

## **Section 2: Anhydrous Ammonia Cargo Trailers, Nurse Tanks and Straight Trucks/Bobtails**

*60 min.*

### **Lesson Goal**

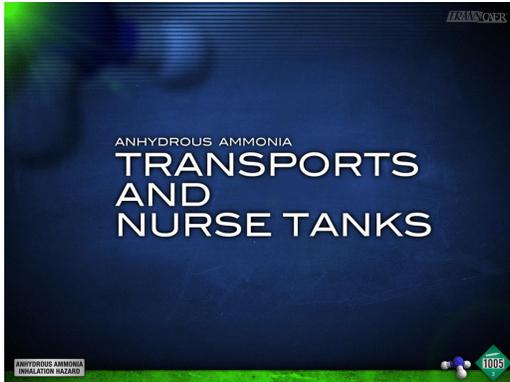
After completing this lesson, the student shall have the knowledge and skills to help them respond to cargo, nurse tank, or straight truck emergencies involving anhydrous ammonia safely and efficiently.

### **Objectives**

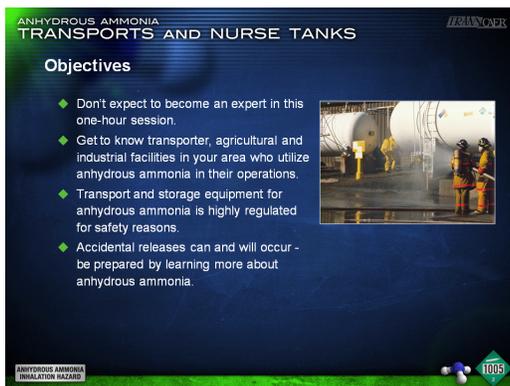
Upon successful completion of this section, the student should be able to:

1. Anhydrous Ammonia Cargo Trailers
  - a. Explain construction features of a MC 331 anhydrous ammonia cargo tank
  - b. Explain examples of internal valves and emergency controls for an MC 331 cargo tank
  - c. Describe examples of loading and unloading valves found on an MC 331 cargo tank
  - d. Explain the difference between a tank pressure gauge and a tank volume gauge
  - e. Describe additional safety features such as break away plumbing and remote emergency shut-offs
2. Bobtails
  - a. Describe equipment used for delivery of ammonia
  - b. Describe the capacities of bobtail tanks
3. Nurse Tanks
  - a. Explain construction features of an anhydrous ammonia nurse tank
  - b. Describe nurse tank valves and shutoffs
  - c. Understand some hazards associated with nurse tank ruptures

# I. CARGO TRAILERS, NURSE TANKS AND STRAIGHT TRUCKS



**Instructor Note:** The purpose of this section is to introduce students to the cargo trailer, nurse tank and straight truck as a mode of delivering anhydrous ammonia. This module is meant to be primarily a hands on module, but the powerpoint presentation is used to prepare for the hands-on review or to cover equipment that may not be on site



## A. Course Objectives

1. You won't be an expert after this 1 hour course
2. Understand the different types of transport containers
3. Describe emergency controls on an MC331 cargo tank, straight truck(bobtail) or nurse tank
4. Describe the valves and gauges on transports



## B. MC-331 Cargo Tanks/Nurse Tanks/Straight Trucks/Bobtails

1. MC 331 cargo tanks are the only DOT specification tank suitable for anhydrous ammonia
  - a. They are pressure coded vessels
  - b. Built to a working capacity of 265 psig

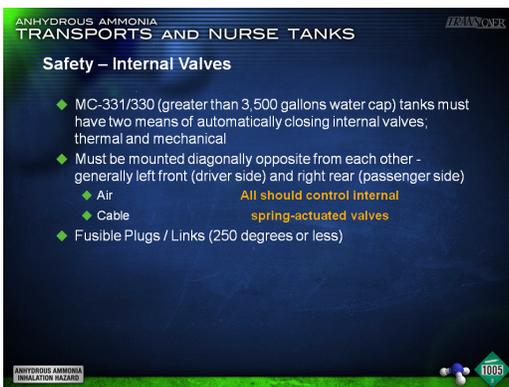


2. Straight Trucks/Bobtails
  - a. Equipped with hoses for intercity delivery
  - b. Straight trucks/bobtails are usually less than 3,500 water gallons capacity
  - c. Deliveries are usually made with a 1" hose
  
3. Transports are limited by weight restrictions on the highway
  - a. Typically 80,000 lbs is maximum weight
  - b. Water gallon capacity ranges from 3500 gallons to 15,000 gallons
  - c. Typical range is 8,000-12,000 gallons capacity
  
4. Transports can be unloaded from the center belly or rear of the trailer – not all trailers can be unloaded from both locations
  
5. Nurse tanks come in various configurations for agricultural applications in various parts of the country.
  - a. Differences in tank size and mounting apparatus may be dictated by the type of local terrain on which these are used.
  - b. May be mounted on a truck chassis or single or dual tank configuration on trailers, and may incorporate applicators.



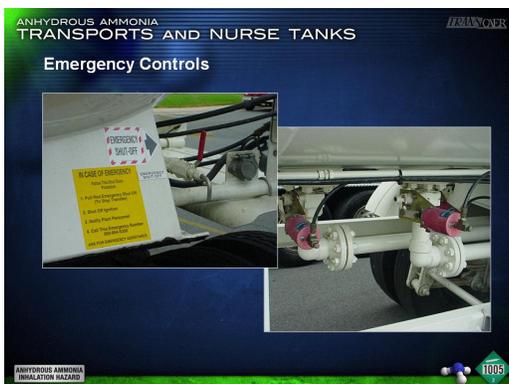
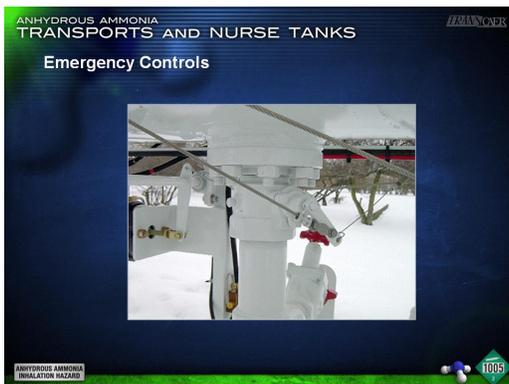
## 6. Trailers "Sweat"

- There is a strong possibility that the trailer will sweat or drop moisture on the ground
- Common when the product inside the container is colder than the outside temperature
- Works on the same principal as moisture collecting on the outside of a glass with ice and a drink in it
- Similar to dropping moisture like the air conditioning in a car



## C. MC 331 Internal Valves and Emergency Controls

- MC 331 tanks with greater than 3500 gallons of water capacity must have two means of automatically closing internal valves; thermal and mechanical
  - They must be mounted diagonally opposite from each other
  - Generally left front (driver side) and right rear (passenger side)
  - May be by air or cable
  - Valves will use fusible plugs or links that will open at 250 degrees or less



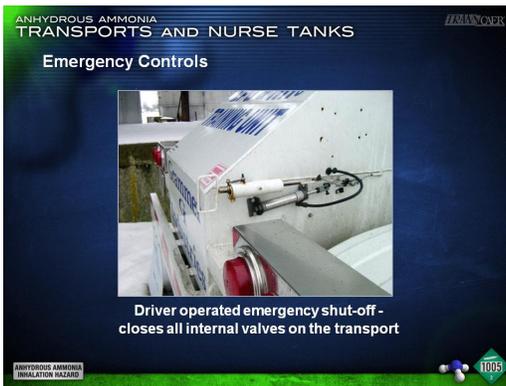
## 2. Loading Materials

- a. To get materials loaded or unloaded the internal valve(s) have to be opened
- b. The driver or operator would perform this function
- c. These valves are called the internal/excess flow valve
- d. It is designed to close in the event of a leak in the delivery hose

## 3. Emergency Shut-offs - Air Actuated

- a. The internal valve has remote shut-off
- b. Top left picture is an air activated emergency shut-off
- c. Push the red handle down and air will be released, closing the internal valve
- d. The bottom right picture is an air activated shut down valve
- e. Emergency shut-offs are located at the driver front and passenger rear of the trailer

- f. The driver or operator would hopefully engage on their way out of the area in an emergency
- g. Since there are two locations for the shut-offs, responders may be able to engage one of the shut-offs if they are upwind from the leak



#### 4. Emergency Shut-offs - Cable Operated

- a. For cable operated remote shut-offs - pull the ring handle straight out to stretch a cable which will close the internal valve
- b. These are also actuated with fusible links
- c. In the event of a fire, the fusible link would melt and activate either a spring that would expand and engage the lever, or it would release air, actuating the shut-off



#### 5. Additional Examples of Emergency Controls

- a. Cable operated remote shut-off. Pull the red handle at the front driver side of the tank



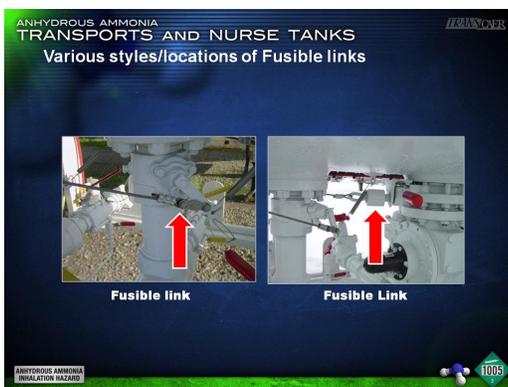
b. Rear passenger side remote shut-off is cable operated, you would pull the red handle out to actuate it



c. Air activated remote shut-off at the rear passenger side. Flip the red handle down and air would be released closing the internal valve



d. This is an example of a fusible link. In case of fire, the fusible link would melt and either activate a spring that would expand and engage the lever or would release air, actuating the shut-off



e. Examples of fusible links



## D. Loading Valves/Unloading Valves/Gauges

### 1. Loading Gates

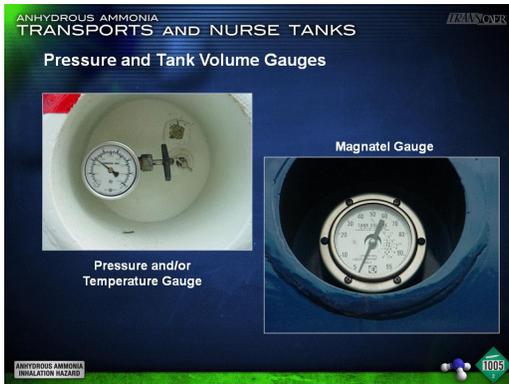
- Some trailers are equipped with loading gates (or Dixie gates) that prevent hoses from being hooked to the inlet lines
- These gates are attached to an air brake valve that locks the brakes on the trailer
- Prevents the trailer from being moved when the gate is in the down position

### 2. Loading/Unloading Valves

- Unloading methods may be by pump, compressor or a combination of both
- For a pump unload, you would use a 1" or 2" liquid line connection
- There would also be a vapor line (usually 1" or less in diameter) used to equalize pressures for the pump to unload
- For a compressor delivery, you have both a liquid and vapor line connection



- e. Vapors from the receiving tank would be compressed and pressure added to the trailer to create a pressure differential to move product from the trailer to the receiving tank



### 3. Pressure and Tank Volume Gauges

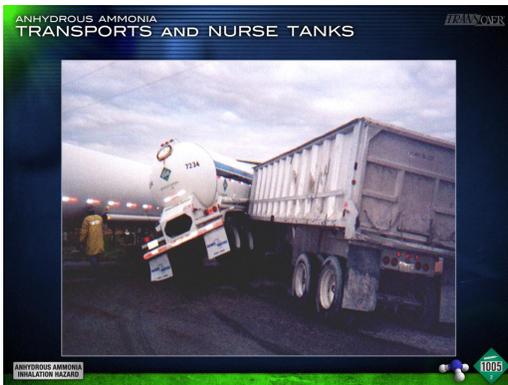
- a. Pressure gauges will show the pressure of the ammonia on the inside of the trailer
- b. Volume gauges show the liquid level in the trailer
- c. You would need to know the overall size of the trailer in water gallon capacity in order to determine the quantity in the unit, for example, a gauge reading 50% = 50% of 9000 gallon capacity



### 4. Trailer Relief Valves

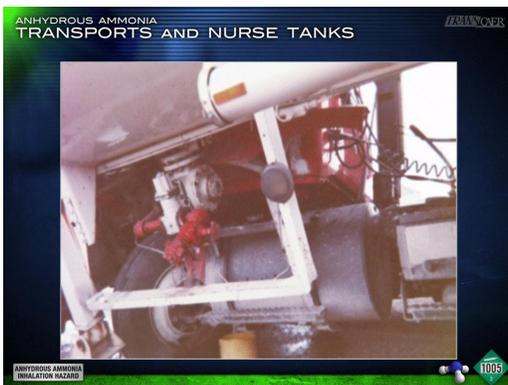
- a. Since the trailer is a pressure vessel there are pressure relief valves that are set in the vapor space at the top of the trailer
- b. There are usually two placed at the front and back or two placed side by side in the middle of the tank
- c. They are indented into the trailer in wells so they are protected in case of a roll over

- d. Relief valves may have a metal flap or rubber insert to prevent contamination from affecting the valves
- e. You may look at the position of the flap or rubber insert to help you determine if a relief valve has opened
- f. This is an example of the wells that would hold the relief valves (this is an ISO container not an MC 331)



## E. Other Safety Features

1. Tanks are designed to withstand significant impacts. This was a 55mph collision
2. Plumbing is made to break away in an accident. The internal valve is designed to break at shear points to prevent leakage from the trailer



ANHYDROUS AMMONIA  
TRANSPORTS AND NURSE TANKS

Passive & "Active" Mitigation

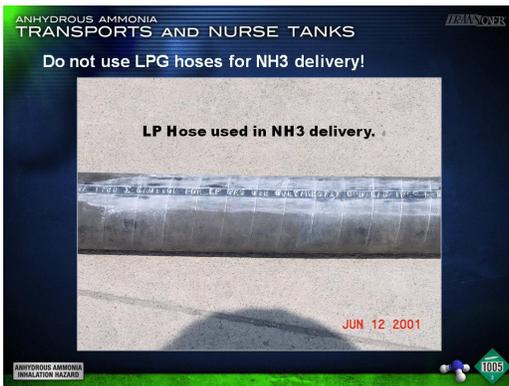
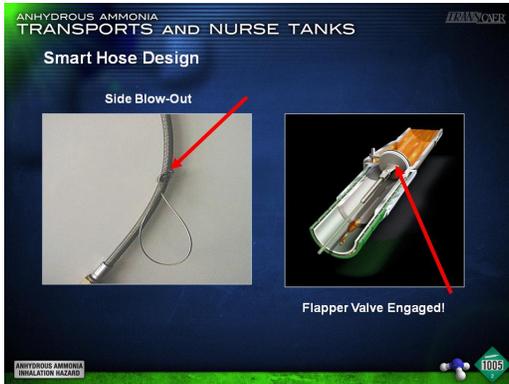


- ◆ Each Trailer Has Passive Mitigation Such as "Base" System or "Garage Door Opener" Recognition
- ◆ "Active" – remote emergency shut offs

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IRRRADIATION HAZARD

1005

3. Passive and active mitigation is required by DOT. This is separate from the remote emergency shutoff valves on a trailer
  - a. For 1" type transfers it is common to see either a "base" system which runs off a pressure drop detection system
    - i. If a pressure drop is detected from a leak the delivery operation will shut down
    - ii. Or a mechanism such as a garage door type opener where the driver/operator must demonstrate he is present at a periodic interval or the delivery system will shut down
  - b. For 2" type transfers a "Smart Hose" system is common
    - i. The Smart hose has a cable inside the hose
    - ii. If the hose completely separates the cable stretches and the hose ends will close at each end



4. Example of a Smart Hose design

5. Don't use LPG hose for ammonia delivery. Hoses are clearly marked for the proper product

## F. Nurse Tank Components

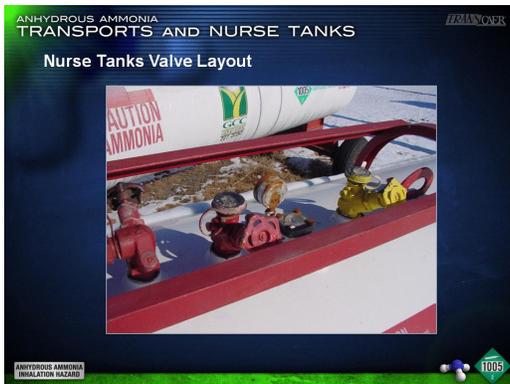
1. Nurse tanks come in various sizes from 1000-1450 gallons
2. Nurse tanks are generally parked together when sitting at a dealer location. This can make it hard to determine which tank is leaking



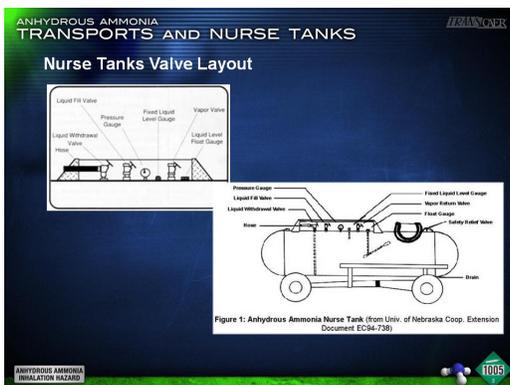
3. Examples of twin 1000 gallon tanks



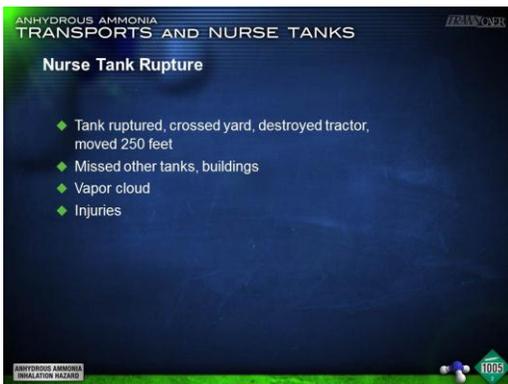
4. Warning Signs on Nurse Tanks



5. Nurse tank valves should be color coded or labeled



6. Nurse tank valve layouts



7. Dip tubes in the tank are used to withdraw product from nurse tank

8. A relief valve is a spring loaded valve designed to close based on flow
- a. This is an added safety feature if a valve is sheared off
  - b. All liquid and vapors valves are protected by excess flow valves
  - c. This would hold true for cargo trailers, nurse tanks, rail tank cars, and above ground stationary tanks

### G. Nurse Tank Rupture

- 1. An internal non-code weld weakened the shell of a 1000 gallon tank
- 2. The tank ruptured, crossed the yard, destroyed a tractor, moved 250 feet
- 3. The tank missed other tanks and buildings



4. A vapor cloud was released
5. The event caused injuries
6. This is the initial location of the nurse tank. You can see the frame for the wheel still on the ground
7. Final resting place of the nurse tank
8. Tank split the tractor in half
9. The running gear remained at the loading area



10. The gash, tire marks, and the red paint all were from the collision with the tractor



11. The missing shell section remained by the load out risers



12. The ammonia cloud drifted over this ditch causing leaf burn

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The materials developed for the Anhydrous Ammonia Training Tour 2011 are intended to provide general understanding and guidance to emergency responders in addressing anhydrous ammonia incidents. They include information about the chemical and helpful considerations that the emergency responder can employ when faced with such an incident. The materials are in no way intended to be prescriptive or otherwise recommend specific procedures on how to respond. Emergency responders are encouraged to consult with the product manufacturer, carrier and other experts when assessing and managing any incident involving anhydrous ammonia.