SENATE AGRICULTURE
EXHIBIT NO. 1
DATE 1/14/05
BILL NO. SB201

United States
Environmental Protection
Agency

Office of Solid Waste
and Emergency Response
(5104)

EPA-F-00-005
March 2000
www.epa.gov/ceppo/

EPA

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Anhydrous Ammonia Theft

The Environmental Protection Agency (EPA) is issuing this Alert as part of its ongoing effort to protect human health and the environment by preventing chemical accidents. EPA is striving to learn the causes and contributing factors associated with chemical accidents and to prevent their recurrence. Major chemical accidents cannot be prevented solely through regulatory requirements. Rather, understanding the fundamental root causes, widely disseminating the lessons learned, and integrating these lessons learned into safe operations are also required. EPA publishes Alerts to increase awareness of possible hazards. It is important that facilities, SERCs, LEPCs, emergency responders, and others review this information and take appropriate steps to minimize risk. This document does not substitute for EPA's regulations, nor is it a regulation itself. It cannot and does not impose legally binding requirements on EPA, states, or the regulated community, and the measures it describes may not apply to a particular situation based upon circumstances. This guidance does not represent final agency action and may change in the future, as appropriate.

CHEMICAL SAFETY ALERT

Who should read this Alert? This Alert discusses the potential hazards of anhydrous ammonia releases caused by theft, steps facilities can take to prevent theft and how to minimize health and safety risks associated with accidental releases. This Alert should be read by individuals who operate and maintain agricultural retail operations, facilities with ammonia refrigeration systems and farmers who apply anhydrous ammonia as a fertilizer. Furthermore, this Alert should be reviewed by law enforcement personnel, emergency responders and members of Local Emergency Planning Committees (LEPCs).

PROBLEM

Anhydrous ammonia is used as an agricultural fertilizer and industrial refrigerant. The substance is stored and used at agricultural retailers and facilities with ammonia refrigeration systems. Anhydrous ammonia also is a key ingredient in the illegal production of methamphetamines. Illegal drug makers often steal anhydrous ammonia from areas where it is stored and used. Anhydrous ammonia is stored as a liquid under pressure, however, it becomes a toxic gas when released to the environment. Anhydrous ammonia can be harmful to individuals who come into contact with it or inhale airborne concentrations of the gas. When stolen, the toxic gas can be unintentionally released, causing injuries to emergency responders, law enforcement personnel, the public, and the criminals themselves.

ACCIDENTS

A number of anhydrous ammonia thefts have resulted in accidental chemical releases from agricultural retailers and facilities with ammonia refrigeration systems. The accidents have occurred when valves were left open as anhydrous ammonia was siphoned off; locks were sawed or broken; anhydrous ammonia was transferred inappropriately into makeshift containers such as propane tanks used on barbeque grills; plugs were removed from anhydrous ammonia lines at refrigeration facilities; or the wrong hoses and/or fittings were attached to storage containers, causing leaks and spills that would otherwise not have occurred.

The following section describes several recent examples in more detail.

- ✓ April 1997 - More than 2,000 pounds of anhydrous ammonia were released from a refrigerated warehouse. A

fence was cut to gain entry into the facility and the anhydrous ammonia was removed through a valve on an oil separator. The valve was left open. Fortunately, the release was mitigated by a rain storm that knocked down the anhydrous ammonia vapor as it was being released to the outside air. The warehouse owner replaced the fence, installed a valve lock on the oil separator valve, and requested enhanced police surveillance following the incident.

✓ April 1998 - An individual attempted to steal anhydrous ammonia from a nurse tank at a retail agricultural dealer in Iowa. The liquid withdrawal valve was left open on the nurse tank and caused an ammonia release that quickly vaporized to the air. One passerby was overcome by the anhydrous ammonia fumes and collapsed. Another nearby resident was overcome by ammonia fumes after leaving her home. Both individuals were hospitalized. Several other area residents were evacuated as a precaution. The agricultural dealer installed security lights following the incident.

✓ April 1999 - A hose on a 30,000-gallon bulk storage tank of anhydrous ammonia was cut intentionally by thieves which resulted in an accidental release at an Illinois fertilizer dealer. One police officer was hospitalized and a highway was shut down for a half hour.

✓ May 1999 - One person was killed when a makeshift container of anhydrous ammonia he was holding exploded. The death occurred when two individuals were driving on an interstate highway in Missouri. The driver was severely injured. The ammonia was to be used for methamphetamine production. Since the cause of the smoke emanating from the car was not immediately known, one fire-fighter, one emergency medical technician, and one member of the general public, all of whom stopped to help and drag the passenger and driver from the car, were also injured as a result of the ammonia release.

✓ February 2000 - Approximately 1000 pounds of anhydrous ammonia were released when someone intentionally opened a valve in the middle of the night at a fertilizer dealer in Missouri. The ammonia release caused 300 residents to be evacuated from their homes and two persons reported respiratory irritation problems. Ammonia theft has been almost a weekly occurrence at this facility. A local law enforcement investigation is currently underway.

HAZARD AWARENESS

Anhydrous ammonia is used widely and in large quantities for a variety of purposes. More than 80% of the ammonia produced in the United States is used for agricultural purposes; less than 2% is used for refrigeration. Ammonia is generally safe provided handling, operating, and maintenance procedures are followed. Anhydrous ammonia is toxic, however, and can be a health hazard. Effects of inhalation of anhydrous ammonia range from lung irritation to severe respiratory injuries, with possible fatality at higher concentrations. Anhydrous ammonia also is corrosive and can burn the skin and eyes. Liquefied anhydrous ammonia is stored as a liquid and has a boiling point of minus 28 degrees Fahrenheit. At this temperature it can cause freezing burns.

When stored for agricultural purposes and for use in refrigeration systems, anhydrous ammonia is liquefied under pressure. Liquid anhydrous ammonia expands 850 times when released to ambient air and can form large vapor clouds. Also, liquid anhydrous ammonia, if accidentally released, may aerosolize (i.e., small liquid droplets may be released along with ammonia gas) and behave as a dense gas, even though it is normally lighter than air.

Anhydrous ammonia may also cause water vapor to condense in the air forming a visible white cloud. Therefore, when anhydrous ammonia is released to the air, it may travel along the ground in a cloud instead of immediately rising into the air and dispersing. This dense gas behavior may increase the potential for exposure of workers and the public.

Anhydrous ammonia containers have particular specifications as required by the Department of Transportation (DOT). Storage tank specifications for anhydrous ammonia ensure that it is stored properly as a pressurized liquid and a corrosive chemical. For example, some storage containers for anhydrous ammonia must have rated pressure relief devices to reduce the likelihood of over pressurization of the container. Because anhydrous ammonia is corrosive, specific valves and hoses that do not readily corrode have to be used.

Pure anhydrous ammonia vapors can become an explosion hazard when in a confined space at concentrations between 16 and 25 % by volume. Mixtures involving anhydrous ammonia contaminated with lubricating oil (e.g. in a refrigeration system), however, may lower the explosive range.

Anhydrous ammonia can be recognized by its pungent odor. Odor threshold varies with the individual but ammonia can usually be detected at concentrations above 5 ppm. Concentrations above 100 ppm are uncomfortable to most people; concentrations in the range of 300 to 500 ppm will cause people to leave the area and are immediately dangerous to life and health.

CLANDESTINE USE

Anhydrous ammonia can be as inexpensive as $200 a ton for agricultural purposes, but can sell for as much as $300 per gallon on the black market when obtained illegally. Very small amounts of anhydrous ammonia are needed to make a batch of methamphetamine. In fact, enough "residual" ammonia is left in a typical transfer hose for a criminal to use for methamphetamine production.

Anhydrous ammonia theft appears to occur in waves with thieves stealing the chemical multiple times at one location. Criminals prefer to use anhydrous ammonia to manufacture methamphetamine because many of the other ingredients needed to make the drug are available commercially. Additionally, the fact that anhydrous ammonia speeds up the manufacturing process to just a few hours makes it attractive to drug makers.

Attempted thefts have occurred at such unlikely places as refrigeration systems holding ammonia, underground pipelines carrying ammonia, and rail cars transporting anhydrous ammonia. Often thefts are aborted when thieves are injured or overcome by the toxic gas. During these aborted attempts, "tools" are often left behind, such as duct tape, inner tubes, buckets, coolers, and/or propane barbeque bottles. Several states have passed legislation making it a felony to tamper with or steal anhydrous ammonia, or hold the substance in a non-approved container.

Special note to first responders:
Anhydrous ammonia can be found in the DOT Emergency Response Guidebook under Number 125. The UN Number for anhydrous ammonia is 1005 and is placarded Class 2.2, Nonflammable gas.

Anhydrous ammonia corrodes brass valving turning the brass to a blue/green color. When inside inappropriate pressure cylinders (e.g. propane cylinders), anhydrous ammonia attacks brass valving from the inside out. In this situation, it is difficult to assess the integrity of valving from outside physical appearances. Extreme caution should be used when handling inappropriate containers storing anhydrous ammonia. Brass valving that appeared to be physically intact from outside appearance has

been known to break off in the hands of responders creating an uncontrolled release from the container. Also, these containers should not be transported in the trunks of cars or other vehicles where the container and the occupant are in the same compartment.

Furthermore, responders should take care in selecting the proper personal protective equipment (PPE) level. Due to anhydrous ammonia's low boiling point, affinity for water, and inhalation hazard, responders can be injured if not wearing proper PPE. Structural fire fighter protective clothing may not provide adequate protection during an anhydrous ammonia release. The use of self-contained positive-pressure breathing apparatus is appropriate during a response to an anhydrous ammonia release. In addition to other appropriate PPE, in some cases it may be necessary to wear cryogenic gloves with a moisture barrier to protect against freezing and/or chemical burns.

HAZARD REDUCTION AND PREVENTION

Here are some tips to deter anhydrous ammonia theft:

- ✓ Educate your employees about the theft problem.
- ✓ Store tanks in well-lit areas.
- ✓ Know your inventory to quickly identify missing chemicals.
- ✓ Visually inspect tanks each morning, especially following weekends or other periods where the facility is not occupied.
- ✓ Consider auditing your facility and setting up a valve protection plan for critical valves that could cause significant releases if left open.
- ✓ Consider installing valve locks or fencing, especially for unattended tanks.*
- ✓ Report thefts, signs of tampering, leaks, or any unusual activity to local law enforcement officials.
- ✓ Consider installing other theft deterrent measures such as motion detector lights, motion detector alarms, security patrols, and/or video surveillance.

** The ANSI Standard K61.1 states under section 6.7 "Protection of Container and Appurtenances" that "main container shut-off valves shall be kept closed and locked when the installation is unattended." Furthermore, it states that "if the facility is protected against tampering by fencing, or other suitable means, valve locks are not required." Many states have adopted the ANSI Standard K61.1 as law; please check your state regulations or contact your state agricultural department or fire marshal for details. Also, OSHA's requirement for storage and handling of anhydrous ammonia under §1910.111(c)(6) state that "valves, regulating, gaging, and other appurtenances shall be protected against tampering and physical damage."*

In addition to the general tips above, agricultural dealers or retailers should consider removing hoses during the off-season and storing them separately from tanks. Also, farmers may consider removing nurse tanks from fields when they are no longer needed and returning used tanks, applicators, or toolbars promptly to the dealer after use. Finally, refrigeration facilities may want to evaluate the benefits of installing lockable, quarter-turn, spring-loaded, ball valves in series with a manual valve in critical areas such as at the system fill point or oil discharge pot.

Special note on purchases:
Agricultural retail establishments should be aware that they may be approached by individuals wanting to purchase ammonia for use in the illegal production of methamphetamine. The following list was developed by the Drug Enforcement Administration (DEA) to help you identify individuals who may be seeking to purchase anhydrous ammonia for illegal purposes:

- Customer cannot answer or is evasive about agricultural use questions.
- Customer insists on taking possession rather than having it delivered.
- Customer insists on using cash, money order or cashiers check.
- Customer is a stranger and unfamiliar to area or your business.
- Customer provides suspicious business or credit information.
- Customer is vague or resists providing personal information
- Customer intends to fill their own inappropriate tank (e.g. a 20-pound propane cylinder). Note: It is unlawful in some states to sell anhydrous ammonia unless it is in an approved product container.

If a customer fits any of these criteria, wait until the person has left your business, write down an accurate description of the person(s), vehicle, license number and contact the DEA or local law enforcement authorities immediately.

INFORMATION RESOURCES

EPA has prepared a general advisory on ammonia and a safety alert on the "Hazards of Ammonia Releases at Ammonia Refrigeration Facilities." Both are available at: www.epa.gov/ceppo

The Agricultural Retailers Association (ARA) and The Fertilizer Institute (TFI) have a brochure "Deter Theft of Anhydrous Ammonia." www.tfi.org or (202) 675-8250; www.ara1.org or (202) 457-0825

The Agribusiness Association of Iowa has prepared a fact sheet "Anhydrous Ammonia Theft, What You Need To Know," available at: www.exnet.iastate.edu/publications/pg99015.pdf

The Hazardous Materials Emergency Preparedness Grant Program has a publication available "Guidelines for Public Sector Hazardous Materials Training" - See Section 2, Special Topics - Illicit Use of Hazardous Materials: First Responder Training Issues. www.fema.gov/emi/hmep

STATUTES AND REGULATIONS

The following is a list of federal statutes and regulations related to process safety, accident prevention, emergency planning, and release reporting.

EPA

Clean Air Act (CAA)

- General Duty Clause [Section 112(r)(1) of the Act] - Facilities handling extremely hazardous chemicals (including anhydrous ammonia) have a general duty to assess hazards, design and maintain a safe facility, and minimize the consequences of accidental releases.
- Risk Management Program (RMP) Rule [40 CFR 68] - Facilities that have anhydrous ammonia in quantities greater than 10,000 pounds are required to develop a hazard assessment, a prevention program, an emergency response program, and submit a risk management plan to EPA.

Emergency Planning and Community Right-To-Know Act (EPCRA)

- Emergency Planning [40 CFR Part 355] - Facilities that have 500 pounds or more of ammonia must report to their LEPC and SERC and comply with certain requirements for emergency planning.
- Emergency Release Notification [40 CFR Part 355] - Facilities that release 100 pounds or more of ammonia (other than the normal application of a fertilizer) must immediately report the release to the LEPC and to the SERC.
- Hazardous Chemical Reporting [40 CFR Part 370] - Facilities that have ammonia at or above 500 pounds must submit an MSDS to their LEPC, SERC, and local fire

department and comply with the Tier I/Tier II inventory reporting requirements.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

- Hazardous Substance Release Reporting [40 CFR 302] - Facilities that release 100 pounds or more of ammonia (other than the normal application of a fertilizer) must immediately report the release to the National Response Center (NRC), (800) 424-8802.

DOT

- The Department of Transportation (DOT) [49 CFR 100-180] - Research and Special Projects Administration has requirements covering the transportation of anhydrous ammonia containers.

OSHA

- Process Safety Management (PSM) Standard [29 CFR 1910.119] Anhydrous ammonia is listed as a highly hazardous substance. Facilities that have ammonia in quantities at or above the threshold quantity of 10,000 pounds are subject to a number of requirements for management of hazards, including performing a process hazards analysis and maintaining mechanical integrity of equipment. The PSM requirements do not apply to retail facilities per 1910.119(a)(2).
- Hazard Communication [29 CFR 1920.120] - Requires that the potential hazards of toxic and hazardous chemicals be evaluated and that employers transmit this information to their employees.
- Storage and Handling of Anhydrous Ammonia [29 CFR 1910.111] - Requires standards for design, construction, location, installation, and operation of anhydrous ammonia systems.

CODES AND STANDARDS

There are a number of state codes and industry standards that apply to safe handling, use, and storage of anhydrous ammonia. A few examples are given below.

American National Standards Institutes (ANSI)
K61.1, 1999 - Standards for the Storage and Handling of Anhydrous Ammonia
Available from ANSI
11 West 42nd Street
New York, NY 10036
(212) 642-4900
Web site: www.ansi.org

ANSI/IIAR 2-1992 - Equipment, Design, and Installation of Ammonia Mechanical Refrigeration Systems
Available from International Institute of Ammonia Refrigeration (IIAR)
1200 19th Street, NW
Suite 300
Washington, DC 22036-2422
(202) 857-1110

For More Information:
Contact the EPCRA Hotline at:
(800) 424-9346 or (703) 412-9810
TDD (800) 553-7672
Monday -Friday, 9 AM to 6 PM, EST

For information on OSHA standards contact OSHA Public Information at (202) 219- 8151 or visit the web site: www.osha.gov

Visit the CEPPO Home Page at:
www.epa.gov/ceppo/