EPRI

toxics release inventory

Chemical Profile

Environment

Ammonia

What is ammonia?

Ammonia (NH_3) is a colorless, corrosive gas with a distinctive odor. The smell of ammonia is familiar to anyone who uses household window cleaning solutions made from ammonia dissolved in water. Ammonia is naturally present in air, water, and soil.

Ammonia is an important industrial chemical. About 18 million tons of ammonia are manufactured for industrial use each year in the United States. It is used as a fertilizer, coolant for refrigeration, cleaning and bleaching agent, and fungicide to protect fruit crops. Ammonia is also used to manufacture many chemicals and plastics, and to treat metals. Water treatment plants sometimes add ammonia to drinking water to eliminate the unpleasant taste and smell of chlorine.

How is ammonia released by electric utilities?

Electric utilities release ammonia as a by-product of controlling nitrogen oxides that can combine with other chemicals in the air to form acid rain or ozone (part of "smog"). With increasing frequency, electric utilities are required to install pollution control equipment that destroys nitrogen oxides before they reach the air. This pollution control equipment uses chemical processes called "selective catalytic reduction" or "selective non-catalytic reduction." In either process, a form of ammonia is injected into hot gases coming from the boiler where fuel is being burned. The ammonia combines with most of the nitrogen oxides in the gases and "reduces" them to nitrogen and water vapor that are released into the air—along with small amounts of ammonia not consumed in the reduction process.

Coal-burning power plants are equipped with devices to capture ash particles before they reach the air. To improve particle capture, some plant operators inject ammonia into hot gases coming from the boiler before those gases reach the particle control device. Particle control devices typically capture more than 99% of the ash, so very little ash enters the air. Small amounts of ammonia in the form of a salt can remain in boiler ash, which is usually sent to ash ponds or land disposal sites.

The amount of ammonia that U.S. power plants release into the air each year is presently unknown, but is expected to be small.

Is ammonia also released by other sources?

In nature, dead plants and animal wastes release ammonia as they decay. On the other hand, living plants and microorganisms take up ammonia because they need the nitrogen in it to grow. Thus, ammonia cycles through the environment. Natural releases from this cycle are much larger than those from all human activities.

Ammonia released into the environment by human activities comes mainly from chemical plants, metal production facilities, food processors, paper plants, and petroleum refineries. Large amounts of ammonia, in various chemical forms, are applied to agricultural lands as fertilizer. Industries reporting to the U.S. Environmental Protection Agency (EPA) released 95,000 tons of ammonia into the environment in 1996. About 80% was released into the air.

What happens to ammonia after it is released by electric utilities?

Ammonia released into the air from power plants spreads widely. Eventually it settles to the ground, where it is taken up by plants or microorganisms directly from the air, or from water and soil.

Ash pond wastewater discharged into public waterways may contain small amounts of ammonia, but these amounts are regulated by local permits.

How might people be exposed to ammonia?

People are commonly exposed to small amounts of ammonia naturally present in the foods they eat, the air they breathe, and the water they drink. They may be exposed to larger amounts of ammonia when they touch household or industrial cleaning solutions and breathe ammonia released by them, or

when they apply fertilizers or work near decaying animal wastes in agricultural settings. Industrial workers may breathe concentrated airborne ammonia on the job or touch concentrated ammonia solutions.

What are the potential effects of ammonia on human health?

Concentrated ammonia in the air can irritate people's eyes, skin, and breathing passages, and can damage body tissues over time. Direct contact with concentrated ammonia solutions can burn the skin. However, there is no evidence that common exposures to dilute ammonia, such as window cleaning solutions, can harm human health. In fact, ammonia has such an unpleasant odor that most people avoid exposures that would cause health effects. Ammonia has not been found to cause cancer or birth defects.

How likely is it that utility releases pose a risk to human health?

It is very unlikely that ammonia from power plants poses a risk to human health. The concentration of ammonia in power plant stack gases is typically less than 5 parts of ammonia per 1 million parts of gas, and this concentration is reduced hundreds of times as stack gases mix with the air. In contrast, the federal long-term exposure limit for industrial workers is 50 parts of ammonia per 1 million parts of air—a level thought to pose no risk to human health.

EPA has not classified ammonia as a hazardous air pollutant. For this reason, ammonia was not included in EPA's 1998 analysis of health risks from power plant releases of hazardous air pollutants.

How is ammonia regulated?

EPA requires that 100 pounds or more of ammonia be reported if it is spilled or released without a permit. Some states require utilities to file an Environmental Impact Report and perform a hazardous substance risk assessment when they store ammonia on their property. Under the National Pollutant Discharge Elimination System, federal and state regulators determine how much ammonia each power plant may release in wastewater discharges. The Food and Drug Administration has found that amounts of ammonia and related compounds normally present in food pose no health risk, but the agency does regulate the amount of ammonia in certain processed foods. The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health have set limits on the amount of ammonia in workplace air.

Where can I get more information about ammonia?

The Agency for Toxic Substances and Disease Registry (ATSDR) has a fact sheet with answers to frequently asked health questions about ammonia. It is available through the ATSDR Information Center at 1-800-447-1544, or on the Internet at http://atsdr1.atsdr.cdc.gov:8080/ToxProfiles/phs9003.html

This Toxics Release Inventory Chemical Profile is available by email at tricoord@epri.com. Funders of Environment may download it from the Internet at http://www.epriweb.com/eg/funders/tri/index.html

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