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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

EvCote PWRH-100

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Director
Chemicals Notification and Assessment

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1. APPLICANT

Asia Pacific Specialty Chemicals Limited (APS) of 15 Park Road SEVEN HILLS NSW 2147 (ABN 32 000 316 138) has submitted a notification statement in support of their application for an assessment certificate for the synthetic polymer of low concern (PLC), EvCote PWRH-100.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and manufacture/import volume have been exempted from publication in the Full Public Report.

Marketing name: EvCote PWRH-100

3. POLYMER COMPOSITION AND PURITY

Details of the polymer composition have been exempted from publication in the Full Public Report.

Purity: High

4. PLC JUSTIFICATION

The notified polymer meets the PLC criteria.

5. PHYSICAL AND CHEMICAL PROPERTIES

Property	Result	Comments
Appearance	Light amber coloured solid or powder.	Aqueous dispersion appears as a transluscent cloudy pale yellow solution.
Melting point	82ºC	
Density	1.12 g/cm^3	
Water solubility	<15 mg/L	See comments below
Particle size	>1mm = 40.3% <1mm - 600µm = 24.6% <600µm - 250µm= 25.1% <250µm = 10%	The particle size distribution was determined by sieve testing of a sample provided from the U.S.A.
Flammability	Not flammable	
Autoignition temperature	Not determined	The minimum temperature of a dust cloud is approximately 390ºC.
Explosive properties	Not determined	Dust/air mixtures may be explosive.
Stability/reactivity	Not determined	The notified polymer is stable and not reactive. It will not depolymerise at standard temperatures and pH range of 6-8 if dispersed in water.
Hydrolysis as function of pH	Not determined	The notified polymer contains ester linkages which could hydrolyse but would not be expected to do so under environmental conditions (pH 4-9).
Partition coefficient	Not determined	The low water solubility of the polymer indicates that it will preferentially partition into the organic phase.
Adsorption/desorption	Not determined	The polymer is expected to strongly adsorb to soils.
Dissociation constant	Not determined	The polymer contains a carboxylic acid functionality (pKa ~ 5), which would dissociate at the lower end of environmental pH conditions (pH 4-9).

Comments on physical and chemical properties

Water solubility was determined by gravimetric analysis. Ten mL of water were added to 15 g of the notified polymer and the slurry was magnetically stirred for 24 hours. The slurry was then placed into a 25 mL syringe fitted with a 0.2 μm syringe filter. The filtrate was placed in a tared drying dish and dried to constant weight at 105° C. The water solubility was then calculated by the ratio of soluble fraction to the sample weight (15 g). The soluble fraction of the polymer comprised <0.00015% and the water solubility of the polymer was determined to be <15 mg/L.

6. USE, VOLUME AND FORMULATION

Use:
The notified polymer is intended for use as a strength enhancer and moisture barrier coating for paper and paper products. It is likely to be used as a replacement for wax coatings, currently used on some paper products.

Manufacture/Import volume:
The estimated quantity of the notified polymer to be manufactured will be greater than 10000 tonnes over the next five years. In addition to the manufactured polymer, <100 tonnes of the solid notified polymer may be imported while the production scale up is implemented during the first year.

Formulation details:
Initially, the notified polymer will be imported into Australia in 25 kg multiwalled bags. The solid polymer will be stored at the notifier's warehouse prior to paper impregnation. The notified polymer will be manually loaded into a dispersion tank containing water and ammonia, mixed to form a 25% aqueous dispersion, which will be pumped pneumatically into 1000 L mini tanks.

During manufacture, the raw materials will be loaded into an 8000L reactor and stirred under controlled thermal conditions to produce the notified polymer. Once the reaction is complete, the polymer will either be packed off into open head drums where it will solidify, or transferred to blending vessels (12000L) where the polymer will be diluted with ammonia and water into an aqueous dispersion. The product will then be pumped pneumatically into 200 L drums (solid) or 1000 L mini tanks (dispersion).

If the polymer is packed off as a solid, it will subsequently be crushed to a coarse powder in a mill fitted with local exhaust ventilation. The polymer will then be charged into a blending vessel with water and ammonia, and stirred to create a 25% aqueous dispersion. The dispersion is then packed off as above.

7. OCCUPATIONAL EXPOSURE

The paper treatment process is enclosed and automated. The 25% polymer dispersion is pumped to a coating tank via dedicated transfer hoses from the holding tank. It is estimated that 50 tonnes of polymer dispersion will be used over 24 hours of paper coating. The paper will travel through the coating tank and the dispersion will be absorbed onto the paper, which travels through a drying chamber. Once dried, the notified polymer is cured and impregnated onto the paper. In this form, the notified polymer is not bioavailable for exposure.

Exposure route	Exposure details	Controls indicated by notifier
Polymer Manufacture *Drumming off polymer, crushing of polymer, loading and blending of polymer to form aqueous dispersion (maximum 10 workers, 2[a] chemical plant operators, 1.5 hours/day, 70 days/year[b])*		
Drumming off polymer		
dermal	Dermal exposure to spills and splashes	• Automated transfer and drumming operations • Personal protective equipment (PPE) - overalls, safety glasses, gloves and safety footwear
Crush solidified polymer into coarse powder		
Respiratory, ocular and dermal	Inhalation of, and eye and dermal exposure to dust particles generated during crushing of solid polymer	• Crushing and blending is under local exhaust ventilation • PPE – overalls, safety glasses, gloves and safety footwear and respiratory protection
Transfer of polymer (solid) to mixing vessels (for dispersion)		
Respiratory and dermal	Inhalation exposure to dust particles and skin contamination from drips and spills	• Mixing operations are enclosed • Automated transfer and drumming operations • PPE – as above
Transfer of aqueous dispersion to 1000L mini-tanks		
Dermal	skin contamination from drips and spills	• Automated transfer operations • PPE – overalls, safety glasses, gloves and safety footwear
Quality control testing (maximum 10 technicians; 1.5 hours/day; 70 days/year)		
Dermal	Dermal contact from drips and spills	• PPE - laboratory coats, safety glasses, safety footwear and gloves

Paper Treatment *Application of dispersion to paper (overall exposure of workers depends on the range of paper products to which the polymer will be applied; estimated 2 hours/day)*		
Pumping dispersion to holding tanks		
Dermal	Dermal exposure from drips and spills when connecting and disconnecting transfer pumps.	• Automated transfer operations • PPE – as above
Transfer of dispersion to paper coating tank		
Dermal	Dermal exposure from drips and spills when adding dispersion into coating systems and maintenance and cleaning of paper making machine	• Automated transfer operations • Enclosed paper treatment process • Local exhaust ventilation fitted above the coating bath on the papermaking machine • PPE – as above
Drying of coated paper		
Dermal	Dermal exposure to freshly treated paper	• PPE – as above • No PPE specified for handling dried coated paper
Transport and storage		
Storage and transport of multiwalled bags; transport and storage of mini tanks (approximately 10 workers)		
dermal	Possible skin contamination if accidental spillage occurs and clean-up is required	• None specified

[a]Normally 1 chemical plant operator will be exposed to the notified polymer.

[b]The notifier estimates that plant operators may be exposed to the notified polymer for a total maximum of 1.5 hours/day 70 days/year during the manufacturing, crushing/blending and packing-off processes.

8. PUBLIC EXPOSURE

The notified polymer is not available for sale to the public. The potential for public exposure to the notified polymer during manufacture, transport, reformulation or disposal is likely to be negligible. Although members of the public will make dermal contact with dried form of the notified polymer when handling treated paper, public exposure is expected to be low

9. ENVIRONMENTAL EXPOSURE

9.1. Release

Little environmental release is expected during the manufacture of the notified polymer as only water vapours are likely to be emitted from the condensation polymerisation reaction. The notifier has stated that this condensate will be returned to the reactor during the later part of the manufacturing process.

Only minor release is anticipated during mixing operations, as these will be carried out under enclosed conditions with waste extraction and scrubbing facilities. However, some polymer may be released to the environment as a result of washing equipment. The notifier has indicated that approximately 1% will be lost due to hanging up used vessels, but are likely to be considerably less if a 'campaign' regimen of manufacture is followed, where there is no requirement to clean manufacturing equipment between batches. If maximum import volumes are assumed, up to 100 tonnes per annum of the polymer could be released to the environment as a result of equipment cleaning. These washings will be removed via transfer lines to the Trade Waste treatment plant and will be processed at the notifier's site. Residual sludge from the waste treatment process will be further treated at a waste treatment plant outside the notifier's site. Due to the low water solubility of the polymer, the vast bulk will associate with sludges and be disposed of to landfill.

The notifier has stated that 200 L drums are used to store the polymer on an interim basis. These will be sold to drum reconditioners for reprocessing. Empty packaging, such as plastic liner bags, will be disposed of to landfill. The notifier estimates that up to 100 g per drum of residual polymer adhering to liners could be disposed to landfill. If maximum import quantities are assumed, up to 50 tonnes per annum of residual polymer could go to landfill.

The paper treatment process is enclosed and automated and little environmental release is expected as the polymer dispersion is transferred via dedicated transfer hoses from the holding tank to the coating tank. The treated paper will then be oven dried to cure the polymer and, according to the notifier, this will render it unavailable to the environment. The notifier has stated that release to the aquatic compartment will be minimal, as the polymer dispersion will be applied to the paper after it has been formed, just prior to it entering the drying chamber. The only polymer likely to end up in the effluent treatment plant is from the washing and cleaning of the coating tank. At the plant, polymer wastes will be removed with a polyacrylamide flocculant to clarify the effluent and suspended solids will be collected with rotary drum filters and disposed of to landfill. It is estimated that a further 1% (100 kg) polymer per annum could be disposed of to landfill from this route.

The great bulk of the polymer is likely to reside in landfill, either as a result of the disposal of paper products to which it is bound, or the disposal of sludge material from the recycling of waste paper, cartons and other paper products. Minor amounts of polymer products may be incinerated.

9.2. Fate

The majority of the notified polymer will share the fate of the paper substrates to which it is bound. Waste paper products containing the polymer are likely to be landfilled or recycled, and minor amounts may be incinerated. The polymer, along with virtually all commodity plastics, is characterised by high molecular weight, insolubility in water, low chemical reactivity, and resistance to biodegradation, photolysis and hydrolysis. These characteristics are associated with little inherent hazard in terms of ecotoxicity (Bartha et al, 1997).

In landfill, it is expected that the polymer will slowly break down and become part of the soil matrix and is unlikely to leach from the soil due to its low water solubility. Dispersion polymers exhibit a strong potential to sorb to soils, sludges, and sediments, and are virtually immobile when associated with organic matter. (Guiney et al, 1997). During the repulping and treatment procedures employed in recycling paper or carton wastes, the notifier has stated that the polymer will either be destroyed or incorporated into the sludge compartment. However, it is unlikely that destruction of the polymer will be achieved in treatment plants, but the polymer is likely to absorb strongly to sludges. The notifier has stated that sludges will be disposed of to landfill or incinerated, while aqueous wastes will be further treated before discharge into sewer. The incineration of polymer wastes would yield water and oxides of carbon while waste polymer discharged into the aquatic compartment would associate with sediments.

The polymer is not expected to cross biological membranes, due to its high molecular weight and low water solubility and, as such, should not bioaccumulate (Connell, 1990).

10. EVALUATION OF HEALTH EFFECTS DATA

No toxicological data were submitted.

11. EVALUATION OF ENVIRONMENTAL EFFECTS DATA

No ecotoxicological data were provided.

12. ENVIRONMENTAL RISK ASSSESSMENT

The aqueous dispersion containing up to 25% of the notified polymer will be sold to paper manufacturers who will apply it as a coating or impregnate it into a range of paper products. These paper products will then be distributed to the general public. Once applied and dried, the polymer is expected to be durable and not easily removed from the paper to which it has applied. Therefore, little release of the ‘free’ polymer is anticipated and the great majority of environmental release of the polymer will be as a result of disposal to landfill, incineration or recycling of waste paper products. Additionally, there may be some minor release to the aquatic compartment from the paper/carton recycling processes.

In landfill, the polymer will exist as a stable polyester and is unlikely to be mobile in the soil environment and would be expected to very slowly degrade to gas such as carbon dioxide through abiotic and biotic processes. The environmental risk of the notified polymer in

landfill is expected to be low. Incineration of the polymer would yield water and oxides of carbon. In the case of aquatic discharge, the polymer is likely to associate with sediments.

The high molecular weight and expected low water solubility of the polymer should prevent bioaccumulation.

Given the above considerations, the overall environmental risk is expected to be low.

13. HEALTH AND SAFETY RISK ASSESSMENT

13.1. Hazard assessment

No toxicological information was provided for the notified polymer. The notified polymer has a high molecular weight and is unlikely to penetrate biological membranes. It contains carboxylic acid groups and very low concentrations of residual monomers. The polymer meets the PLC criteria and is unlikely to be a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999).

The notified polymer is not a dangerous good for road and rail transport.

The Material Safety Data Sheet (MSDS) for the notified polymer lists a number of potential health effects based on products of similar composition, namely irritation of the gastrointestinal tract with upper abdominal pain, nausea, vomiting and diarrhoea if swallowed, irritation of the eye with discomfort or blurring resulting in eye damage if exposure is prolonged, irritation of the skin following prolonged exposure and irritation of the upper respiratory passages following overexposure by inhalation. The MSDS for the aqueous polymer dispersion lists potential health effects as irritation of the gastrointestinal tract, nausea, vomiting and diarrhoea if the liquid is swallowed, irritation to the eye causing redness and pain following eye exposure, skin irritation following prolonged exposure of the skin to the liquid and irritation of the upper respiratory tract following mist inhalation. The adverse health effects relate to the physical characteristics of the solid polymer particles rather than its toxicological effects.

13.2. Occupational health and safety

During polymer manufacture, crushing of the solid polymer and blending of the crushed polymer into an aqueous dispersion there is potential for respiratory, ocular and dermal exposure to the coarse particles of the notified polymer. There is no NOHSC exposure standard for the notified polymer itself, however the NOHSC exposure standard for nuisance dust is 10 mg/m^3 (NOHSC, 1995). The manufacturing, crushing and blending processes are largely enclosed, with local exhaust ventilation provided. Workers handling the notified polymer will wear personal protective equipment including overalls, safety glasses, gloves, safety footwear and respiratory protection. These controls will also provide protection against exposure to other constituents of the polymer dispersion. These controls and the low toxicological impact render the health risk from the notified polymer during manufacture, crushing and blending of polymer low.

Inhalation exposure to airborne particulates and skin contamination from drips and spills is possible when packing off the polymer and the dispersion into containers. The expected low hazard of the notified polymer and the use protective equipment to mitigate exposure render the health risk to workers during the packing off of the polymer and its dispersion low.

During quality control testing of samples of the polymer, intermittent dermal contact can occur. Laboratory workers are protected by wearing laboratory coats, safety glasses and gloves. The health risk to workers during this process is low.

Dermal exposure to spills when adding the dispersion into coating systems can occur during the paper treatment process, which is largely enclosed and automated. Plant operators are protected from dermal exposure by wearing overalls, safety glasses and gloves. Once the notified polymer is impregnated onto the paper and has dried, it becomes unavailable for exposure. Therefore, due to the low potential for exposure and the low health hazard of the notified polymer, the health risk to paper treatment workers is low.

There is no occupational exposure expected for transport and storage workers except in the event of accidental spillage.

Conclusion
The notified polymer is of low hazard to human health and safety. The standard control measures in place during plant operation and protective measures during quality control and application of the dispersion to paper will ensure sufficient protection against the notified polymer. Therefore, the notified polymer is of low concern to human health and safety and no additional risk reduction measures are necessary.

13.3. Public health
The notified polymer is not available for sale to the general public. Although members of the public will make dermal contact with the dried form of the notified polymer when handling treated paper items, the risk to public health from the notified polymer is likely to be low because the notified polymer is unlikely to be bioavailable.

14. MSDS AND LABEL ASSESSMENT

14.1. MSDS

The MSDS of the notified polymer and products containing the polymer provided by the notifier were in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). The MSDS of the notified polymer is published here as part of the assessment report. The accuracy of the information on the MSDS remains the responsibility of the applicant.

14.2. 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.

15. RECOMMENDATIONS

Control Measures

No specific precautions are required to control exposure to the notified polymer. However, in the interests of good occupational health and safety, the following guidelines and precautions should be observed:

- Employers should implement the following engineering controls to minimise occupational exposure:
  - Exhaust ventilation during manufacture, blending, crushing and filling process
  - Enclosed and automated manufacture process

- Employers should implement the following safe work practices to minimise occupational exposure:
  - During manual transfer of notified polymer and polymer dispersion into reaction tanks and coating bath, avoid spills and splashing
  - Avoid generation of dust clouds when handling the polymer in powder form

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer:
  - Chemical resistant gloves
  - Protective clothing which protects the body, arms and legs
  - Eye protection when splashes are generated
  - A dust mask when dusts are generated

  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 polymer 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.

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 subsection 64(1) of the Act; if
  - the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

or

(2) Under subsection 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.

16. REFERENCES

Bartha R. et al (1997) Plastics. In: Ecological Assessment of Polymers, pp 167-184. Van Nostrand Reinhold, New York, USA

Connell, D.W. (1990) General Characteristics of Organic Compounds Which Exhibit Bioaccumulation. In: Bioaccumulation of Xenobiotic Compounds, pp 47-57. CRC Press, Boca Raton, USA.

Guiney P.D. et al (1997) *Dispersion Polymers*. In: Ecological Assessment of Polymers, pp 147-165. Van Nostrand Reinhold, New York, USA

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National Occupational Health and Safety Commission (1999) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.