lifts. Dermal exposure to drips and spills of the solution of the notified polymer is possible at this stage.

Solvents and other paint additives are then added to the floor pot and the components are mixed by high speed stirring. During this process the pot is covered. Local exhaust ventilation is supplied at the floor pot. Before and after dispersion, samples are taken from the floor pot

by cup and poured into sealable 500 mL steel containers for laboratory testing. Dermal exposure to drips and spills is also possible at this stage, and during the laboratory testing. Between 2 and 4 factory operators will carry out these processes, for 1.5 hours per day, 30 days per year. The laboratory testing will involve 2 laboratory staff for 15 minutes per day, 30 days per year.

The formulated product (30 % notified polymer) is filled from the floor pots via funnels (hoppers) into 4 L or 10 L epoxy lined steel cans manually. A ventilation extraction system is present on each filling line. Dermal exposure to the 30 % solution of notified polymer is possible during filling.

Warehouse workers will handle the drums of polymer solution and also the filled cans of finished paint, but no exposure is expected unless the packaging is ruptured.

Workers in the paint formulation area, and especially the filling line staff, are stated to have access to disposable latex gloves, safety glasses, uniforms and safety shoes.

Paint Application

The paints containing the notified polymer will only be available to industrial customers. The paint application to oil storage tanks, pipelines and structural steel works will be done as required by brushes, rollers or airless spraying. Only qualified industrial spray painters will apply the paints, in accordance with the NOHSC *Draft National Code of Practice for Spray Painting* (National Occupational Health and Safety Commission, 1991). Applicators will be required to wear respiratory protection in accordance with Australia/New Zealand Standard AS/NZS 1715 (Standards Australia/Standards New Zealand, 1994a), chemical goggles or face shield, impermeable gloves and protective overalls.

After application of the paint, it will cure and crosslink, and the notified polymer will no longer be separately available for exposure.

Worker Education and Training

The notifier states that all operators involved in the handling of the notified polymer and paints containing the notified polymer will have received training in and are familiar with the correct handling of similar coating materials. Material Safety Data Sheets will be available to all workers.

7. PUBLIC EXPOSURE

Public exposure is only likely to arise from accidental dermal or inhalation exposure from a spill or during application of the paint, or from touching the inert cross-linked paint film. As the use of the paints is generally to be in industrial environments, the potential for public exposure to the notified polymer during all phases of its life cycle is considered to be low.

8. ENVIRONMENTAL EXPOSURE

Release

Release to the environment may occur at a number of places along the production and distribution line. The notifier estimates that 300 kg annually of the notified polymer will be lost due to spills and residues at the manufacturing plant.

The notifier estimates that 1 % of the notified polymer is lost through spillage (100 kg annually) at the formulation site. Approximately 0.5 % of the notified polymer remains as residue in the steel drums (50 kg annually). No estimate about the amount of residue obtained from cleaning equipment is given by the notifier.

Except in the case of accident, it is not expected that either the polymer or the paint formulation containing the polymer would be released to the environment during storage and transportation. The MSDS contains adequate instructions for handling a spill should one occur.

The major release to the environment is likely to occur during paint application through overspray and residual material left in the paint containers and spray equipment. It is estimated that up to 2.5 % of the paint may remain in the tins after use, equating to approximately 230 - 240 L of notified polymer annually. No estimate for the amount that may be left in spraying equipment was given by the notifier. However, the major release of the notified polymer to the environment will be as a consequence of overspray during application. This may be as high as 15 % of total paint used under moderately windy outdoor conditions. Assuming maximum annual paint application of 30 tonnes, around 1100 kg of the new polymer could be released during spray paint application in one year for all sites. It is expected that this release would be on a nationwide basis, with the amount released not significant at any one site. Where possible, overspray should be collected through the use of protective sheeting on surrounding surfaces; these could be collected and disposed of via approved methods.

Material left in cans may be mixed with residual hardener and disposed of with the empty containers into landfill.

Fate

All spills and washings from cleaning of equipment in the manufacturing and the formulation plants are collected and removed by a licensed waste disposal company. The 205 L drums which contain approximately 0.5 % of the notified polymer as residue at the formulation plant are also sent to a licensed waste disposal company and are not recycled.

The uncured formulation containing the new polymer is predominantly hydrophobic and any spilt material would be expected to associate with the organic component of soils and sediments and become assimilated. Biological membranes are not permeable to polymers of

very large molecular size, therefore bioaccumulation of the notified polymer would not be expected if quantities of uncured polymer were to be released into the water compartment.

Any notified polymer released to the sewer would be entrained within particles and flakes of a cured polymer matrix (paint). These would be quite insoluble, and would associate with the sewer plant sludge, and be deposited into landfill or incinerated.

Once applied to the surfaces of steel structures such as oil storage tanks and pipelines, 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 steel structures 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. When recycled, the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon. When deposited into landfill either with used paint tins or on discarded panels, 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, which is acceptable for a synthetic polymer of low concern with a NAMW > 1000 according to the *Industrial Chemicals (Notification and Assessment) Act*. The polymer is stable with low volatility. Polymers of high molecular weight do not readily cross biological membranes. The notifier states that no injuries or diseases related to occupational exposure to the notified polymer have been reported from overseas experience.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted, which is acceptable for a synthetic polymer of low concern with a NAMW > 1000 according to the *Industrial Chemicals (Notification and Assessment) Act.*

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

It is possible that up to 15 % (ie a maximum of 1100 kg per annum) of the notified polymer could be released as a consequence of paint application. This is expected to be nationwide; therefore not significant at any one site. The majority of the material would be encapsulated in a cured polymer matrix and is expected to be insoluble and inert. Most of this solid waste would be deposited into landfill.

However, some of the cured waste paint generated during the cleaning of spray equipment may be released into sewers. It would become incorporated into sewerage treatment plant sludge, and eventually incinerated or placed into landfill.

The polymer is unlikely to present a hazard to the environment when it is incorporated into the paint, applied to steel structures and cured. Such painted objects 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, where small quantities of the polymer may be released to drains and waterways. However, the polymer should quickly become immobile on association with the soil/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

No toxicological information has been provided for the notified polymer and therefore the substance cannot be assessed against the Approved Criteria. However, the polymer solution, as manufactured, is a hazardous substance and also a Class 3 dangerous good (flammable liquid) because of the solvent content (ethylbenzene and xylene). The MSDS for the polymer solution identified as HP-16-3471 lists a number of potential health effects, namely lung damage if aspirated, stomach lining, skin, eye and respiratory irritation and central nervous system effects such as headaches, dizziness, nausea and loss of consciousness. These relate mainly to the solvents, xylene and ethylbenzene, rather than the notified polymer.
The MSDS also mentions the possibility of skin sensitisation. The polymer solution would be expected to be a potential skin sensitiser as the combined concentration of residual methyl methacrylate and butyl acrylate is close to the cutoff for the polymer itself to be classified as a skin sensitiser according to the Approved Criteria. Care should be taken to protect against dermal contact with the concentrated solutions of the notified polymer to avoid skin sensitisation.

Occupational Health and Safety
There is little potential for significant occupational exposure to the notified polymer in the transport and storage of the polymer solution or the paint component containing this polymer. There will be exposure during the manufacture and reformulation of the polymer and during production of the paint component, and in the use and disposal of the paints.

During the manufacture and reformulation processes, the main exposure route for the notified polymer will be dermal. The paints and polymer solutions will be viscous, and ready formation of aerosols is not expected. The polymer is not expected to be hazardous by dermal exposure as the high molecular weight will preclude absorption through the skin. The notified polymer does, however, contain a combination of hazardous residual monomers which

approach the concentration cutoff for skin sensitisation. Protective measures used to prevent exposure to the hazardous solvents should provide sufficient protection against the notified polymer. In addition, the polymer solutions and paints will be handled by workers with knowledge of the processes and trained in procedures to control exposure to hazardous substances.

The notification indicates that disposable latex gloves will be available as protection in occupational environments where the notified polymer is used. These are very unlikely to give adequate protection against the solvents in LS5122 or the paint, and are prone to tearing when worn during manual labour, and should not be used in place of the impermeable gloves recommended in the MSDS.

The final polyurethane paint mix, including the pre-prepared paint containing the notified polymer, could contain a wide variety of additional ingredients once fully mixed. This is likely to introduce additional human health hazards because, apart from a range of potentially toxic solvents, there may be components containing resins with pendant isocyanate groups. If the paint is applied by spraying, the spraying procedure produces a dense aerosol of paint particles which would adversely affect human health even in the absence of additional hazardous components.

The use of the paint containing the notified polymer should therefore 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 and other hazardous components of the final paint mix.

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 xylene and ethylbenzene, identified as ingredients in the polymer solution. 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.

Public Health
There is negligible potential for public exposure to the notified polymer arising from use in industrial paints. Therefore, based on its use pattern and physico-chemical characteristics, the notified polymer will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to LS5122 Alkyd/Acrylic Resin the following guidelines and precautions should be observed:

- Employers should ensure that NOHSC exposure standards for all of the components of the final paint mix are not exceeded in the workplace;

- 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);

- 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) and AS 3765.2 (Standards Australia, 1990);

- Impermeable gloves or mittens should conform to AS 2161 (Standards Australia/ Standards New Zealand, 1998). Disposable latex gloves should not be used;

- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994b);

- 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.

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* (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

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

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 (1999) 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 (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia, Sydney.

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

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, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, use and maintenance of respiratory protective devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

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

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, Sydney/Wellington.