File No: PLC/39

Date: November 1996

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

JONREZ®HC-910

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 Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Commonwealth Environment Protection Agency and the assessment of public health is conducted by the Department of Health and Family Services.

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Under subsection 34(2) of the Act the Director of Chemicals Notification and Assessment is to publish this Report in the Chemical Gazette on November 5 1996.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

JONREZ®HC-910

1. APPLICANT

Westvaco Pacific Pty Ltd of Suite 2, 6th Floor - Charlton House - 20 Alfred Street MILSONS POINT NSW 2061 has submitted a notification statement in support of their application for assessment of a synthetic polymer of low concern, Jonrez®HC-910.

2. IDENTITY OF THE POLYMER

Chemical Name: fatty acids, tall-oil, polymer with glycerol, light steam-cracked petroleum naphtha C5 fraction oligomer conc., maleic anhydride, pentaerythritol, rosin, steam-cracked petroleum distillates C8-12 fraction and tall oil

Other Name: Rosin Modified Hydrocarbon Resin

Chemical Abstracts Service (CAS) Registry No.: 175779-57-4

Trade Name: Jonrez®HC-910

Molecular Formula: $(C_{155}H_{219}O_{21})_x$

Structural Formula:

Number-Average Molecular Weight (NAMW): 44 645

Maximum Percentage of Low Molecular Weight Species (polymers and oligomers)

- **(molecular weight < 1 000):** < 1%
- **(molecular weight < 500):** < 0.5%

Table 1: Polymer Constituents

Constituent	*CAS No.*	*% Weight*
rosin	8050-09-7	31.0
maleic anhydride	108-31-6	6.0
tall oil	8002-26-4	2.0
pentaerythritol	115-77-5	7.0
glycerine	56-81-5	1.0
tall oil fatty acid	61790-12-3	4.0
C_8 - C_{12} steam-cracked naptha	68477-54-3	14.4
naptha (petroleum), light steam-cracked, C5 fraction, oligomer concentration	30525-89-4	34.5
magnesium oxide	1309-48-4	0.1

Means of identification: the polymer can be separated by gel permeation chromatography and identified by low angle laser light scattering detection (LALLS) method and infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa: amber resin solid

Odour: slight aromatic

Melting Point: ~160°C

Density: 1009 kg/m^3

Water Solubility: < 1 mg/L at 20°C

Flammability Limits: not determined

Autoignition Temperature: not determined

Explosive Properties: the possibility of a dust explosion (similar to grain explosion) is always present with organic dusts.

This possibility arises when a build up static charge occurs, usually during pouring of the product, in the presence of an ignition source. Proper grounding techniques need to be utilized to prevent dry particles building up electrostatic charge. However, the large particle size may reduce the likelihood of a dust explosion. The emulsion form is unlikely to have explosive properties

Reactivity: may undergo a slow surface oxidation over extended periods of time, if proper storage conditions are not maintained

Particle Size Distribution: in solid form < 1% of particles having an aerodynamic diameter < 70 μm

Comments on physico-chemical properties

The water solubility result is based on partition coefficient testing conducted using a related chemical, JONREZ® HC-901. This compound differs from the notified substance in that the bisphenol A and paraformaldehyde (in the 901 formulation) are replace by tall oil, glycerine and tall oil fatty acid (in the 910 formulation). JONREZ® HC-901 was found to be insoluble in octanol at levels of 1 mg/mL, and therefore no further testing was conducted. No polymer could be detected in the water solution and the notifier has provided information to indicate that the lower detection limit for the analysis conducted was less than 1 ppm. JONREZ® HC-910 is soluble in many organic solvents and oils.

The notified polymer does not contain any positively or negatively charged groups or groups that are likely to react. However, there are a number of carbon-carbon double bonds that will allow slow surface oxidation. Such oxidation is expected to be eliminated through proper storage conditions.

4. PURITY OF THE CHEMICAL

Table 2: Maximum weight-percentage of residual monomers and impurities

Impurity	*CAS No.*	*% Weight*
rosin	8050-09-7	< 2%

5. INDUSTRIAL USE, VOLUME & FORMULATION

The notified polymer will be imported in the pure form. The polymer is a component in lithographic printing ink, primarily used to print newspapers and magazines. It is targeted at the printing industry as an occupationally and environmentally less hazardous chemical. The import volumes will be dependent on market penetration and the following estimates are approximately 20 000 to 40 000 kg per year over the next five years.

The product will be imported from USA and converted into a lithographic varnish and then sold to ink makers to produce the desired colour for printing.

The notified polymer is approved under the US EPA Polymer Exemption, and has been notified in Canada as a Low Concern Polymer. The analog product, Jonrez®HC-901 has been on the US market for five years and the Canadian market for two years.

6. OCCUPATIONAL EXPOSURE

The notified polymer is to be imported in 500 kg bulk bags, and transported on pallets to formulating sites and normally stored in sealed bags in cool surroundings (< 26°C). The occupational exposure during transport and storage will be limited to accidental spillage only.

At each site, the polymer will initially be mixed with oils and other additives to produce a lithographic varnish, or with further addition of pigments, to produce coloured inks in a blend tank. From here onwards the entire blending process is automated, enclosed and fitted with local exhaust ventilation containing fabric filters to collect dust. At each site, only one worker will be exposed to the pure notified polymer and formulation (25% of notified polymer) at the rate of 15 minutes/batch for 8.75 hr/year. A quality control analyst, will also be exposed to the ink product at the rate of 30 minutes/batch for 17.5 hr/year. Inks are packed into drums following blending, and transported either to storage tanks, or direct to printing presses. During lithographic printing, ink tanks or drums are hooked directly onto the printing presses. Ink is squeezed directly onto the printed paper, and small amounts are released carried in evaporated solvent fumes which are normally trapped by scrubber fans.

Three forms of exposure are likely during the use of the notified polymer: dust resulting from emptying of bags during feeding the polymer; spillage of product that may occur during loading of the blending tank; and spills of formulated inks and blend tank cleaning waters. The dust collected by fabric filters and spills during feeding procedures are recycled into subsequent batches, or sent to landfill.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to the notified polymer during ink formulation or printing operations.

There will be widespread public contact with the notified polymer on printed paper. However, at this stage the polymer will exist in the form of an inert, insoluble coating. Waste printed paper will be either disposed of to landfill as garbage, incinerated, or recycled. No data were provided on the likely behaviour of the notified polymer during recycling. The polymer is expected to survive paper recycling processes and remain bound to the pulp or become associated with the sludge. In the latter case, the polymer would be consigned to landfill, where it is expected to remain intact, or be destroyed by incineration.

8. ENVIRONMENTAL EXPOSURE

. Release

The notifier has supplied information regarding release during the varnish/ink formulation and blending process. Three forms of release are considered likely: spillage of product that may occur during loading of the blending tank; dust resulting from emptying of bags during feeding; and spills of formulated inks and blend tank cleaning waters. Spills during feeding procedures, and dust collected by fabric filters will be recycled into subsequent batches (the preferred procedure), or sent to landfill. Tank washout waters are recycled several times, and are eventually sent to wastewater treatment, but the notifier also states that some of these waters may not be contained and may be washed into drains, and thence to wastewater facilities.

Estimated amounts of the substance to be released from these three sources are 2 kg, 0.5 kg and 0.1 kg per batch for source 1, 2 and 3, respectively. The notifier has not indicated how many batches are to be produced each year, but assuming that a typical batch will be 2 300 kg, and that a total volume of 40 000 kg per annum will be imported, it is anticipated that up to 18 batches per year may be produced. Therefore, it is possible that up to 47 kg may be disposed of in landfills each year.

Losses are also expected from the cleaning of blending tanks, transfer lines and tubing. The notifier states that approximately 7 litres of ink is expected to remain in tanks and tubing, which is equivalent to 7.2 kg of ink, or 1.8 kg JONREZ® HC-910. Blend tanks are cleaned with petroleum solvent at the end of each production run, with washing ís recycled as part of the petroleum solvent for subsequent batches. If the solvent cannot be recycled, incineration is the recommended disposal route.

Losses from printing works are expected to be minimal. Lithographic printing is claimed to be an efficient process, as ink tanks are hooked directly onto the printing presses, reducing the number and amount of possible spills. Ink is squeezed directly onto the printed paper, and small amounts are released carried in evaporated solvent fumes. It is anticipated that these fumes would be collected by scrubber fans. Waste ink will also come from paper printed at the start and finish of printing runs, as start up/finishing wastes, and from paper towels that are used to clean up press rolls and ink troughs at the completion of printing runs.

Waste paper is to be disposed of as solid waste or recycled according to the particular procedures followed at the printing works, while paper towels are to be collected and disposed of by incineration (as will solvents). The notifier states that of 500 kg ink used in a printing run, approximately 10 kg will end up as waste, with 8 kg of ink on waste paper, and 2 kg of ink on paper towels after cleaning. Thus, approximately 2 kg of the notified substance will be either disposed of to landfill or recycled on the waste printed paper, and approximately 0.5 kg will be disposed of by incineration. Disposal of spilt inks, and of emptied bags, from printing works will depend on the particular ink blend.

Burning of printed materials, or of emptied packaging in landfills may release carbon dioxide, carbon monoxide and other vapours. Burning of emptied packaging should be avoided.

. Fate

JONREZ® HC-910 is not expected to biodegrade, and due to its high molecular weight should not bioaccumulate. Testing of a related substance, JONREZ® HC-901, also indicated minimal biodegradation occurred during the Bartha-Pramer Biometric test conducted. This test (conducted according to GLP procedures) is an *in-vitro* evaluation of evolved CO_2, and used two JONREZ® HC-901 loadings (1000 mg and 500 mg) in soil boxes, kept at 20^{O}C for 90 days in the dark. The soils used were maintained at $\geq$ 85% relative humidity, and were amended to 3.35% carbon by the addition of leaf mulch. In addition, an inoculum of 5 micro-organism species was also added to the soils. Evolved CO_2 was measured weekly, or more frequently if necessary. Bartha-Pramer flasks were used as the biometers. Evolution of CO_2 was compared to that from control flasks, where filter paper was used as a substrate for degradation. Degradation rates for the two levels of treatment averaged 0.2 - 0.3% a week for the 13 weeks of testing, with overall degradation values of 2 - 4%. By contrast, the control samples degraded approximately 18% over the 13 weeks of the study. A follow up study, to determine whether the carbon had been converted to forms other than gaseous CO_2 (such as total organic carbon in the soil) found that while the control sample showed degradation of 65.2%, the two treatment levels showed 44.4% and 0% respectively, and therefore it was concluded that degradation via another route was not likely.

Paper recycling is a growing industry in Australia. Waste paper is repulped using a variety of alkalis, dispersing agents, wetting agents, water emulsifiable organic solvents and bleaching agents. These chemicals enhance the fibre separation, ink detachment from the fibres, pulp brightness and the whiteness of the paper. After pulping, the contaminants and the ink are separated from the fibres by pumping the stock through various heat washing, screening, cleaning, flotation and dispersion stages. The notifier has provided no data on the likely behaviour of the polymer during the recycling process. The hydrolysis of ester linkages under alkaline conditions will be minimal due to the low solubility of the polymer. The polymer therefore is likely to survive the paper recycling conditions, either remaining bound to the pulp or becoming associated with the sludge. In the latter case, the polymer will arrive in landfill where it can be expected to remain intact, or be destroyed through incineration.

As the notified substance is expected to be insoluble, when placed in landfill it is not expected to leach. Should a spill of the polymer in varnish form occur to waterways or drains, it is anticipated that it will settle onto sediments. Spilt inks should be dyked and collected for either recycling or disposal.

9. EVALUATION OF TOXICOLOGICAL DATA

The Act does not require the provision of toxicological data for polymers of low concern category. However, the following studies on acute oral toxicity, skin and eye irritation done on the analog Jonrez®-901 is provided.

9.1 Acute Toxicity

Summary of the acute toxicity of Jonrez®901

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 5000 mg/kg	(1)
skin irritation	rabbit	non-irritant	(3)
eye sensitisation	guinea pig	non-sensitiser	(4)

9.1.1 Oral Toxicity (1)

Species/strain:	Sprague Dawley rats
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	given orally by gavage
Clinical observations:	no abnormalities were observed
Mortality:	no deaths
Morphological findings:	no abnormalities were noted at necropsy
Test method:	based on OECD Guidelines for Testing of Chemicals (2)
LD_{50}:	> 5000 mg/kg
Result:	low oral toxicity in the rat

9.1.2 Skin Irritation (3)

Species/strain:	Rabbit/New Zealand White
Number/sex of animals:	3/sex
Observation period:	three days at 24 hour intervals
Method of administration:	0.5 g moistened with physiological saline
Test method:	OECE Guidelines for Testing of Chemicals (2)
Result:	non-irritant to rabbit skin

9.1.2 Eye Irritation (4)

Species/strain: New Zealand White Rabbits

Number/sex of animals: 3/sex

Observation period: three days at 24 hour intervals

Method of administration: 0.1 ml of the notified polymer instilled in the conjunctival sac of the left eye

Draize scores (5) of unirrigated eyes:

	Time after instillation														
Animal	***1 hour***			***1 days***			***2 days***			***3 days***			***4 days***		
Cornea	***o[a]***	***a[b]***		***o[a]***	***a[b]***		***o[a]***	***a[b]***		***o[a]***	***a[b]***		***o[a]***	***a[b]***	
1	0[1]	0		0	0		0	0		0	0		-	-	
2	0	0		0	0		0	0		0	0		-	-	
3	0	0		0	0		0	0		0	0		-	-	
4	0	0		0	0		0	0		0	0		-	-	
5	0	0		0	0		0	0		0	0		-	-	
6	0	0		0	0		0	0		0	0		-	-	
Iris															
1	0			0			0			0			-		
2	0			0			0			0			-		
3	0			0			0			0			-		
4	0			0			0			0			-		
5	0			0			0			0			-		
6	0			0			0			0			-		
Conjunctiva	***r[c]***	***c[d]***	***d[e]***	***r[c]***	***c[d]***	***d[e]***	***r[c]***	***c[d]***	***d[e]***	***r[c]***	***c[d]***	***d[e]***	***r[c]***	***c[d]***	***d[e]***
1	1	0	0	1	0	0	0	0	0	-	-	-	-	-	-
2	1	0	0	0	0	0	0	0	0	-	-	-	-	-	-
3	1	0	0	0	0	0	0	0	0	-	-	-	-	-	-
4	1	0	0	0	0	0	0	0	0	-	-	-	-	-	-
5	2	0	0	1	0	0	0	0	0	-	-	-	-	-	-
6	2	2	0	1	1	0	0	0	0	-	-	-	-	-	-

[1] see Attachment 1 for Draize scales
[a] opacity [b] area [c] redness [d] chemosis [e] discharge

Test method: based on OECD Guidelines for Testing of

Chemicals (2)

Result: slight irritant to the rabbit eye

9.2 Overall Assessment of Toxicological Data

Based on studies done on a compositionally similar chemical, the notified chemical may exhibit low acute oral (LD_{50} > 5 000 mg/kg) toxicity in rats, no skin irritation in rabbits and slight eye irritation in rabbits.

On the basis of submitted analog data, it may be assumed that the notified chemical will not be classified as hazardous in accordance with *Approved Criteria for Classifying Hazardous Substances* (Approved Criteria) in relation to acute oral toxicity and skin and eye irritation

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were supplied for this resin, which is acceptable for a polymer of low concern. Due to the high molecular weight of the notified substance, it is not expected to cross biological membranes.

This was confirmed via toxicity testing conducted for the related compound, JONREZ® HC-901, demonstrated no toxic effects to mammals, *Daphnia*, fish or algae. A summary of the tests conducted, and the relevant toxicity levels are shown in the table below.

Test	Species	Concentrations Used	Result
96 hour acute toxicity (static, non-renewal)	Fathead minnow, *Pimephales promelas*	0, 10 000 ppm	LC_{50} > 10 000 ppm no mortality recorded
48 hour acute toxicity (static, non-renewal)	Water flea, *Daphnia magna*	0, 10 000 ppm	LC_{50} > 10 000 ppm no mortality recorded
96 hour acute toxicity - algal growth (static, non-renewal)	Algae, *Selenastrum capricornutum*	0, 1, 10, 100 and 10 000 ppm	> 10 000 ppm w/v no algicidal/inhibitory effects recorded

In all tests, the test substance was insoluble, and floated on the surface or sank to the bottom of test chambers. A saturated solution was used for all of the toxicity tests.

The above toxicity tests demonstrated JONREZ® HC-901 was non-toxic to the range of organisms tested up to the levels of its solubility and by analogy, no ecotoxicological effects are expected for JONREZ® HC-910.

10. ASSESSMENT OF ENVIRONMENTAL HAZARD

Disposal of the notified polymer to landfill is unlikely to present a hazard to the environment, as it unlikely that either the printing varnish or final ink form will be soluble, and should not leach. Biodegradation to a more soluble form is also unlikely.

The low total amount of the notified substance to be disposed of to landfill (approximately 50 kg per annum) is expected to occur in a dispersed manner, thereby minimising the hazard associated with this means of disposal.

The main environmental hazard would arise through spillage in transport accidents that may release quantities of the polymer to drains or waterways. However, the polymer is expected to sink to sediments and remain immobile pending collection and disposal, due to the expected low solubility of the substance. Recycling of spilt material will reduce the losses due to spillage. The Material Safety Data Sheet (MSDS) contains adequate directions for dealing with such spills.

The polymer is likely to persist in sludge resulting from paper recycling conditions or to remain bound to the pulp. Should such wastes be placed in landfill, the polymer is not expected to leach due to its low solubility. Alternatively, incineration may be used to dispose of these wastes.

The low environmental exposure to the polymer as a result of the proposed use, together with the expected low environmental toxicity indicate that the overall environmental hazard should be negligible.

11. ASSESSMENT OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY EFFECTS

Jonrez®HC-910 has been notified as a synthetic polymer of low concern under section 23 for the purpose of section 24A of the Act. The polymer meets the criteria for a synthetic polymer of low concern specified in regulation 4A of the Act and therefore is considered of low hazard to human health.

The notified polymer has a NAMW > 1000 and, as such, is not expected to cross biological membranes. Considering the above and the low monomer levels of the notified polymer any adverse health effects would not be expected to result from exposure to the polymer. However, based on analog data the notified polymer may be a slight eye irritant but would not be classified as hazardous according to the Approved Criteria.

Exposure of workers to the polymer during wharf handling, transportation and storage is expected to be minimal other than in the event of a spill. Exposure during formulation is minimised by the use of an automated and enclosed system with local exhaust ventilation other than during emptying bags containing the polymer. This may give rise to dust generation. However, particle size range of the notified polymer has a low percentage of particles considered to be inspirable (< 1% of ,particles having an aerodynamic diameter < 70 μm) and the respirable fraction is

negligible. The applicable standard for workplace exposure is likely to be that for nuisance dusts (6) this is; TWA 10 mg/m^3 for inspirable dusts.

The notified polymer should be stored and used in areas devoid of open flames, ignition sources and electrical discharges to prevent any possible dust explosions which might occur due to build up of static charges.

Small amounts of ink containing the notified polymer that may be released when ink is squeezed directly onto the printed paper will be carried with solvent fumes and collected by scrubber fans. Hence, exposure from the printing works are expected to minimal.

There is no significant occupational health risk from use of the notified chemical, however other ingredients (petroleum distilled solvents) which can be hazardous may pose health risks.

There is negligible potential for public exposure to the notified polymer arising from ink formulation and printing processes. There will be widespread public contact with the notified polymer on the surface of the printed paper, but its adhesion to the substrate and physico-chemical properties will be sufficient to preclude absorption across the skin or other biological membranes. Based on its use pattern and physico-chemical characteristics, it is considered that the notified polymer will not pose a significant hazard to public health.

12. RECOMMENDATIONS

To minimise occupational exposure to Jonrez®HC-910 the following guidelines and precautions should be observed during the use of adhesives containing the notified polymer:

- Safe practices, for handling any chemical formulation, should be adhered to - these include:
    - minimising spills and splashes;
    - practising good personal hygiene; and
    - practising good housekeeping and maintenance including bunding of large spills which should be cleaned up promptly with absorbents and put into containers for disposal.

  It is expected that, in the industrial environment, protective clothing conforming to and used in accordance with Australian Standard (AS) 2919 (7) and protective footwear conforming to Australian/New Zealand Standard (AS/NZS) 2210 (8) should be worn as a matter of course. In addition it is advisable when handling the product containing the notified polymer to wear chemical-type goggles (selected and fitted according to AS1336 (9) and meeting the requirements of AS/NZS 1337 (10)), impermeable gloves (AS 2161) (11) should be worn to protect against unforseen circumstances. In

printing, If adequate engineering controls are not in place appropriate respiratory device should be selected and used in accordance with AS/NZS1715 (12) and should conform to AS/NZS 1716 (13).

- Proper grounding techniques should be utilised to reduce any possibility of a dust explosion.

- A copy of the MSDS should be easily accessible to employees.

13. MATERIAL SAFETY DATA SHEET

The attached MSDS for the notified chemical was provided in suitable format (14).

This MSDS was provided by Westvaco Pacific Pty Ltd 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.

14. 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.

15. REFERENCES

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