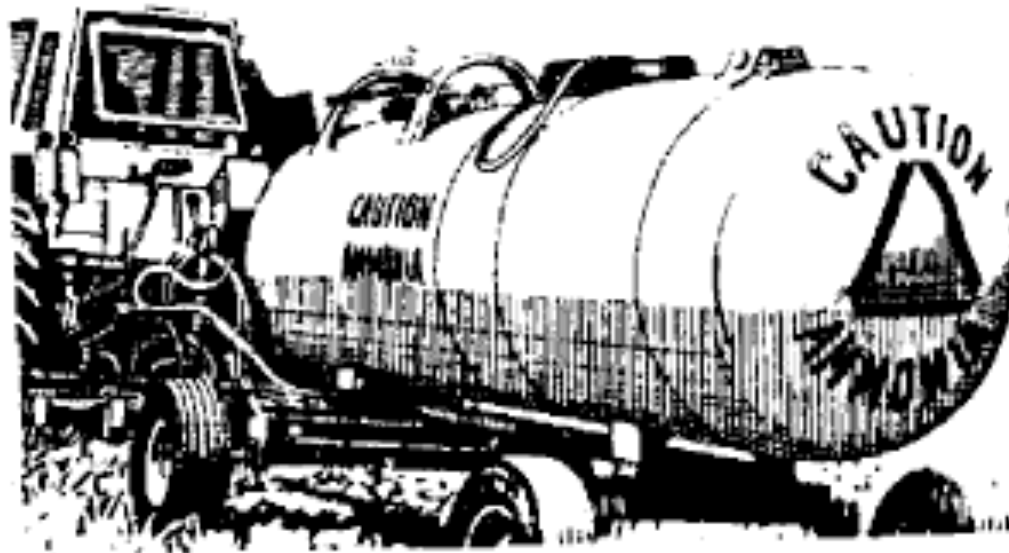


Anhydrous Ammonia

Keys to maintaining Anhydrous
Safety

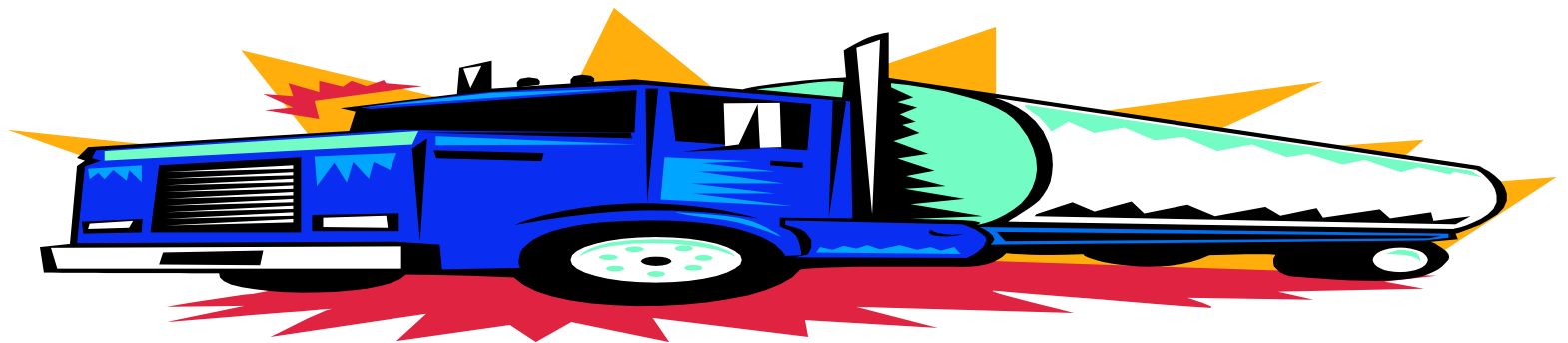


Anhydrous Basics

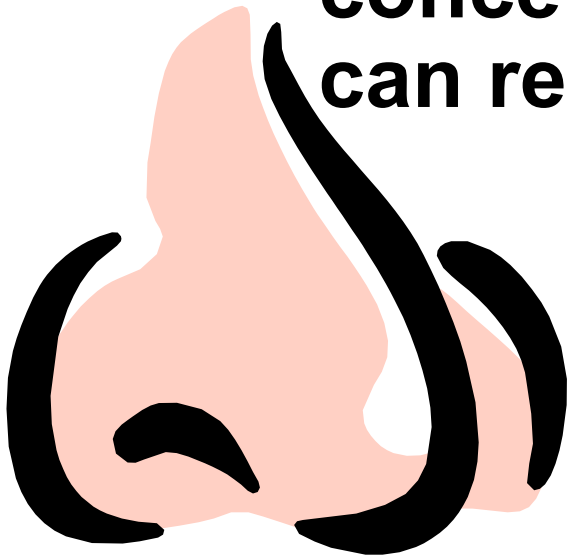
- Chemical Formula is NH_3
- Made up of one part nitrogen (N) and three parts hydrogen (H_3)
- One of the most widely used sources of nitrogen for plant growth.
- Anhydrous means "without water."
- Because NH_3 contains no water, it is attracted to any form of moisture.
- If exposed to NH_3 immediately flush the exposed body area(s) with water for at least 15 minutes
- Seek medical attention immediately after emergency first aid treatment.

- **NH₃ a hygroscopic compound (it seeks water from the nearest source, including the human body)**
 - **This attraction places the eyes, lungs, and skin at greatest risk because of their high moisture content. Caustic burns result when the anhydrous ammonia dissolves into body tissue.**
- **Most deaths from anhydrous ammonia are caused by severe damage to the throat and lungs from a direct blast to the face.**
- **When large amounts are inhaled, the throat swells shut and victims suffocate.**
- **Exposure to vapors or liquid also can cause blindness.**

- **An additional concern is the low boiling point of anhydrous ammonia.**
 - Freezes on contact at room temperature.
 - Causes burns similar to, but more severe than, those caused by dry ice.
- **Under normal temperature and air pressure, anhydrous ammonia is a colorless gas**
 - Used and transported under pressure as a liquid.
 - Equipment used for applying or transferring liquid anhydrous ammonia must be designed for use under high pressure to avoid ruptures or breaks.



- **Anhydrous ammonia has a distinct odor, which humans can detect in concentrations as small as 5 parts per million (ppm). When used in fertilizer, anhydrous ammonia has a concentration of about 1,000,000 ppm. Brief exposure to concentrations of 2,500 to 6,500 ppm can result in death.**



- You can prevent serious injury around anhydrous ammonia. You just have to know what to do.
- The following is a list from the The National Ag Safety Database. For more information, see your dealer. If you are uncertain of a tank or equipment, do not accept it. The risk is too great.



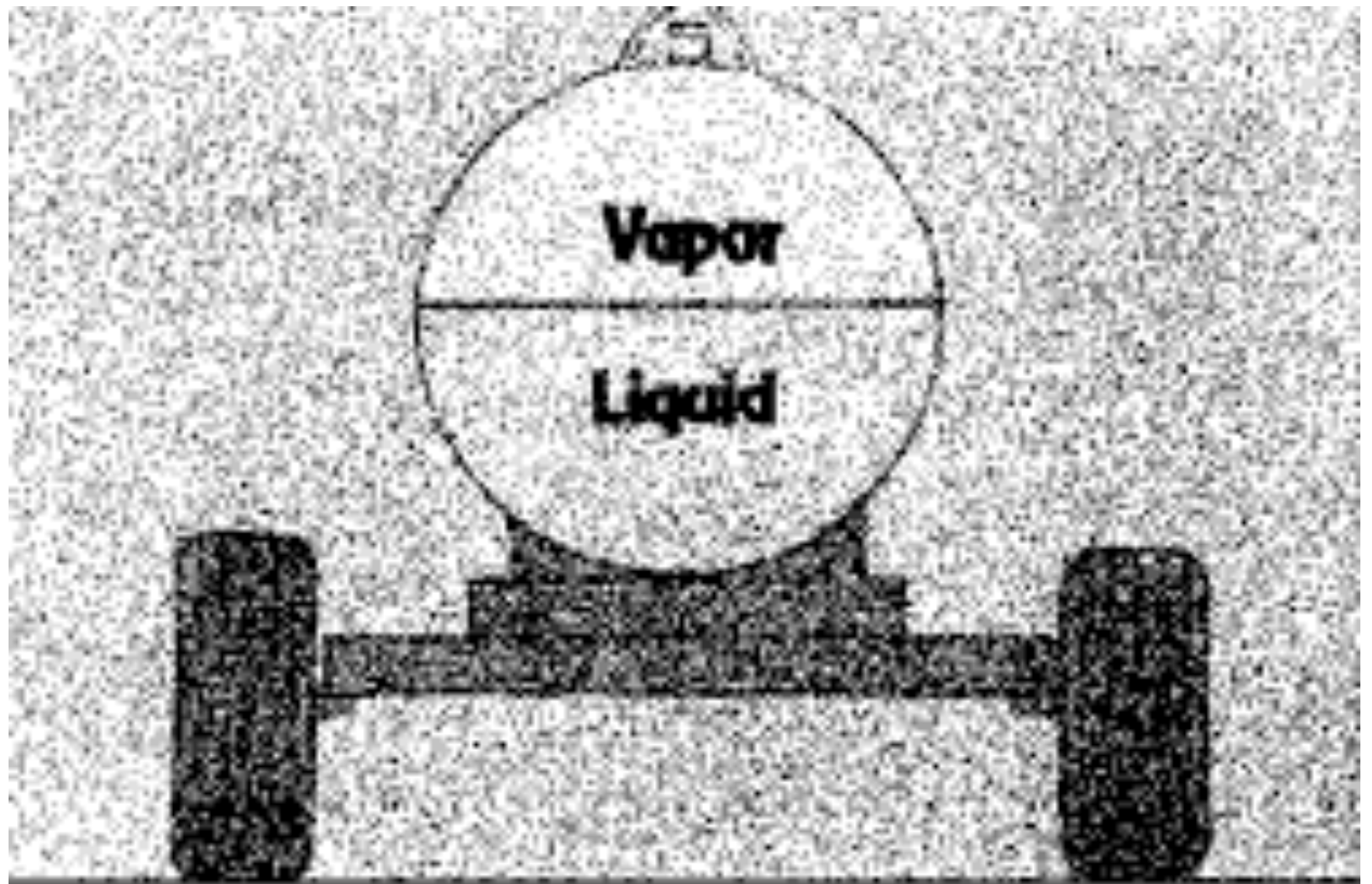


Figure 1. Anhydrous ammonia is compressed into a clear, colorless liquid when used for an agricultural fertilizer

Risk basics

- In the rush to apply liquid fertilizer during the busy planting season, always take time for safety around anhydrous ammonia
- Each year, a number of farmers are injured when they are exposed to anhydrous ammonia. According to records kept by the Iowa Department of Public Health, 55 people have been injured within the past three years from anhydrous ammonia. Of those injuries, 19 required hospitalization.

- The most serious injuries include permanent loss of eyesight or third-degree burns when the liquid fertilizer comes in contact with skin, eyes, nose or mouth. Death also can occur if a large amount is inhaled.
- Most of the recent accidents in Iowa that involved anhydrous ammonia occurred in driveways or fields as a result of equipment failure. This would include eruptions from a leaky hose, valve or nozzle. Some accidents occur while the operator fills the applicator tank, however, this is when protective gear is most likely to be worn.
- For more information about how to be safe around anhydrous ammonia, read instructions that come from your chemical supplier or dealer.

Exposure

- Exposure can happen suddenly and is almost always unexpected, including these situations:
 - During its transfer from the nurse tank to the applicator. Anhydrous ammonia can escape from the transfer hose or valves that connect the hose to the nurse tank or applicator. Farm operators must always follow procedures for making and breaking connections because the fertilizer is under extreme pressure.
 - .

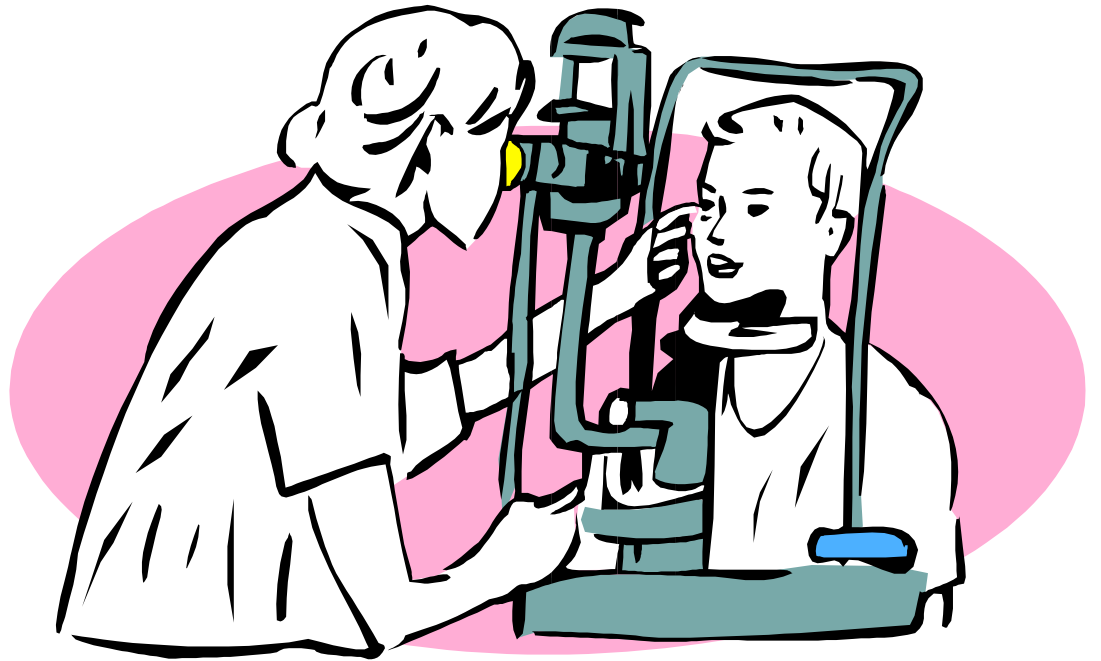
- When equipment fails. Malfunctions of valves, the quick coupler that connects the nurse tank to toolbar, and gauges cause dangerous situations that could spray anhydrous ammonia in any direction with a force greater than that of a fire hydrant. Hoses exposed to sunlight, constant rubbing, or those that are stretched are subject to failure.
- During transportation or application in the field. A loose or broken hitch can cause the anhydrous hose to simply pull apart. Always use safety chains and a locking hitch pin when transporting the nurse tank

Injuries

- NH₃ is a common cause of chemical injuries.
- Most are the result of accidental exposure, frequently in the course of work.
- Exposure may produce serious injury to the eyes, respiratory system, and integument.
- Anhydrous ammonia injuries occurring in a predominantly agricultural region are reviewed.
- Pathophysiology of anhydrous ammonia injury is reviewed.
- Therapeutic modalities are described.
- Guidelines to prevent or minimize injury re delineated.

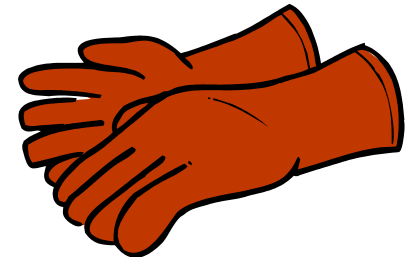
NH₃ may cause:

- Blindness,
- Lung damage,
- Burns, or
- Death.



Anhydrous Ammonia Safety

- Wear personal protective equipment, including:
 - a mask,
 - goggles,
 - gloves,
 - long-sleeved shirt,
 - long pants,
 - and proper work shoes.
- Have an ample water supply close by.
- Regularly inspect hoses and valves and replace them as needed.



Safety, Continued

- Be careful not to fill a tank over 85 percent of capacity.
- Bleed off hose pressure before disconnecting.
- Stay clear of hose and valve openings.
- Follow regulations when using equipment.
- Have a qualified technician repair the tank.
- Use the proper hitch, safety chains, and a Slow Moving Vehicle sign when towing.

And don't overlook other fluids, such as cold coffee and juice, or water from nearby farm ponds, for immediate first aid.

Equipment Safety

- Should be
 - additives compatible and
 - meet NH₃ codes and standards.
- Equipment replacement **MUST** be made "IN KIND" with the same materials of construction and the same specifications
- Nurse tank cutting or welding must be done only by a certified welder with R-stamp or U-stamp, or equivalent
- If baffle is detached, remove the tank from service.

Vehicle Towing

- Towing vehicles should be of adequate size to handle the loaded trailer
- Each towed trailer should have two safety chains attached, adequately sized, and criss-crossed to support the tongue
- Hitch pins should be securely locked and designed for the intended purpose.



Transport Checklist:

- Before you tow the tank home, make sure:
 - Towing connections are in good condition, correctly adjusted and firmly secured.
 - Hitches are secure and equipped with locking pins.
 - Safety chains are securely connected.

PLANT AND OPERATOR RESPONSIBILITIES

- Develop a "Site Specific Safety Plan" which includes emergency, maintenance, and troubleshooting procedures.
- Do NOT use galvanized pipe for anhydrous NH₃ service-even for temporary repairs.
- Identify "sign off" on material manifest before accepting delivery.
- Check unloading lines. Remember that they MUST be compatible for NH₃ service.

- Be sure unloading lines are attached and secure.
- Be available during unloading to initiate emergency plans.
- Properly disconnect and secure plant valves following unloading.
- Set up inspection and testing procedures to be applied to ALL storage tanks.



Hose Maintenance

- Unloading hoses must meet the same five-year replacement criteria as facility transfer tanks. Stainless steel hoses are recommended for nurse tank risers.



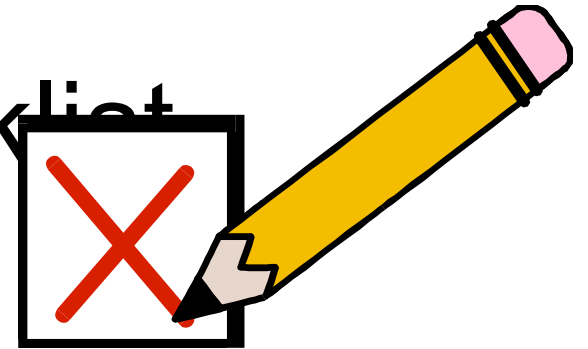
Tank Procedures

- Nurse tank contents SHOULD NOT be transferred back to the storage tank
- Nurse tank cutting or welding is ONLY to be done by a certified welder with R-stamp or U-stamp, or equivalent. If the baffle is detached, remove the tank from service
- Five-gallon container of clean and easily accessible water MUST be mounted to the nurse tank
- Multiple water sources should be available

Valve Operation

- Opening control valves too quickly may cause excess flow valves to shut.
- Manual valves are to be opened WIDE when transferring liquid ammonia from tank car to storage tank.
- Relief valves must be stamped with the replacement date.
- Take extra caution when using additives in fill valves to minimize corrosion. Flush with additive-free ammonia, or add small amount of lubricating oil after additive.
- Applicator valves on top of the tank should be protected by a rollover cage.
- A strap-on design rollover cage should be considered for upgrading applicator tanks.

Nurse Tank Checklist



- Are the fittings and valves clean and free from rust and wear?
- Is the kingpin in good condition and well lubricated?
- Is the high-pressure hose secure, with no cracks or signs of wear? Replace the hose if you can see the braided layer.
- Is the emergency water supply full? Is the grabhose clean and free of any slimy internal buildup that would impede or contaminate water flow?

- Is the hose free of cuts, soft spots, blistering, kinking, flattening, or indications that it may have been stretched? Is there slippage at any coupling connector? Check for leaks, kinks and bulges, especially near the couplings.
- Is the tank free of rust? Is the paint in good condition?
- Does the tank have a slow-moving vehicle (SMV) emblem mounted on the rear of the tank that is in good condition?
- Are the tires in good condition and properly inflated?
- Are both ends of the hose secured to prevent damage to the hose and connections during transport?

- If the answer to any of these questions is no, **don't take the tank.** Ask the dealer to fix it or request another tank. Although the dealer is responsible for maintaining equipment in proper working condition, you are the one who may be injured in an accident.
- **Take the time to inspect the equipment to reduce the risk of a serious accident. Never take a questionable tank home and try to repair it yourself.**

Application Equipment Checklist

- Are applicator knives in good condition and not plugged with soil or other material?
- Is the shut-off rope the right length and in good condition?
- Are you using locking hitch pins?
- Is the nurse tank secured with a safety chain?
- Is the applicator tool bar equipped with a breakaway coupler that is in good physical condition?
- Do you have a small squeeze bottle of fresh water in your pocket that will be readily accessible if ammonia gets in your eyes?

Is the emergency five-gallon water tank filled with fresh water? *Always empty and refill the water tank at least once a day to ensure an adequate supply of fresh water.*

Do you have a second five-gallon water tank filled with fresh water on the tractor? *A ruptured hose and the failure of a safeguard may prevent you from reaching the water tank on the nurse tank. A five-gallon water tank on the tractor may be your only available source of water.*

- Is all low-pressure tubing securely clamped and free of pinches, nicks, weak spots and leaks? *Folding and unfolding the applicator wings can pinch hoses so always inspect them before using. Are hoses clear and flexible? Hoses that are weathered, cracked, discolored or brittle need to be replaced. Check all hoses, connections and tires daily.*
- Is the regulator working properly?

How Much Do You Know?

1. The effects of anhydrous ammonia exposure to humans can be best described as a:
 - A. poison.
 - B. antiseptic.
 - C. corrosive agent.
 - D. cleaner.
2. Anhydrous ammonia is a hydroscopic compound, which means it seeks out moisture. True or false?

What do you know?

3. During spring weather and under normal atmospheric pressure, anhydrous ammonia is a liquid. True or false?
4. Contact lenses offer some eye protection from anhydrous ammonia exposure. True or false?
5. What liquid can you use for first aid treatment in anhydrous ammonia exposure?
 - a. orange juice
 - b. water
 - c. cold coffee

Answers

- 1-c;
- 2-True;
- 3-False;
- 4-False;
- 5-a, b, and c.



Sources

- The National Institute for Occupational Safety and Health, Centers for Disease Control.