



Government
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UPDATE TO THE RISK MANAGEMENT STRATEGY

for

Acrylonitrile

(ACN)

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This risk management strategy is an update to the risk management strategy for acrylonitrile published in 2002, and outlines a path forward to continue managing risk to human health. Comments on this document or other information that would inform decision making are welcome.

1. ISSUE

An environmental and human health risk assessment was conducted for the priority substance acrylonitrile under the *Canadian Environmental Protection Act, 1999* (CEPA 1999). The final Priority Substances List (PSL) Assessment Report for acrylonitrile was published in Part I of the *Canada Gazette* on May 27, 2000 (Environment Canada and Health Canada 2000).

The environmental risk assessment section of the report concluded that acrylonitrile is not entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity and that acrylonitrile is not entering the environment in a quantity or concentration or under conditions that constitute or that may constitute a danger to the environment on which life depends.

The human health risk assessment section of the report concluded that acrylonitrile does enter the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health.

Acrylonitrile is considered to meet the criteria in paragraph 64(c) of CEPA 1999 because of its potential for carcinogenicity. A range of tumours in rats—including those of the central nervous system (brain and/or spinal cord), ear canal, gastrointestinal tract and mammary glands—has been consistently observed following both ingestion and inhalation. While increases in cancer have not been observed in available epidemiological studies, their weight is insufficient to rule out increases in particularly rare tumours. Available data are insufficient to support a consensus view on a plausible mode of action for induction of tumours by acrylonitrile by other than direct interaction with genetic material and, as a result, there is considered to be a probability of harm at any level of exposure.

The higher exposure via outdoor air estimated for populations near industrial point sources was identified as a particular concern. On May 9, 2001, the final order to add acrylonitrile to the List of Toxic Substances in Schedule 1 of CEPA 1999 was published in the *Canada Gazette*, Part II.

2. HOW CONCERNS WERE ADDRESSED BY THE GOVERNMENT OF CANADA

In May 2002, a risk management strategy for acrylonitrile was posted online for public comment (Environment Canada 2002). The risk management objective was the reduction of releases of acrylonitrile from the major industrial sources to the lowest achievable levels by the application of best available techniques economically achievable by December 31, 2005. Since one company accounted for the majority of the emissions to outdoor air, the focus of risk management action

was on reducing those emissions. The proposed risk management instrument for preventing or controlling releases of acrylonitrile from this company was a pollution prevention plan.

On May 24, 2003, the Minister of the Environment published a notice requiring the preparation and implementation of pollution prevention plans in respect of acrylonitrile. The notice applied to owners or operators of facilities involved in the manufacture of synthetic rubber, where such manufacture used acrylonitrile and resulted in releases of acrylonitrile to the environment (Environment Canada 2003).

On September 10, 2003, under section 200 of CEPA 1999, the Minister of the Environment published the *Environmental Emergency Regulations* which applied to a number of substances including acrylonitrile. These regulations require anyone storing or using acrylonitrile above a threshold quantity of 9.1 tonnes and at a concentration equal to or greater than 10% to prepare an environmental emergency plan (Environment Canada 2003-a).

Since the publication of the PSL assessment report and the pollution prevention (P2) planning notice respectively in 2000 and 2003, the following new information regarding releases and exposure has become available:

- Since 2008, the largest emitter at the time of the publication of the 2003 P2 planning notice no longer uses nor releases acrylonitrile.
- According to the National Pollutant Release Inventory (NPRI) data, a facility in a different industry sector is now the single largest acrylonitrile emitter in Canada.
- Data on air concentrations of acrylonitrile in the vicinity of this facility has become available.

3. WHY AN UPDATE TO THE RISK MANAGEMENT STRATEGY IS NEEDED

Since the original P2 planning notice was issued in May 2003, Environment Canada had been monitoring the NPRI to identify and address any significant new sources of acrylonitrile emissions not subject to the original P2 planning notice. Towards the end of 2005, Environment Canada and Health Canada began working with various agencies in Quebec, including the Ministère du Développement durable, de l'Environnement et des Parcs (MDDEP) and industry to characterize an increase in acrylonitrile emissions reported to NPRI to determine if further risk management measures would be warranted. At the same time, the company responsible for this increase was planning an expansion of its facility, which had the potential for increasing its emissions even further. The MDDEP then issued a certificate of approval for this expansion, requiring that an emission reduction action plan be implemented by that facility to reduce its acrylonitrile releases. The combined federal/provincial actions had resulted in significant emission reductions when in December 2008, the Commissioner of the Environment and Sustainable Development to the House of Commons tabled a report to Parliament recommending that Environment Canada review and update its risk management strategy (RMS) for acrylonitrile to take into account significant new sources of the substance. In its response, Environment Canada confirmed that it would update the RMS.

4. CURRENT USES AND INDUSTRIAL SECTORS

Acrylonitrile is not produced in Canada but is imported and used as a monomer/reactant in applications such as the production of styrene-acrylonitrile (SAN) foam and polymers, acrylic emulsions and diamines. In 2008, it is estimated that 5900 metric tonnes of acrylonitrile were imported in Canada, all of which were imported from the United States (CEH 2008).

Acrylonitrile is known to be used for the production of acrylonitrile-butadiene-styrene (ABS) resins. ABS resins are only imported and used in Canada but are not currently produced. In the past, acrylonitrile was also imported into Canada for the manufacturing of nitrile-butadiene rubber (NBR), but in 2008, the only Canadian NBR manufacturer transferred its production outside of Canada. A literature research showed that acrylonitrile is also commonly used as a chemical intermediate in the production of acrylic fibres, adiponitrile and acrylamide (CEH 2008). Adiponitrile is used in the production of nylon 66, but adiponitrile has not been produced in Canada since 1986 (CEH 2007).

5. PRESENCE IN THE CANADIAN ENVIRONMENT AND EXPOSURE SOURCES

5.1 Releases to the Environment

In 2009, 10 facilities reported releases of acrylonitrile to NPRI, with 4 of them reporting releases to air (Table 1).

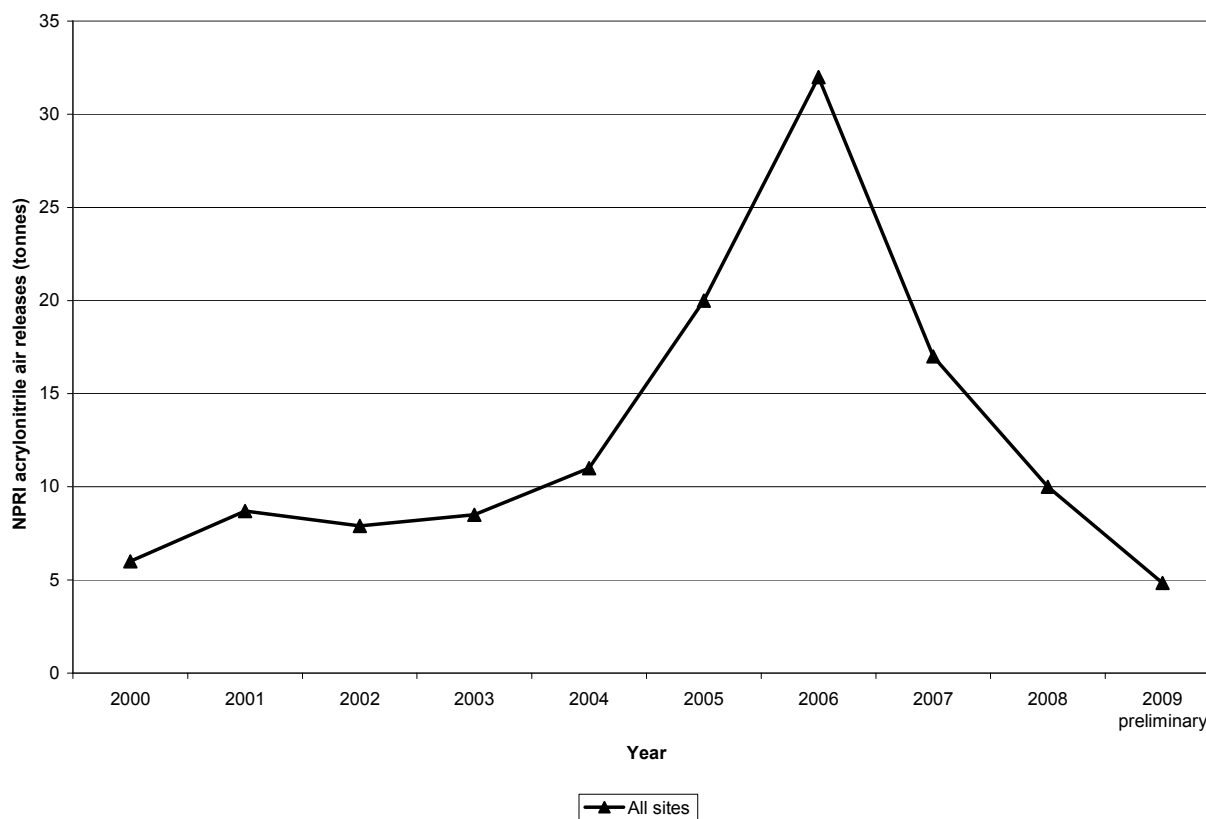
Table 1: List of facilities reporting acrylonitrile air release to NPRI in 2009

Facility name	Location	Air release (tonnes)
Gurit (Canada) Inc.	Magog, QC	4.410
Rohm and Haas Canada LP	West Hill, ON	0.425
Dow Chemical Canada Inc.	Varennnes, QC	0.002
Fournitures Funéraires Victoriaville	Victoriaville, QC	0.001

Source: NPRI preliminary data 2009

As illustrated in Figure 1, since the PSL assessment report was published (Environment Canada and Health Canada 2000), the total air releases of acrylonitrile have increased from 6 tonnes in 2000, to a peak of 32 tonnes in 2006, followed by a decrease to 4.8 tonnes in 2009.

Figure 1: Total air releases of acrylonitrile from 2000 to 2009 (source: NPRI 2000-2008 data, NPRI preliminary data 2009)



The major source of air releases in 2009 was one facility in the plastic sector with 91% of the releases. Since 2006, the largest single emitter has reduced its releases from 28.5 to 4.4 tonnes (NPRI preliminary data 2009) through installation of pollution control equipment. This facility is operating under a certificate of approval issued by the province of Quebec which required the company to develop and implement actions to address its acrylonitrile releases.

5.2 Exposure Sources

Acrylonitrile is not known to occur naturally, and there are no known reactions that could lead to in situ formation of this substance in the atmosphere (Grosjean 1990).

According to the 2000 PSL assessment report, Canadians are mostly exposed to acrylonitrile through releases to air. The percentage of exposure through water is 2.7%, while exposure through air is 97.3% (Environment Canada and Health Canada 2000).

The PSL assessment report estimated that indoor air was the principal medium of exposure to acrylonitrile; however, this was a function of the methodology used to derive the exposure estimate. Acrylonitrile has not been detected in indoor air in Canada, which is consistent with the nearly entire lack of known indoor air sources. Indeed, in the absence of data on levels of acrylonitrile in indoor air, most of the scenarios in the assessment assumed that indoor air levels were the same as those estimated for outdoors. The one exception documented in the assessment report is tobacco smoke. Acrylonitrile has been measured in tobacco smoke in a number of

studies, and acrylonitrile-hemoglobin adducts have been measured consistently in the blood of smokers, while in non-smokers they were not detected or were present at very low levels (Environment Canada and Health Canada 2000).

The PSL assessment report recommendations assigned a higher priority to investigation of options to reduce exposure in the vicinity of industrial point sources (Environment Canada and Health Canada 2000).

Monitoring in the vicinity of the largest industrial emitter showed that acrylonitrile ambient air yearly average concentrations were reduced by 16% between 2008 and 2009.

6. CONSIDERATIONS

6.1 Alternative Chemicals or Substitutes

No information was found with respect to alternative chemicals or substitutes. Acrylonitrile is mostly used as a raw material / feedstock to manufacture plastic and rubber; replacing acrylonitrile in these applications would not be feasible.

6.2 Alternative Technologies and/or Techniques

Air releases of acrylonitrile from industrial sites may be decreased by the use of abatement technology. Oxidative techniques, particularly the use of a thermal oxidizer, have proven to be both practically and economically viable for acrylonitrile point source air emissions.

6.3 Children's Exposure

The 2000 PSL assessment report evaluated exposure of the general population to acrylonitrile by age groups, which included groups for infants and children. On the basis of point estimates, it was concluded that intake from ambient and indoor air ranges from 96% to 100% of total intake by the general population.

7. PROPOSED OBJECTIVES

7.1 Environmental or Human Health Objective

An environmental or human health objective is a quantitative or qualitative statement of what should be achieved to address environmental or human health concerns identified during a risk assessment.

While there was no environmental or human health objective identified in the original risk management strategy for acrylonitrile, the generally accepted human health objective for non-threshold carcinogenic substances like acrylonitrile is to minimize human exposure to the extent practicable.

7.2 Risk Management Objective

A risk management objective (RMO) is a target expected to be achieved for a given substance by the implementation of risk management regulations, instrument(s) and/or tool(s). Environment Canada's original risk management objective was the reduction of releases of acrylonitrile from the major industrial sources to the lowest achievable levels by the application of best available techniques economically achievable (BATEA). This objective is still valid.

8. PROPOSED RISK MANAGEMENT

8.1 Action on Existing Sources

8.1.1 Acrylonitrile emissions from the plastic sector

Based on NPRI reports of the last four years (NPRI 2000-2008 data, NPRI preliminary data 2009), one facility (production of SAN foam) releases the large majority of all industrial acrylonitrile emissions (91%). The implementation of BATEA at this facility has resulted in a reduction of its acrylonitrile emissions by 84.5% over the last four years (NPRI 2000-2008 data, NPRI preliminary data 2009). Ambient air monitoring program results in the vicinity of this site show that acrylonitrile concentrations were reduced by 16% in the last two years.

One other facility in the plastic sector (production of polystyrene foam product) reported minimal (2 kg in 2009) releases of acrylonitrile to air.

Given that the largest acrylonitrile emitter in this sector has significantly reduced its acrylonitrile releases by implementing BATEA and thus achieved the RMO, no risk management actions are considered, at this time, for the plastic sector.

8.1.2 Acrylonitrile emissions from the rubber sector

The single NBR manufacturer subject to the 2003 P2 notice prepared and implemented its P2 plan. The RMO was achieved by implementing BATEA. In 2008 this facility transferred its NBR production outside of Canada.

Given that this facility has prepared and implemented a P2 plan for acrylonitrile and is no longer using or releasing acrylonitrile, no risk management actions are considered, at this time, for the rubber sector.

8.1.3 Acrylonitrile emissions from the chemical manufacturing sector

The 2009 acrylonitrile releases for one facility in the chemical manufacturing sector (production of acrylic emulsions) are minimal as a result of the implementation of BATEA at the facility.

Given that this facility has achieved the RMO by implementing BATEA and the small relative contribution of that sector to total releases of acrylonitrile, no risk management actions are considered, at this time, for the chemical manufacturing sector.

8.1.4 Acrylonitrile emissions from other sectors

One facility in the wood product manufacturing sector reported releases of only 1 kg of acrylonitrile to air in 2009.

Given the minimal contribution of that sector to releases and its even smaller impact related to exposure, no risk management actions are considered, at this time, for the wood product manufacturing sector.

8.1.5 Acrylonitrile in tobacco smoke

Given the broad range of activities included in Canada's comprehensive tobacco control strategy, and recent ones aimed specifically at particular chemicals, including acrylonitrile in tobacco smoke (i.e., the *Tobacco Products Information Regulations* and the *Tobacco Reporting Regulations*), no additional risk management initiatives for acrylonitrile are planned at this time.

9. NEXT STEPS / PROPOSED TIMELINE

Environment Canada and Health Canada will continue to identify and evaluate new sources or increased releases from existing sources of acrylonitrile in the future to determine if the new activity requires further risk management consideration.

Releases of acrylonitrile will continue to be monitored through review of NPRI reports. Consideration will be given to reduce the NPRI reporting threshold for this substance (presently 10 tonnes produced or used annually) to facilitate a more comprehensive review of industry sources. Acrylonitrile will also be considered for inclusion in the upcoming update for substances on the Domestic Substances List (DSL).

Facilities storing or using acrylonitrile above a threshold quantity of 9.1 tonnes are still subject to the *Environmental Emergency Regulations*.

Industry and other interested stakeholders who wish to provide any comments on this updated risk management strategy can send them to the following address:

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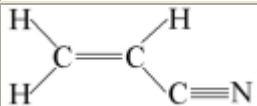
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ANNEX 1 SUBSTANCE INFORMATION

Acrylonitrile is a volatile, flammable, colourless liquid with a weakly pungent odour at room temperature.

Substance Identity

Chemical Abstracts Service Registry Number (CAS RN)	107-13-1
Domestic Substances List (DSL) name	2-Propenenitrile
National Chemical Inventory (NCI) names¹	2-Propenenitrile (TSCA, REACH, AICS, ECL, SWISS, PICCS, ASIA-PAC, NZIoC) Acrylonitrile (EINECS, ENCS, ECL, PICCS) PROP-2-ENENITRILE (PICCS)
Other names	acrylic acid nitrile, acrylon, carbacryl, cyanoethene, cyanoethylene, fumigrain, propenenitrile, propenoic acid nitrile, propylene nitrile, VCN, ventox and vinyl cyanide
Chemical group (DSL stream)	Organics
Chemical formula	C ₃ H ₃ N
Chemical structure	
Molecular mass	53.06 g/mol

¹Abbreviations: National Chemical Inventories (NCI). 2010: AICS (Australian Inventory of Chemical Substances); ASIA-PAC (Asia-Pacific Substances Lists); ECL (Korean Existing Chemicals List); EINECS (European Inventory of Existing Commercial Chemical Substances); ENCS (Japanese Existing and New Chemical Substances); NZIoC (New Zealand Inventory of Chemicals); PICCS (Philippine Inventory of Chemicals and Chemical Substances); REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances); SWISS (Inventory of Newly Notified Substances and Giftlist 1 - List of Toxic Substances); and TSCA (Toxic Substances Control Act Chemical Substance Inventory).

ANNEX 2 OVERVIEW OF EXISTING ACTIONS

Existing Canadian Risk Management

Federal Acts and Regulations

- Under the *Canadian Environmental Protection Act, 1999* (CEPA 1999), acrylonitrile is listed in Schedule 1;
- Under the *Canadian Environmental Protection Act, 1999* (CEPA 1999); *Environmental Emergency Regulations*, an environmental emergency plan must be prepared and implemented by anyone storing or using acrylonitrile above a concentration of 10% and a threshold quantity of 9.1 tonnes;
- Under the *Canadian Environmental Protection Act, 1999* (CEPA 1999): National Pollutant Release Inventory, facilities need to report acrylonitrile releases if acrylonitrile was manufactured, processed or otherwise used at the facility in a quantity of 10 tonnes or more and employees worked 20 000 hours or more;
- Under the *Canadian Environmental Protection Act, 1999* (CEPA 1999): *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, waste material or recyclable material containing acrylonitrile (stabilized) in a concentration by mass above 100 mg/kg is considered hazardous;
- Under the *Transportation of Dangerous Goods Act: Transportation of Dangerous Goods Regulations*, acrylonitrile (stabilized) is forbidden in passenger-carrying ships, road and rail and is a Class 3 (Flammable Liquids) substance;
- Under the *Hazardous Product Act*, acrylonitrile at or above a concentration of 0.1%-weight/weight is listed on the Ingredient Disclosure List;
- Under the *Canada Shipping Act: Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals*, acrylonitrile is listed as a pollutant;
- Under the *Food and Drug Act: Food and Drug Regulations*, no person shall sell a food in a package that may yield to its contents any amount of acrylonitrile as determined by official method FO-41.

Provincial and Territorial Acts and Regulations

- Under Ontario's *Environmental Protection Act: Ontario Regulation 127/01 Airborne Contaminant Discharge – Monitoring and Reporting*, acrylonitrile is subject to monitoring and reporting requirements (same threshold as NPRI, 10 000 kg/yr);
- Under Ontario's *Toxics Reduction Act*, S.O. 2009 c.19, acrylonitrile is listed in Phase 2 of the proposed list of toxic substances;
- Under Ontario's *Environmental Protection Act: Ontario Regulation 419/05 Air Pollution – Local Air Quality*, acrylonitrile is subject to the following air standards: the 1/2-hr average concentration is 1.8 µg/m³ for all sectors not listed in Schedule 4 and the 24-hr average concentration is 0.6 µg/m³ for sectors listed in Schedule 4;
- Under Ontario's *Occupational Health and Safety Act: Ontario Regulation 490/09 Designated Substances*, acrylonitrile is prescribed as a designated substance;

- Under Ontario's *Occupational Health and Safety Act: Regulation 833 Control of Exposure to Biological or Chemical Agents*, the Time-Weighted Average (TWA) exposure of a worker to airborne acrylonitrile shall not exceed 2 ppm and the ceiling limit shall not exceed 10 ppm;
- Under Ontario's *Environmental Protection Act: Regulation 347 General-Waste Management*, acrylonitrile is listed in Schedule 1 as F039, K011, K013, K014 and is subject to concentration limits for land disposal of hazardous waste. There is a limit of 0.24 mg/L for aqueous waste and 84 mg/kg for non-aqueous waste. All waste generators meeting the requirements must register their facilities annually;
- Under Quebec's *Mise à jour des critères québécois de qualité de l'air*, March 2010, the limit value for acrylonitrile concentration is 12 µg/m³ on an annual basis;
- Under Quebec's *Environmental Quality Act: Land Protection and Rehabilitation Regulation*, R.Q. c. Q-2, r.18.1.01, acrylonitrile is listed in Schedule 1 and 2 under "Other Organic Substances". Limit prescribed in Schedule 1 is 1 mg/kg of soil (dry matter). Limit prescribed in Schedule 2 is 5 mg/kg of soil (dry matter);
- Under Quebec's *Environmental Quality Act: Respecting the Burial of Contaminated Soils Regulation*, R.Q. c. Q-2, r.6.01, acrylonitrile is listed in Schedule 1 and is subject to a concentration limit of 840 mg/kg of dry matter;
- Under Quebec's *Occupational Health and Safety Act: Regulation Respecting the Quality of the Work Environment*, R.Q. c. S-2.1, r.15, the TWA values for acrylonitrile is 2 ppm (4.3 mg/m³);
- Under Quebec's *Occupational Health and Safety Act: Regulation Respecting Industrial and Commercial Establishments*, R.Q. c. S-2.1, r.9, acrylonitrile is listed as a hazardous chemical substance in Schedule 4;
- Under Quebec's *Environment Quality Act: Land Protection and Rehabilitation Regulation*, R.Q. c. Q-2, r.18.1.01, acrylonitrile is a soil contaminant;
- Under Newfoundland and Labrador's *Environmental Protection Act: Air Pollution Control Regulation 56/03*, acrylonitrile is listed in Schedule A, subject to 24-hr air quality standard, and must not exceed 100 µg/m³;
- Under British Columbia's *Environmental Management Act: Hazardous Waste Regulation 63/2009*, acrylonitrile is listed in Schedule 7 as waste types 26, 27 and 28;
- Under British Columbia's *Environmental Management Act: Contaminated Sites Regulation 343/2008*, acrylonitrile is subjected to soil and vapour standards listed in Schedules 10 and 11. Agricultural, Urban Park, Residential Soil Standard = 2.1 µg/g, Commercial, Industrial Soil Standard = 4.9 µg/g, Drinking Water Standard = 1.2 µg/L, Agricultural, Urban Park, Residential Use Standard = 1.5 µg/m³, Commercial Use Standard = 1.5 µg/m³, Industrial Use Standard = 1.5 µg/m³;
- Under British Columbia's *Workers Compensation Act: Occupational Health and Safety Regulation Part 5*, B.C. Reg. 296/97, acrylonitrile is classified as Skin, 2B Carcinogen, and subject to an 8-hr TWA limit of 2 ppm;
- Under Alberta's *Environmental Protection and Enhancement Act: Ambient Air Quality Objectives*, acrylonitrile is subjected to a limit of 1-hr average concentration = 43 µg/m³ (19 ppb) and an annual long-term exposure of 2 µg/m³ (0.9 ppb);
- Under Alberta's *Environmental Protection and Enhancement Act: Waste Control Regulation 192/96*, acrylonitrile is listed and classified as a hazardous waste;

- Under Saskatchewan's *Occupational Health and Safety Act (1993): Occupational Health and Safety Regulations*, R.R.S. c. O-1.1 Reg. 1, the exposure limits for acrylonitrile are 2 ppm (8-hr limit) and 4 ppm (15-min limit);
- Under Saskatchewan's *Environmental Management and Protection Act (2002): Environmental Spill Control Regulations*, R.R.S. c. D-14 Reg. 1, acrylonitrile is subject to reporting requirements if spills are equal to or greater than the following amounts, On-Site = 25L, Off-Site = 5L, within a 24-hr period;
- Under Yukon's *Occupational Health and Safety Act: Occupational Health and Safety Regulations*, Y.O.I.C. 2006/178, acrylonitrile is an air contaminant and a carcinogen. It is subject to a worker's exposure permissible concentration limit of 45 mg/m³ (8-hr limit) and 70 mg/m³ (15-min limit);
- Under the Northwest Territories' *Safety Act: General Safety Regulations*, R.R.N.W.T. 1990, c. S-1, acrylonitrile is subject to exposure limits of 4.3 mg/m³ (8-hr limit) and 8.6 mg/m³ (15-min limit).

Existing United States Risk Management

Federal Agencies and Departments

- Under the Department of Transportation (DOT), acrylonitrile is declared a hazardous material, and special requirements have been set for marking, labelling and transporting this material;
- Under the Environmental Protection Agency (EPA) *Clean Air Act*, acrylonitrile is listed as 1 of 33 Hazardous Air Pollutants (HAP) posing the greatest threat to public health in urban areas. Manufacturing is subjected to certain provisions for the control of Volatile Organic Compound (VOC) emissions. Threshold Quantity of 20 000 lb (9 metric tonnes) for prevention of accidental release;
- Under the Environmental Protection Agency (EPA) *Clean Water Act*, the water quality criteria is 0.05 µg/L (based on fish/shellfish) and the water consumption is 0.25 µg/L (based on fish/shellfish consumption only);
- Under the Environmental Protection Agency (EPA) *Comprehensive Environmental Response Compensation and Liability Act*, the reportable quantity of acrylonitrile is 100 lb (approximately 45 kg);
- Under the Environmental Protection Agency (EPA) *Emergency Planning and Community Right-to-Know Act*, acrylonitrile is subject to reporting requirements and the threshold planning quantity is 10 000 lb (approximately 4 545 kg);
- Under the Environmental Protection Agency (EPA) *Resource Conservation and Recovery Act*, acrylonitrile is listed as a Hazardous Constituent of Waste;
- Under the Food and Drug Administration (FDA), acrylonitrile copolymers and resins containing less than 30% acrylonitrile may be used in food packaging materials;
- Under the Occupational Health and Safety Administration (OHSA), acrylonitrile Ceiling Concentration (15-min exposure) is 10 ppm, the Permissible Exposure Limit is 2 ppm, the recommended Exposure Limit is 1 ppm and the Immediately Dangerous to Life and Health Concentration is 85 ppm.

Individual U.S. States

- Under California's *Permissible Exposure Limits for Chemical Contaminants*, acrylonitrile is known in the State of California to cause cancer, birth defects and other reproductive harm. It requires a warning label (prop 65), and has a permissible exposure limit of 2 ppm;
- Under New York's *Chapter V – Resource Management Services: Part 597 List of Hazardous Substances*, the reportable quantities for acrylonitrile are 100 pounds (approximately 45 kg) in air and 1 pound (454 g) in water or land;
- Under Texas' *Effects Screening Levels List*, acrylonitrile has a short-term Effects Screening Level (ESL) of 40 µg/m³ or 20 ppb and a long-term ESL of 4 µg/m³ or 2 ppb;
- Under Massachusetts' *Revised Air Guidelines*, the Threshold Effects Exposure Limit (TEL) = 0.4 µg/m³ or 0.18 ppb (24-hr average) and Allowable Ambient Limit (AAL) = 0.01 µg/m³ or 0.0046 ppb (annual average).

Existing International Risk Management

- Under the European Union (EU) directive relating to plastic materials and articles intended to come into contact with foodstuffs, acrylonitrile is on the list of authorized monomers and other starting substances with a specific migration limit (SML) that is not detectable (ND), corresponding to a detection limit (DL) of 0.020 mg/kg;
- The EU published a final risk assessment of acrylonitrile (2004).
 - The environmental conclusions were:
 - There is a need for limiting the risks; risk reduction measures which are already being applied shall be taken into account;
 - There is at present no need for further information or testing or risk reduction measures beyond those which are being applied already;
 - Concerns for effects on the local aquatic sphere as a consequence of exposure arising from production of acrylic fibres at a particular site.
 - The human health (humans exposed via the environment) conclusions were:
 - There is a need for limiting the risks; risk reduction measures which are already being applied shall be taken into account;
 - There is at present no need for further information or testing or risk reduction measures beyond those which are being applied already.
- Under the United Kingdom's *EPP2 Regulations Annex II Environmental Permitting (England and Wales) Regulations 2010*, acrylonitrile maximum storage quantity in bulk is 20 tonnes;
- Under the United Kingdom's *Control of Substances Hazardous to Health Regulations*, acrylonitrile must have an 8-hr TWA limit of 2 ppm or 4.4 mg/m³;
- Under the United Kingdom's *Cosmetic Products (Safety) Regulations 2008 No. 1284*, acrylonitrile is prohibited in cosmetic products;

- Under Denmark's *Limit Values for Substances and Materials (October 2002)*, acrylonitrile 8-hr time weighted average (TWA) exposure limit is 2 ppm;
- Under Switzerland's *Prévention des accidents et des maladies professionnelles*, acrylonitrile 8-hr time weighted average (TWA) exposure limit is 2 ppm;
- Australia's industrial use must be reported to relevant public authorities and requires health surveillance. Acrylonitrile is listed in Schedule 7 of *Australian Standard for the Uniform Scheduling of Drugs and Poisons*. Worksafe Australia recommends an 8-hr time weighted average (TWA) exposure limit of 2 ppm;
- Under New Zealand's *Workplace Exposure Standards*, acrylonitrile 8-hr time weighted average (TWA) exposure limit is 2 ppm;
- Under Japan's *Recommendation of Occupational Exposure Limits (2008-2009)*, acrylonitrile 8-hr time weighted average (TWA) exposure limit is 2 ppm and is classified as a carcinogenic class 2A;
- Under South Africa's *Regulations for Hazardous Chemical Substances – Annex 1*, acrylonitrile 8-hr time weighted average (TWA) exposure limit is 2 ppm.