File No: PLC/88

August 1998

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

PLIOWAY EC-1

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

PLIOWAY EC-1

1. APPLICANT

International Sales and Marketing Pty Ltd of 55 Halstead Street SOUTH HURSTVILLE NSW 2221 has submitted a notification statement accompanying their application for assessment of a Synthetic Polymer of Low Concern, Plioway EC-1.

2. IDENTITY OF THE CHEMICAL

Claims were made and accepted for the identity of Plioway Ec-1 to be exempt from publication in the Full Public Report. The data items were:

chemical name;
CAS number;
molecular and structural formulae;
polymer constituents; and
residual monomer content.

Number-Average Molecular Weight (NAMW):	42 809 – 46 017, see comments below
Weight-Average Molecular Weight (WAMW):	~ 103 000 (from gel permeation chromatography)
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	-
Molecular Weight < 1 000:	0% (from gel permeation chromatography)
Additives/Adjuvants:	none
Method of Detection and Determination:	gas chromatography
Spectral Data:	a report with infrared (IR) spectrometric data was submitted for the identification of the notified polymer

Comments on Chemical Identity

A Gel Permeation Chromatography (GPC) determination report (including the trace and associated print-out) was supplied to determine the molecular weight and percentage of low molecular species (Biedermann K, 1995). The NAMW of two samples of polymer ranged from 42 809 to 41 017 , with means of 44 393 and 43 833 g/mol. The polydispersity of the polymer is approximately 2.3.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	white powder or granule
Particle Size:	~ 95% have particle size > 45 μm
Melting Point:	not determined
Glass Transition Temperature:	53.5-58.5°C
Specific Gravity:	1.034
Water Solubility:	not determined, see comments below
Charge Density:	very low polarity
Hydrolysis as a Function of pH:	not required
Polymer Stability:	stable
Flammability Limits:	the polymer does not have a vapour pressure below its decomposition temperature which is ~ 250°C
Autoignition Temperature:	not determined for the notified polymer, however, 400°C was reported for a similar polymer
Explosive Properties:	not determined for the notified polymer, however, a similar polymer has been determined to be explosive

Comments on Physico-Chemical Properties

The data provided for the notified polymer satisfies the criteria for the notification category of Synthetic Polymer of Low Concern.

A water solubility study was not submitted. The notifier claims that the notified polymer is not soluble in water, with the water soluble species removed during the separation and dewatering/drying stages of the manufacturing process. It is further claimed that the backbone of the polymer is of very low polarity with no probability of the solid polymer

swelling in the presence of water. It is accepted that the polymer will have very low water solubility.

The notified polymer is of high molecular weight, with the notifier claiming that it is designed to be chemically and environmentally inert. Hydrolysis of the polymer's ester linkages in the environmental pH range will be precluded by the expected insolubility.

4. PURITY OF THE CHEMICAL

Degree of Purity: high

Toxic or Hazardous Impurities:

Chemical name:	rosin
Synonyms:	colophony
CAS No.:	8050-09-7
Weight percentage:	<10%
Toxic properties:	may cause sensitisation by skin contact (R43) (European Commission, 1996)
	fumes of colophony may cause asthmatic reactions (Silver Platter International, 1998)

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported mainly in 25 kg bags, with the remainder imported in finished paint products packaged in ready-to-use aerosol cans (containing 5% of the notified polymer). The notifier estimates that 2 000 kg of the polymer will be imported in the first year, increasing to 10 000 kg after year three.

The notifier anticipates that in the first year one to two paint companies will be using the imported polymer, with four to five customers over the five year period.

The notified polymer is a component to be added (at 2 to 10%) to paint and coating products. These products will be low odour and solvent based for application by roller, brush or spray to interior and exterior masonry surfaces. The products will be used by both professional painters and home handymen.

The paint manufacture process is summarised briefly as follows:

Mixing: part of the polymer (resin) is blended with solvent to form a grinding vehicle. The grinding vehicle is held in a predisperison mixer to which pigments are added to form a mill base;

Dispersion: the mill base is ground in a bead mill, then transferred to a mixing tank;

Make-Up: additives and remaining resin and solvent are added to the mixing tank by direct pumping. Mixing or agitation continues until the desired level of dispersion of pigment/additives in the solvent/resin mixture is achieved;

Testing: during formulation, the batch is tested and adjusted; and

Filtering and Packaging: the finished paint product is filtered, then packaged into steel paint cans of 500 mL, 1 L, 4 L, 10 L and 20 L capacity.

6. OCCUPATIONAL EXPOSURE

The notified polymer, either in 25 kg bags (shrink wrapped in plastic) or a finished product in aerosol cans will be transported from wharves to the notifier's warehouse, for subsequent dispatch to customer sites. The notified polymer will remain in its original packaging until it reaches the customer site. Exposure of waterside, storage and transport workers is not expected under normal circumstances.

Paint manufacture
Initially, the notified polymer will be formulated into paints at two customer sites. Workers who will have potential exposure to the notified polymer during paint manufacture, include plant operators, laboratory staff and maintenance personnel.

During paint manufacture plant operators will be involved in the following processes: dispersion (66 personnel, 4 hours/day, 30 days/ year); paint make up (66 personnel, 2 hours/day, 30 days/year); and filtering/packaging (66 personnel, 8 hours/day, 30 days/year). Up to 12 laboratory staff will be involved in research and development and quality control testing. The paint manufacturing process is summarised in Section 5 above.

Inhalation, skin and eye exposure to the notified polymer (granules) may occur during the mixing and make-up stages as 25 kg bags of the notified polymer are manually added to the mixers via a loading chute for blending with solvent. In addition, exposure may also occur during pre-weighing of the polymer. The notifier states that pre-weighing occurs in the event when part-bags are required as pre-weighing is kept to a minimum by adjusting the batch size. The notifier indicates that mixing vessels are enclosed, with local exhaust ventilation positioned over the vessels and that workers wear personal protection such as impervious gloves, coveralls and chemical goggles.

During the tinting and testing stage, small samples (up to 500 mL) of the paint mixture are tested for colour and performance properties. This is typically carried out either by brush or spray application. Potential for inhalation, skin and eye exposure to aerosols exists. The notifier indicates that spraying is performed in a spray booth. Exposure to the notified polymer is expected to be negligible at this stage as the notified polymer is compounded into the paint mixture, sample sizes are small and engineering controls are in place.

Skin and dermal exposure to the paint containing the notified polymer may occur as paint cans/drums are filled and sealed for example, by spillage or overfilling. The notifier states

that local exhaust ventilation is in place and workers are required to wear personal protective equipment.

Skin and dermal exposure to the notified polymer and paint containing the notified polymer may occur during cleaning and maintenance of equipment. The notifier indicates local exhaust ventilation is positioned over mixing vessels and that workers wear personal protection such as impervious gloves, coveralls and chemical goggles.

End Use
The final paint product containing the notified polymer can be used straight from the paint can (applied by brush, roller or spray) or from an aerosol can. The number of professional painters and home handymen in Australia numbers in the 1 000s. Painters may receive dermal or ocular exposure to the paint containing the notified polymer. However, direct exposure to the notified polymer is expected to be negligible as the polymer is bound in the paint medium and unavailable for contact.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to the notified polymer arising from manufacturing, waste disposal and transport. The notified polymer will be imported in 25 kg bags on shrink wrapped pallets and finished goods (aerosol cans containing 5% of the notified polymer). Products and bags containing the notified polymer will be transported by road to several customer paint manufacturing sites. In the event of an accidental spill, the notified polymer is to be scraped up and placed into suitable containers for disposal under local regulations.

The notified polymer will enter the public domain as paints for use by professional tradesman and the general public. Although there will be extensive public contact with painted products, the cured paint containing the notified polymer is inert and will be in the form of an unreactive coating which would not be bioavailable.

8. ENVIRONMENTAL EXPOSURE

Release

No release or exposure to the environment is expected from this polymer during transportation, with the exception of accidental spillage. There are adequate instructions on the polymer MSDS to cope with accidental spillage.

The notifier has estimated that up to 100 kg of waste polymer may be generated per year at maximum import quantities due to minor spills and cleaning manufacturing equipment. Waste paint and polymer will be disposed of through a licensed waste disposal contractor. Following treatment, the solids from the polymer and paint will be disposed of to an approved landfill site.

The paint and coating products will be applied by brush, roller and spray, by both

professional painters and home handymen. The notifier estimates that approximately 2% of the paint will be lost during application, with spray losses up to 30%. The notifier has indicated that release to the environment will also occur through cleaning paint application equipment and disposal of paint cans and aerosols (which can contain residues of polymer). The notifier recommends that unwanted paint be brushed out on newspapers, allowed to dry and then disposed of to landfill. It is expected that any washings will be sent to the sewer, with some lost to the surrounding ground near the wash-up site. It is expected that residues in empty paint cans used by professional painters will be minimised, with the amount of residue left in cans supplied to home handymen and the general public unknown. Nonetheless, the notifier recommends that empty cans be left open to dry and disposed of to municipal or trade waste landfill sites. Residues in aerosol cans are expected to be minimal as these can be stored until empty.

Fate

The vast majority of notified polymer will be bound to masonry surfaces and in its final form will be a part of the hardened paint film. Any fragments, chips or flakes of the dried paint will be of little concern as they are expected to be inert. Spray droplets are also expected to dry to inert particles. Articles coated with the polymer may be reused (the polymer film may be removed by either mechanical or chemical means) or disposed of to landfill at the end of their useful life.

Uncured notified polymer waste generated due to spillage is expected to be incinerated or sent to approved landfill sites. Combustion products will include oxides of carbon and hydrogen. In landfill the polymer is expected to remain and be immobile. Exposure to the uncured polymer following coating formulation is expected to be as a residue in paint cans disposed of to landfill. These residues will become entrapped as the paint product dries, and subsequently will have low mobility. Paint in aerosols is expected to remain within the steel can.

Notified polymer that is released to the sewer is expected to become associated with the sludge during treatment due to its expected insolubility. Hence, it will be disposed of to landfill or incinerated with the sludge.

The insoluble nature of the cured polymer will ensure any hydrolysis or breakdown occurs at an extremely low rate under normal environmental conditions, and the polymer should undergo limited biodegradation. Biological membranes are not permeable to polymers of very large molecular size and as such, bioaccumulation of the notified polymer is not expected (Anliker R Moser P Poppinger D, 1988, Gobas FAPC Opperhuizen A Hutzinger O, 1986).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were provided. None are specifically requested for a Synthetic Polymer of Low Concern.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were provided. None are specifically requested for a Synthetic Polymer of Low Concern.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Taking the worst case assumption that **all** paint is applied using spray equipment (that is, a loss rate of 30% of the polymer), approximately 3 tonne per annum of the polymer (encapsulated in the cured paint matrix) may be disposed of from paint application, mostly to landfill but some to the sewer. However, it is more likely that release will be significantly lower due to the much smaller losses generated by application with rollers and brushes. Nonetheless, the polymer will be encapsulated in the dried paint product and be inert.

The polymer is unlikely to present a hazard to the environment when it is incorporated into the paint and applied to solid substrates and cured. Such painted objects will be consigned to landfill at the end of their useful life and the paint containing the notified substance will share their fate.

The release of the notified polymer to the sewer as a result of the cleaning of application equipment is not expected to present a hazard to the environment. It is anticipated that the majority of the polymer will be associated with sewage sludge, which will be landfilled or incinerated. Due to the high molecular weight of the polymer it is unlikely to bioaccumulate. 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/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

The notified polymer comes as a chemically inert granule with particle size well above the respirable range. Low residual monomer content and high molecular weight is indicative of slow absorption across biological membranes. The notifier states that human exposure to these polymers is characterised by the absence of adverse health effects. For the above reasons the health hazard to humans is low.

Occupational Health and Safety

During paint manufacture, inhalation, skin and eye exposure to the notified polymer may occur at various stages of the process. For example, exposure may occur during manual weighing of the polymer, cleaning up of spills and during maintenance. However, once the notified polymer is bound into the paint at a concentration of 2 to 10%, exposure to the notified polymer itself would be minimal. Where exposure to the notified polymer may

occur, local exhaust ventilation is in place to limit inhalation exposure and personal protective equipment, such as chemical goggles, impervious gloves and coveralls, is provided. Therefore, given the compounded form of the polymer in the paint matrix, the risk of adverse health effects due to exposure to the polymer during paint manufacture is extremely low. Other operations in the paint manufacture process occur within closed systems and as indicated above, the notified is compounded within the paint medium. Therefore worker exposure is expected to be negligible.

During end use, professional painters and home handymen, may be exposed by the dermal ocular and inhalation routes when applying the paint by brush, roller or spray or whilst using the aerosol can. However, as the notified polymer is bound within the paint matrix, and therefore unavailable for direct contact, risk of adverse health effects due to exposure to the polymer during painting is extremely low.

The occupational risk to waterside, storage and transport workers under normal conditions is expected to be negligible.

The notified polymer is produced from a polymerisation reaction that employs rosin (pine resin) as a surfactant. Rosin is a skin sensitiser (European Commission, 1996) and the fumes of heated solder core containing colophony (rosin) have been implicated in many cases of occupational asthma (Silver Platter International, 1998). Rosin is present in the notified polymer at less than 10% as an insoluble impurity bound within the polymer matrix and therefore, unavailable for direct contact under normal conditions.

Public Health
There is negligible potential for public exposure to the notified polymer arising from use in paints. There may be widespread public contact with the notified polymer on the painted surfaces of treated products, but its adhesion to the substrate and the physico-chemical properties of the cured paint will be sufficient to preclude absorption across the skin or other biological membranes. It is considered that the notified polymer will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Plioway EC-1 the following guidelines and precautions should be observed:

- Respiratory protection should be selected and fitted in accordance with Australia/New Zealand Standard 1715-1994: *Use and Maintenance and Respiratory Protective Devices* (Standards Australia/Standards New Zealand, 1994a) and Australian/New Zealand Standard 1716-1991 *Respiratory Protective Devices* (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 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 3765.1 (Standards Australia, 1990);
- Impermeable gloves or mittens should conform to AS 2161.2 (Standards Australia/ Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c);
- Spillage of the notified chemical 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.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under 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

Anliker R Moser P Poppinger D (1988) Bioaccumulation of dye stuffs and organic pigments in fish. Relationship to hydrophobicity and steric factors. Chemosphere, 17 (8): 1631-1644.

Biedermann K (1995) Validation of a GPC-method for the Determination of Mn, Mw and Polydispersity of Plioway EC-1, Project No. 385571, RCC Umweltchemie AG, Switzerland.

European Commission (1996) EC Council Directive 96/54/EC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances. Official Journal of the European Communities, L248, 30 September 1996 .

Gobas FAPC Opperhuizen A Hutzinger O (1986) Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation. Environmental Toxicology and Chemistry, 5 : 637-646.

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

Silver Platter International (1998). Toxline SilverPlatter CD-ROM database: January 1995-June 1998. N.V., Silver Platter International.

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

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

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

Standards Australia (1998) AS/NZS 2161.2:1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements. Sydney/Wellington, Standards Australia and Standards New Zealand.

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

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

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

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