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

FULL PUBLIC REPORT

Adduct P88-638

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**Director
Chemicals Notification and Assessment**

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FULL PUBLIC REPORT

Adduct P88-638

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)

Huntsman Advanced Materials (Vantico Pty Limited, ABN 93091627879) of 235 Settlement Road THOMASTOWN VIC 3074.

NOTIFICATION CATEGORY

Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication: chemical identity: chemical name, other name, molecular weight, molecular and structural formulae, spectral data and CAS Number, monomer identity and composition and identity of customer(s).

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

Commercial Evaluation Permit Application for P88-638 was made on 7 August 2003.

NOTIFICATION IN OTHER COUNTRIES

USEPA in January 1988.

2. IDENTITY OF CHEMICAL

OTHER NAME(S)

Ren:C:O-Thane RP 6444 RO (contains notified polymer at > 60%)
RenCast 6444

MARKETING NAME(S)

Adduct P88-638

MOLECULAR WEIGHT

Number Average Molecular Weight (Mn) >1000

METHODS OF DETECTION AND DETERMINATION

ANALYTICAL METHOD	Infrared (IR) spectroscopy
Remarks	An IR spectrum was provided.

3. COMPOSITION

DEGREE OF PURITY

High.

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS

Chemical Name	Isocyanates		
CAS No.	-	Weight %	>10%

Hazardous Properties At concentrations equal to or more than 2% and less than 20%: Toxic (T)
R23 - Toxic by inhalation.
R42/43 - May cause sensitisation by inhalation and skin contact.

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (> 1% by weight)
Exempted information.

ADDITIVES/ADJUVANTS
Exempted information.

POLYMER CONSTITUENTS
Exempted information.

DEGRADATION PRODUCTS
Decomposition products for the product containing the notified polymer are: carbon monoxide, carbon dioxide, nitrogen oxides and other possibly toxic gases and vapours.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
The notified polymer is in liquid form and the total content of residual monomers may be lost to the environment. However, the residual monomers are expected to have low vapour pressure (i.e. <0.0003 mmHg at 20 deg C). Thus, release to atmosphere will be minimal. Once the polymer is mixed with hardener and allowed to cure, the residual monomer will be trapped within the solid matrix.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be imported as RenCast 6444, which has been developed as the isocyanate component of a two component wear resistant polyurea elastomer.

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

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	<10	<10	<10	<10	<10

USE
Isocyanate resin used in casting polyurethane elastomer moulds.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, transport and storage

PORT OF ENTRY
Melbourne.

IDENTITY OF MANUFACTURER/RECIPIENTS
Huntsman Advanced Materials (Vantico Pty Limited).

TRANSPORTATION AND PACKAGING
The product containing the notified polymer will be imported initially in 5 kg kits (3 kg of isocyanate resin and 2 kg of hardener). However, it is envisaged that in the future it will be imported in 200 L drums. The product containing the notified polymer is packed in steel cans or drums, and will be transported by road from wharf to the warehouse where it is stored and then transported to customer(s) site.

5.2. Operation description

The operations which will take place in Australia are transport, storage, blending, moulding, curing and drilling of the cured polymer. The details are described in the next sections.

5.3. Occupational exposure

Number and Category of Workers

<i>Category of Worker</i>	<i>Number</i>	<i>Exposure Duration</i>	<i>Exposure Frequency</i>
Huntsman Advanced Materials			
Transport and Storage	6-8	1-2 hours/week	50 days/year
Customer Site			
Incoming goods receiving personnel	2	1-2 hours/week	50 days/year
Production operators	10	35 hours/week	240 days/year

Exposure Details

Transportation of RenCast 6444 from the wharf to the warehouse and subsequently to customer site will be carried out by accredited carriers in compliance with all relevant transportation regulations.

At the customer's site, two incoming goods receiving personnel will unload the containers of RenCast 6444 and store them in designated storage areas. They may also transfer the drums from the storage area into the production area. The only chance of exposure for these people will be in the case of spillage if a container is accidentally breached.

The production operators transfer RenCast 6444 from the containers into a mixing vessel. RenCast 6444 is blended with the associated hardener RP 6444 HO in an open mixing vessel. The batch size is 20 kg (12.5 kg RenCast 6444 and 7.5 kg RP 6444 HO). The weighing and mixing is carried out in a designated and isolated area. This area is well ventilated. Blending is achieved by manual operation and by use of simple mixing equipment e.g. a mixer attached to a drill. The mixture is then poured into a prepared mould, which contains the negative shape of the part to be cast. Once the resin and hardener have been mixed and poured, cure takes place at normal room temperatures in 24 hours. Operators carrying out these tasks wear overalls, gloves, safety glasses and respiratory protection.

It is envisaged that the supply of RenCast 6444 in future will be in 200 L drums. The weighing/mixing/bending process will take place in-line using an automated mix/metering system. RenCast 6444 will be meter pumped directly from the 200 L drums into the mixing head. The hardener will also be meter pumped into the mixing head. After mixing takes place the mixture is then applied/sprayed through a hose into a prepared mould, which contains the negative shape of the part to be cast. Curing takes place at room temperature. The mix/metering equipment eliminates the need for weighing and mixing and therefore minimises exposure to workers. Operators involved in using the mix/metering equipment will wear overalls, gloves and safety glasses as a precautionary measure.

The production operators typically work a 35-hour week, over 48 weeks per year. However, RenCast 6444 will only be used as required, since the making of new moulds or moulds for new parts is required only intermittently. If new moulds are required at short notice, the production operators may work some overtime.

Once the resin has been cured, some machinery work like drilling may be required to bring the casting size within allowable tolerance limits and also for the casting to be attached to a steel plate which is used to support the casting when the final mould is formed by pressing the sand against the cured polymer. During machining the operators wear safety glasses, overalls and dust masks.

The customer(s) employs skilled tradesmen who have experience in handling chemical products of this type. Typical procedures used to minimise exposure include:

- All operators are required to wear overalls, gloves (to AS 2161) and safety glasses (to AS 1336) whenever handling these chemicals.
- The use of respiratory protection is not normally required due to the use of extraction systems in the factory. Respiratory protection is available in the factory should it be required due to a failure of the extraction system or to clean up any spillage that may occur.
- There are safety procedures specific for the safe handling and disposal of chemicals used on site.
- Prior to any new chemical product being introduced into the factory, a full risk assessment is

carried out by the Site Safety Committee. This is a Standard Operating Procedure.

- In relation to spills, an Emergency Response Team is available to provide all of the necessary information as to what is required to clean up the spill and to carry out the clean-up operation.
- In terms of housekeeping, RenCast 6444 would be kept in a chemical store that is in compliance with all local regulations until it is required to be used in the factory. No containers are allowed to be left in the manufacturing area itself.

5.4. Release

RELEASE OF CHEMICAL AT SITE

At Huntsman Advanced Materials

Release to the environment of RenCast 6444 during storage, due to accidental spillage or damaged drums or pails would not be expected to be significant. The quantities likely to be stored will be relatively small (typically < 2 tonnes). The storage warehouse is fully compliant with all current government regulations relevant to the storage of hazardous chemicals.

RELEASE OF CHEMICAL FROM USE

At Customer site

Release of the adduct to the environment is expected to be minimal. The release points to the environment are:

1. In the case of a spill or damage to the container in which the RenCast 6444 is supplied. Initially the product will be supplied in 5 kg kits (3 kg of isocyanate resin and 2 kg of hardener). In this scenario, a spill will be small, with only $3 \text{ kg} \times 0.83 = 2.5 \text{ kg}$ of Adduct P88-638 being spilt. It is envisaged that supply in the future will be in 200 L drums, since this will facilitate the use of mix/metering equipment which the customer is planning to purchase and use. In this scenario, the amount of RenCast 6444 that would be spilt would be ca 215 kg, which translates to ca 180 kg of the Adduct P88-638. The Adduct P88-638 will never be released in isolation at customer site.
2. Spillage during transfer from the containers in which the product is supplied into the mixing vessel. This process is well controlled, hence spillage would be expected to be minimal and difficult to quantify. A typical mix is of the order of 20 kg which translates to 12.5 kg of the resin and 7.5 kg of hardener. In the 12.5 kg of resin, there is ca 10.4 kg of the Adduct P88-638.
3. Residual material in the containers. This product is of relatively low viscosity, hence it is reasonable to assume that > 98% of the contents of each container will be consumed. For the 3 kg pails, only 0.06 kg of product will remain and for the 200 L drums, only 4.3 kg of product will remain. These containers will be collected by licensed waste contractors for disposal in landfill. Hence, up to 200 kg of the notified polymer will be disposed of in landfill per annum.
4. As small amount of the notified polymer (< 100 kg, 1%) of the notified polymer will be disposed as waste from cleaning of mixing equipment. This waste will be dissolved in a solvent and collected by a licensed waste disposal contractor.
5. At the customer site, it is highly unlikely that any of the Adduct P88-638 will enter the waterways due to it being used under well controlled conditions and the site is contained in the sense of having an emergency storm water shut-off valve. In the event of an emergency, the pipe that takes stormwater from the factory site into the main stormwater drain is automatically closed.
6. The release of Adduct P88-638 or RenCast 6444 to the atmosphere is not likely to be of any significance due to the adduct having a high molecular weight hence a low vapour pressure. It is used at ambient temperatures only.

The notified polymer is a reactive species that will react with the hardener component or water to form

an inert polymeric material.

The RenCast 6444 product itself will present the most significant opportunities for release to the environment as discussed above. However, once the resin and hardener have been mixed, reaction occurs which results in the formation of an inert polymeric material. It is usual for waste cured material to be disposed of as industrial waste at an approved landfill.

5.5. Disposal

Most waste material resulting from the use of RenCast 6444 on site is usually disposed of as industrial waste. It is mixed with hardener and allowed to solidify prior to disposal. Wastage by the applicators is usually minimal due to the nature of the work done (i.e. making of moulds as required) and the high cost of the products, which dictates maximum utilisation of the products.

The majority of the notified polymer will be disposed of to landfill or incinerated at the end of the products' useful lifetimes bound within the cured polymer matrix.

5.6. Public exposure

The notified polymer or products containing it will not be sold to the public. It will only be used for industrial applications.

Normally the public will not come into contact with Adduct P88-638, or RenCast 6444. The only scenario where the public would have any direct exposure to the adduct would be in the event of a spill from a drum or pail of RenCast 6444. Such a spill could only occur during transport from the wharf/airport to the customer site or to the warehouse and subsequently to the customer.

6. PHYSICAL AND CHEMICAL PROPERTIES

The information below is for RenCast 6444 containing >60% notified polymer .

Appearance at 20°C and 101.3 kPa	Amber liquid with slight odour.
Melting Point/Freezing Point	Not determined, but expected to be < 0°C.
Boiling Point	> 200°C
Density	1050 kg/m ³ at 25°C
Vapour Pressure	Data not available.
Remarks	Vapour pressure expected to be 4×10^{-5} kPa at 20°C based on the presence of residual isophoronediiisocyanate.
Water Solubility	Not determined.
Remarks	The notified polymer contains free isocyanate groups which will react with water to form an amine. The formed amine can react with the free isocyanate resulting in the formation of a biuret crosslink. It is therefore anticipated that in the presence of water the notified polymer crosslink to form a new polymer of higher molecular weight. Hence, the product of the reaction with water would be expected to have little water solubility.
Hydrolysis as a Function of pH	Not determined.
Remarks	The free isocyanate groups of the polymer would be expected to undergo hydrolysis as described above but at a slow rate in the absence of a catalyst.
Partition Coefficient (n-octanol/water)	Not determined.

Remarks	The notified polymer is expected to react with water to form a new polymer of low water solubility. Hence it is expected that the notified polymer would partition to the organic phase.
Adsorption/Desorption	Not determined.
Remarks	As noted above the notified polymer will react with water to form a new polymer of low water solubility. Hence it is expected that the notified polymer will sorb strongly to sediments.
Dissociation Constant	Not determined.
Remarks	The polymer will react with water.
Particle Size	Not applicable for a liquid.
Flash Point	> 150°C
METHOD	(DIN 51758 – Pensky-Martens Closed Cup)
Flammability Limits	Not determined, but not expected to be flammable.
Autoignition Temperature	Not determined.
Explosive Properties	Not determined, but not expected to be explosive.
Reactivity	<p>The adduct will react with water, strong oxidising agents, strong acids and strong bases. Hazardous decomposition products are carbon dioxide, carbon monoxide, nitrogen oxides and other possibly toxic gases and vapours.</p> <p>This product will not decompose explosively.</p>
Viscosity	7500 mPa.s at 23°C
METHOD	OECD TG 114 Viscosity of Liquids.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicity data were submitted.

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data were submitted.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

The notified polymer will be imported as part of a two part polyurethane elastomer casting product. As such the majority of the notified polymer will be bound within the polymer matrix of the cured articles. The use of the cast articles will be restricted to an industrial environment. Some release of the notified polymer into the environment may occur during manufacture and during cleaning of mixing equipment.

The notifier estimates approximately 300 kg per year of the notified polymer will be released during manufacture, either as waste in import containers or as washings of mixing equipment. Wastes in import containers will be disposed of to approved landfill as cured resin. Washings from the cleaning of mixing equipment will be collected by a licensed liquid waste contractor who will reclaim the solvent and dispose of solid residues to approved landfill.

The majority of the notified polymer will be disposed of in landfill bound within the polymer matrix in the articles into which it has been cast at the end of their useful lifetime. In landfill, it is anticipated that the cured polymer will not be mobile and will degrade slowly to give water and oxides of carbon and nitrogen.

9.1.2. Environment – effects assessment

No data were provided for the notified polymer. Based on the anticipated low water solubility as a result of the reaction with water and the high molecular weight, it is anticipated that the notified polymer would have low aquatic toxicity.

9.1.3. Environment – risk characterisation

The notified polymer is an additive in casting resins, and as such, most of it will be incorporated into an inert plastic matrix, posing little risk to the environment.

Most wastes generated during casting and in container residues are typically allowed to harden, where the polymer is bound within the plastic matrix in an inert manner, hence environmental risks are low, particularly in landfills with leachate collection and treatment plants.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

The notified polymer will be imported as a component of the formulated product Ren:C:O-Thane RP 6444RO or RenCast 6444. The concentration of the notified polymer in RenCast 6444 is > 60%. The balance is residual isocyanates.

After the resin and hardener have been cured, some machining and/or drilling of the cured polymer may be required. Cured polymer matrix is not bioavailable, but small particles or dust will be generated during machinery operations. The operators wear safety glasses, overalls and dust masks during machining operations.

The occupational exposure is considered to be low when the industrial controls are in place and personal protective equipment is worn by the workers.

9.2.2. Public health – exposure assessment

The public will not come into contact with Adduct P88-638 or RenCast 6444 in the ordinary course of events. The only scenario where the public would have any direct exposure to the adduct would be in the event of a spill from a drum or pail of RenCast 6444.

9.2.3. Human health - effects assessment

The notified polymer has free isocyanate functional groups. RenCast 6444 also contains free methylene-bis (4-cyclohexylisocyanate) (CAS No. 5124-30-1) and isophoronediiisocyanate (CAS No. 4098-71-9). All isocyanates (as NCO) are on the NOHSC *List of Designated Hazardous Substances* (NOHSC, 1999a). According to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b), the notified polymer is classified as a hazardous substance.

9.2.4. Occupational health and safety – risk characterisation

Isocyanate compounds in relatively high concentrations have a strong irritant effect on the respiratory tract in most people. They are irritating to the skin and eyes. Skin sensitisation is seen with some isocyanates. Other health effects, which have been reported, include liver and kidney dysfunction.

Dermal and inhalation exposure to the notified polymer is possible during manual casting operations but the occupational exposure is expected to be low due to the industrial controls in the workplace and personal protective equipment worn by the workers. NOHSC (1995) has established an exposure standard (0.02 mg/m³ TWA or 0.07 mg/m³ STEL) for all isocyanates (as -NCO). NOHSC also has published a special guidebook on isocyanates (NOHSC, 1990). When the notifier follows the NOHSC guidebook while handling isocyanates in the workplace, the adverse health risk is expected to be low.

During mechanical operations, inhalation exposure to the small particles or dust may occur. The national exposure standard for nuisance dusts is 10 mg/m³ TWA (NOHSC, 1995). Australia has no exposure standard for respirable dust, however, the ACGIH TLV of 3 mg/m³ TWA is recommended (ACGIH, 2001).

The notified polymer may be present in formulations containing hazardous ingredients. If these formulations are classified as hazardous to health in accordance with the NOHSC Approved Criteria for Classifying Hazardous Substances, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

9.2.5. Public health – risk characterisation

As there will be little exposure of the public to the notified polymer or products containing the notified polymer the risk to the public from exposure to the notified polymer is considered low.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available data the notified chemical is classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b). The classification and labelling details are:

R23 (Toxic by inhalation)

R36/37/38 (Irritating to eyes, respiratory system and skin)

R42/43 (May cause sensitisation by inhalation and skin contact).

As a comparison only, the classification of 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>
Acute toxicity	3	Toxic if inhaled.
Skin corrosion/irritation	2	Causes skin irritation
Serious eye damage/ eye irritation	2B	Causes eye irritation
Respiratory sensitiser	1	May cause allergic or asthmatic symptoms or breathing difficulties if inhaled
Skin sensitiser	1	May cause allergic skin reaction

10.2. Environmental risk assessment

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is Moderate Concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is Negligible Concern to public health based on its reported use pattern.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the imported product containing the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

REGULATORY CONTROLS

Hazard Classification and Labelling

- Use the following risk phrases for the notified polymer:
 - R23 (Toxic by inhalation)
 - R36/37/38 (irritating to eyes, respiratory system and skin)
 - R42/43 (May cause sensitisation by inhalation and skin contact).
- The notified polymer should be classified as follows under the ADG Code:
 - Class 9, Packing Group III

Health Surveillance

- As the notified polymer is a health hazard, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a significant risk of the health effect.

CONTROL MEASURES

Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer:
 - local exhaust ventilation during casting and mechanical operations.
- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer:
 - Safe work practice measures described in NOHSC Guidebook “Isocyanates”.
- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer:
 - Protective clothing

- Protective gloves
- Eye protection
- Respirators during casting operations, and masks during mechanical operations.

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

- Atmospheric monitoring should be conducted to measure workplace concentrations of isocyanates during formulation and use of the notified polymer.
- 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 NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- The following control measures should be implemented by end users to minimise environmental exposure during use of the notified chemical:
 - Do not allow material or contaminated packaging to enter drains, sewers or water courses.

Disposal

- The product containing the notified polymer should be mixed with hardener and allowed to solidify prior to disposal in an approved landfill.

Emergency procedures

- In case of spill, prevent product from entering drains. Do not contaminate surface water. Avoid aerosol formation. Spilt material should be absorbed into dry, inert material (e.g. sand, vermiculite) which then can be put into appropriately labelled drums for disposal as chemical waste.

12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

- (1) Under Section 64(1) of the Act; if
 - the use pattern of the notified polymer changes from casting polyurethane elastomer moulds.
- or
- (2) Under Section 64(2) of the Act:
 - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

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