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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME  
(NICNAS)**

**FULL PUBLIC REPORT**

**WP-2**

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (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 Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment, Water, Heritage and the Arts.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at 334-336 Illawarra Road, Marrickville NSW 2204.

This Full Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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**Director  
NICNAS**

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**FULL PUBLIC REPORT****WP-2****1. APPLICANT AND NOTIFICATION DETAILS**

## APPLICANT(S)

Ammtec Limited (ABN: 23 063 332 516)  
6 Macadam Place, Balcatta,  
Western Australia, 6021

Purity Systems Inc. (ABN: 22 040 735 207)  
6 Macadam Place, Balcatta,  
Western Australia, 6021

## NOTIFICATION CATEGORY

Limited: Synthetic polymer with  $M_n \geq 1000$  Da.

## EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication: Chemical name, Molecular and structural formulae, CAS Name, Means of identification, Number Average Molecular Weight, Weight Average Molecular Weight, Weight percentage of low molecular weight species, Charge density, Polymer constituents, Residual monomers and impurities, Reactive functional groups, Import volume, Use details, Site of reformulation.

## VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

Variation to the schedule of data requirements is claimed as follows: Melting/Boiling point, Vapour pressure, Water solubility, Hydrolysis as a function of pH, Partition coefficient, Absorption/Desorption, Dissociation constant, Flash point, Flammability limits, Autoignition temperature and Explosive properties.

## PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

## NOTIFICATION IN OTHER COUNTRIES

None

**2. IDENTITY OF CHEMICAL**

## MARKETING NAME(S)

WP-2 (Notified polymer at >99.5% concentration)

## ANALYTICAL DATA

No spectral data was provided.

**3. COMPOSITION**

## DEGREE OF PURITY

>99.5%

## HAZARDOUS IMPURITIES/RESIDUAL MONOMERS

None

## NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (&gt; 1% by weight)

None

**4. PHYSICAL AND CHEMICAL PROPERTIES**

APPEARANCE AT 20°C AND 101.3 kPa: White to off-white granular powder

Property	Value	Data Source/Justification
Melting Point/Freezing Point	Not determined	Expected to decompose at >200°C.
Boiling Point	Not determined	The notified polymer is solid.
Specific gravity	0.57	Manufacturers specification.
Vapour Pressure	Not determined	Not expected to be volatile, based on structure.
Water Solubility	Not determined	The notified polymer is a high molecular weight, heavily cross-linked particulate solid which is not expected to have any significant water solubility.
Hydrolysis as a Function of pH	Not determined	The notified polymer is not expected to hydrolyse in the environmental pH range (4-9) at ambient temperature.
Partition Coefficient (n-octanol/water)	Not determined	The notified polymer is a high molecular weight, heavily cross-linked solid which is not expected to have any significant solubility in water or octanol.
Adsorption/Desorption	Not determined	The notified polymer is heavily cross-linked, has a very high molecular weight and is not expected to have any significant solubility in water. Therefore, it is expected to associate with soils/sediments.
Dissociation Constant	Not determined	The notified polymer contains functional groups that are expected to be ionised in the environmental pH range (4-9).
Particle Size	Grade A: 85% (180-250 µm) Grade B: 85% (350-650 µm)	Measured.
Flash Point	Not determined	The notified polymer is solid.
Flammability	Not determined	Unlikely to be flammable, based on structure.
Autoignition Temperature	Not determined	Unlikely to autoignite, based on structure.
Explosive Properties	Not determined	Unlikely to be explosive, based on lack of explosives in structure.

#### DISCUSSION OF PROPERTIES

For full details of tests on physical and chemical properties, refer to Appendix A.

#### Reactivity

The notified polymer is stable in both air and in the presence of water.

#### Dangerous Goods classification

Based on the submitted physical-chemical data in the above table, the notified polymer is not classified as dangerous according to the Australian Dangerous Goods Code (NTC, 2007). However, the data above does not address all Dangerous Goods endpoints. Therefore, consideration of all endpoints should be undertaken before a final decision on the Dangerous Goods classification is made by the introducer of the notified polymer.

## 5. INTRODUCTION AND USE INFORMATION

#### MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

The notified polymer will not be manufactured in Australia and will be imported as a finished ion-exchange resin product (WP-2) containing >99.5% of the notified polymer.

#### MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	1	2	3	4	5
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<i>Tonnes</i>	<50	<50	<50	<150	<150
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**PORT OF ENTRY**

All major Australian ports

**IDENTITY OF RECIPIENTS**

Ammtec Ltd., Balcatta , WA.

**TRANSPORTATION AND PACKAGING**

The notified polymer will be imported in 25 kg (44 L) barrels or 25 kg plastic lined paper sacks. For larger bulk orders, bulk bags with opening and closing lids may be used. Packages will be transported from wharf to a warehouse and stored until required for dispatch to customers. The notified polymer will remain in its original packaging until it reaches the customers site.

**USE**

The notified polymer is an ion-exchange resin for use in processing waste streams from industrial or mining processes and environmental remediation and metals recycling.

**OPERATION DESCRIPTION**

The notified polymer will not be manufactured in Australia and will be imported as a finished ion-exchange resin product (WP-2) containing >99.5% of the notified polymer. Depending on the end use, the resin will be manually poured into an ion exchange column (10 – 2500 L), where it will first be treated with dilute mineral acid solution to pre-condition the column for use. Leach solution (from heap, dump or pressure leaching) will be passed through the column followed by a solution of mineral acid (sulphuric, nitric or hydrochloric) to recover the target metal(s) from the column. The column will then be rinsed with water prior to repeating the process with more leach solution. During all these operations, the vessel will be sealed and the equipment operates automatically. The resin can be reused until it loses efficiency (5-10 years).

**6. HUMAN HEALTH IMPLICATIONS****6.1 Exposure assessment****6.1.1 Occupational exposure****NUMBER AND CATEGORY OF WORKERS**

<i>Category of Worker</i>	<i>Number</i>	<i>Exposure Duration (hours/day)</i>	<i>Exposure Frequency (days/year)</i>
Transport & warehouse workers	4	2-3	4
Ion-exchange resins handlers	10-15	3	20

**EXPOSURE DETAILS**

There is little potential for occupational exposure of transport and warehouse workers to the notified polymer unless the packaging is breached.

During unpacking and loading of the resin to tanks, there is a potential for manual handlers to be exposed to the notified polymer by dermal, ocular and inhalation routes. Safety glasses, coveralls, gloves and dust mask are expected to be used during handling of the resin containing notified polymer, which is anticipated to minimise exposure. During the ion-exchange process, the entire system will be closed and operates automatically with minimal potential for exposure. Disposal of the used resin may lead to exposure via the dermal, ocular or inhalation routes. However, exposure to workers is expected to be minimised by the use of safety glasses, coveralls, gloves and dust masks.

**6.1.2. Public exposure**

As the notified polymer will only be used in specific operations in the mining industry, public exposure is not anticipated.

**6.2. Human health effects assessment**

As no toxicological data were submitted for the notified polymer, human health hazards associated with the use

of notified polymer can not be identified. However, the notified polymer has been classified by the manufacturer as irritating to eyes and respiratory system. The notified polymer has a very high molecular weight ( $>10,000$  Da), is insoluble in water and is therefore, not expected to be absorbed or transported across biological membranes.

About 85% of the notified polymer (Grade A) contained particles in the range 180-250  $\mu\text{m}$ . Although the portion of particles in the respirable range ( $<10$   $\mu\text{m}$ ) was not reported, there is a possibility that a small fraction of particles may be respirable.

Respirable, high molecular weight, insoluble polymer particles are considered to be of concern, due to studies in which irreversible lung damage was linked with inhalation of respirable particles of water-insoluble polymers [US EPA (2007)]. This is expected to be a physical effect; i.e. deposition of particles to the deep lung from where they cannot be removed by normal clearance mechanisms. This may lead to lung overloading at higher exposure levels. Normal lung clearance mechanisms are expected to tolerate low exposures to the notified polymer. Furthermore, the MSDS of the product WP-2 states that the chronic, long term exposure (10-30 years) may result in pulmonary fibrosis (silicosis).

#### **Health hazard classification**

As no toxicological data were submitted, the notified polymer cannot be classified according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004). However, the notified polymer has been classified by the manufacturer as follows:

R36: Irritating to eyes

R37: Irritating to respiratory system

### **6.3. Human health risk characterisation**

#### **6.3.1. Occupational health and safety**

The main risk from the use of the notified polymer is eye and respiratory system irritation. Exposure is possible during manual tipping of the resin into column and column packing (loading and recharging). However, the potential for exposure during the ion-exchange process is low as the resin is in sealed equipment and operates automatically. Personal protective equipment, including safety glasses, dust mask and impervious gloves and coveralls are expected to be worn by workers during these processes to minimise exposure to the notified polymer.

However, there is a concern relating to the inhalation hazard of the notified polymer. Although only  $<10\%$  of the notified polymer will have a diameter of  $<180$   $\mu\text{m}$ , the MSDS of the product WP-2 states that the chronic, long term exposure (10-30 years) may result in pulmonary fibrosis (silicosis). Handling of the notified polymer during processes such as unloading of import containers, loading into storage tanks, feeding into ion-exchange columns and disposal may create airborne dusts which have the potential to be inhaled. Furthermore, the notified polymer may also cause respiratory irritation (hazard classification by the manufacturer). Inhalation exposure to dusts of the notified polymer should therefore be minimised as far as possible by the use of a correctly fitted particle filter mask or respirator (adequate for respirable particle sizes) during manual handling of the notified polymer.

The recommended Australian exposure standard for silica gel and dust is 10  $\text{mg}/\text{m}^3$  [NOHSC 3008:(1995)].

#### **6.3.2. Public health**

As the notified polymer is intended for industrial use at specific sites only, exposure to the public is not expected. Therefore, the risk to the public is not considered to be unacceptable.

## **7. ENVIRONMENTAL IMPLICATIONS**

### **7.1. Environmental Exposure & Fate Assessment**

#### **7.1.1 Environmental Exposure**

##### **RELEASE OF CHEMICAL AT SITE**

The imported notified polymer will not be reformulated in Australia. It will be stored in warehouses and sent to customers as required. In the event of accidental spills during transport, the notified polymer is expected to be collected and disposed of to landfill.

##### **RELEASE OF CHEMICAL FROM USE**

Since the imported notified polymer will be in the form of a particulate solid, in the event of an accidental leakage, clean-up procedures (containment and manual collection) are expected to efficiently remove the majority of the released notified polymer. Annually, it is estimated that 1% of the total annual import volume is expected to be lost due to spills during transport, handling and filling of ion-exchange columns. Any spilt material will be collected and placed in sealed containers ready for disposal to landfill.

The notified polymer is an ion-exchange resin that will be used in ion-exchange columns to extract heavy metal cations in the mining, environmental remediation and metal recycling industries. The ion-exchange columns are not cleaned between emptying and refilling with resin, so no waste cleaning stream is created.

Empty import bags/drums will be disposed to landfill. It is estimated that 0.2% of the notified polymer may remain as residue in bags.

The spent polymer resin from columns will be drummed and disposed of to landfill.

##### **RELEASE OF CHEMICAL FROM DISPOSAL**

Disposal of spent notified polymer will be to landfill.

#### **7.1.2 Environmental fate**

No environmental fate data were submitted. The majority of the imported quantity of the notified polymer, once spent, will end up in landfill on the mine sites where it is used or in other appropriate landfill disposal sites. In landfill, the notified polymer is expected to remain immobile within soil and eventually degrade to landfill gases including oxides of carbon and nitrogen, salts and oxides of metals/non-metals and water vapour.

The notified polymer is not expected to cross biological membranes due to its high molecular weight and is therefore not expected to bioaccumulate.

#### **7.1.3 Predicted Environmental Concentration (PEC)**

As direct release to the aquatic environment is not expected, it is neither possible nor appropriate to calculate a predicted environmental concentration (PEC).

### **7.2. Environmental effects assessment**

No ecotoxicity data were submitted.

The toxicity of amphoteric polymers depends on the cation to anion ratio (CAR) and the CAR for the notified polymer is <1, indicating that it is anionic overall. Anionic polymers are known to be moderately toxic to algae when there are acid groups on alternating carbons of the polymer backbone, however, this does not apply to the notified polymer. The toxicity to algae is likely to be further reduced due to the presence of metal ions which will bind to the functional groups. Therefore, the notified polymer is not expected to pose a significant hazard to aquatic organisms (Boethling and Nabholz, 1996).

### 7.2.1 Predicted No-Effect Concentration

As direct release of the notified polymer to the aquatic environment is not expected, it is not appropriate to calculate the predicted no-effect concentration (PNEC).

### 7.3. Environmental risk assessment

The notified polymer will be used on mining and industrial sites. In use, there is limited potential for the release of the notified polymer to the aquatic environment as it is contained within ion-exchange columns. The typical operational lifetime of the notified polymer is long (5–10 years) which implies a low frequency of replacement and disposal of used resin at each site. The ultimate fate of the notified polymer is to be buried in landfill, where it is expected to remain immobile within soil. Based on the reported use pattern and the low potential for environmental exposure the notified polymer is not expected to pose a risk to the environment.

## 8. CONCLUSIONS AND REGULATORY OBLIGATIONS

### 8.1 Hazard classification

As no toxicological data were submitted, the notified polymer cannot be classified according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004). However, the notified polymer has been classified by the manufacturer as follows:

R36: Irritating to eyes

R37: Irritating to respiratory system

In the absence of toxicity information for the notified polymer, NICNAS accepts that the above classification provided by the manufacturer.

As a comparison only, the classification of the notified polymer using the Globally Harmonised System for the Classification and Labelling of Chemicals (GHS) (United Nations 2003) is presented below. This system is not mandated in Australia and carries no legal status but is presented for information purposes.

	<i>Hazard category</i>	<i>Hazard statement</i>
Eye irritation	2B	Causes eye irritation
Respiratory system irritation	3	May cause respiratory irritation

### 8.2 Human health risk assessment

Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unacceptable risk to the health of workers.

When used in the proposed manner, the notified polymer is not considered to pose an unacceptable risk to public health.

### 8.3 Environmental risk assessment

On the basis of the reported use pattern, the notified polymer is not expected to pose a risk to the environment.

### 8.4 Recommendations

Regulatory Controls

Hazard Classification and Labelling

- Safe Work Australia should consider the following health hazard classification for the notified polymer:
  - R36 Irritating to eyes
  - R37 Irritating to respiratory system
- Products/mixtures containing the notified polymer at concentrations  $\geq 20\%$  should contain the risk phrase:
  - R36 Irritating to eyes
  - R37 Irritating to respiratory system



## CONTROL MEASURES

## Occupational Health and Safety

- Employers should implement the following safe work practices to minimise occupational exposure to the notified polymer as introduced in powder form:
  - Avoid contact with eyes and skin
  - Do not breath dust
  - Ensure adequate ventilation is in place to minimise dust levels.
  - The level of atmospheric dust should be maintained as low as possible. The Australian recommended exposure standard for silica gel and dust is 10 mg/m<sup>3</sup> [NOHSC 3008:(1995)].
- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer during handling:
  - Safety glasses
  - Correctly fitted particle filter mask or respirator (adequate for respirable particle sizes)
  - Gloves and overalls

Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the MSDS should be easily accessible to employees.
- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

## Disposal

- The notified chemical should be disposed of to landfill.

## Emergency procedures

- Spills or accidental release of the notified polymer should be handled by physical containment, collection and subsequent safe disposal.

**8.5 Regulatory Obligations**

This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS must be notified in writing within 28 days by the notifier, other importer or manufacturer:

- (1) Under Section 64(2) of the Act; if
  - the function or use of the chemical has changed from ion-exchange resin for use in industrial or mining processes or is likely to change significantly;
  - the amount of chemical being introduced has increased, or is likely to increase, significantly;
  - the chemical has begun to be manufactured in Australia;
  - additional information has become available to the person as to an adverse effect of the chemical on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

*Material Safety Data Sheet*

The MSDS of the notified polymer provided by the notifier was reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

**APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES****Specific Gravity** 0.57 kg/m<sup>3</sup>

Method Unspecified  
Remarks Manufacturer's specification. Test report was not provided.

**Particle Size**

Method Unspecified

<i>Range (μm)</i>	<i>Mass (%)</i>
180-250 (Grade A)	85
350-360 (Grade B)	85

Remarks Test report was not provided.

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- NOHSC (2004) Approved Criteria for Classifying Hazardous Substances, 3<sup>rd</sup> edition [NOHSC:1008(2004)]. National Occupational Health and Safety Commission, Canberra, AusInfo.
- NTC (National Transport Commission) 2007 Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG code), 7th Edition, Commonwealth of Australia
- United Nations (2009) Globally Harmonised System of Classification and Labelling of Chemicals (GHS), 3<sup>rd</sup> revised edition. United Nations Economic Commission for Europe (UN/ECE), <[http://www.unece.org/trans/danger/publi/ghs/ghs\\_rev03/03files\\_e.html](http://www.unece.org/trans/danger/publi/ghs/ghs_rev03/03files_e.html)>.
- US EPA (2007) High Molecular Weight Polymers in the New Chemicals Program. Available online [February 2010]: <http://www.epa.gov/oppt/newchemicals/pubs/hmwtpoly.htm>