A few minutes spent checking the condition of the breakaway coupling before applying anhydrous ammonia can substantially reduce the potential for an accident which can result in crop loss, a loss of sight, a loss of ones sense of smell, or painful body disfigurement.
Look For 10 Minutes - See For A Lifetime

Is saving your eyesight worth 10 minutes of your time? Of course it is. Is possibly saving the eyesight or sense of smell of another person worth 10 minutes of your time? Again the answer is an obvious yes. Ten minutes is about all the time it takes to inspect the breakaway quick coupling on an anhydrous ammonia applicator. Unfortunately, season after season, year after year, owners and users of anhydrous ammonia equipment don’t spend that 10 minutes and find out too late that the equipment was in need of maintenance or replacement. Even more unfortunate is the fact that, if recommended inspection and maintenance procedures are not followed, an ammonia accident can result in people suffering anhydrous ammonia burns, partial or full loss of their sense of smell, or partial or full blindness in one or both eyes. These are very serious consequences for someone to suffer because of a lack of proper maintenance. Compounding the seriousness is the fact that the injured party may not be the one responsible for doing needed equipment inspection and maintenance but may be someone who assumed that it had been done and that the application equipment was in good operating condition.

This article is intended to inform you of the need for regular inspection of one part of an anhydrous ammonia application system, the break-away quick coupling. This is certainly not to suggest that it is the only area requiring regular inspection and maintenance. It is not. Other publications and training are available on the care needed when working with anhydrous ammonia and on the proper use and care of ammonia application equipment. This article will concentrate on the breakaway quick coupling only. The article will explore why a breakaway coupling is used, how a breakaway coupler works, where it is installed in a typical application system, and, most importantly, how in 10 minutes or less, you can verify that it is working properly and will provide the needed breakaway and anhydrous ammonia shutoff functions when required to do so. This article will not cover breakaway coupling annual maintenance requirements or procedures but does list a source for them. Ordering information for reprints of this article and other publications concerning anhydrous ammonia safety and more comprehensive breakaway coupling installation, use and maintenance information may be found at the end of this article.

Description Of A Typical Anhydrous Ammonia Application System

Refer to Figure 1 which is a schematic diagram of a typical anhydrous ammonia application system.

The nurse tank is attached to the applicator with a mechanical hitch. The anhydrous ammonia flows from the tank to the applicator through a hose, normally 1 inch or 1-1/4 inch inside diameter. The nurse tank end of the hose is attached to a manual shut-off valve called the nurse tank valve. The other end of the hose is often attached to another manual shut-off valve called the nurse tank hose valve. This valve is equipped with a small bleed valve to bleed off the pressure between the hose end valve and the meter after the hose end valve is closed. The hose end valve is attached to the male half of the breakaway quick coupling by means of an acme thread connection with a rubber gasket type seal, similar to a garden hose type connection. The female half of the break-away quick coupling is connected to the meter which provides an on-off control of the anhydrous ammonia flow from the tank to the ground and also is the means to regulate or meter the amount of anhydrous ammonia that goes into the soil. This in turn determines the pounds of nitrogen per acre that are applied to the soil. In many cases the connection between the female half of the breakaway quick coupling and the meter is another length of hose. For a breakaway quick coupling to disconnect with a pull on the nurse tank hose attached to the male half, the body of the female half must be able to freely move in relation to the sleeve of the coupler. The sleeve is firmly attached to a clamp. The hose between the female half of the breakaway quick coupling and the meter is what allows this move-
ment. Some applicator manufacturers use a system where the meter is rigidly attached to the female half of the breakaway quick coupling with the mounting arrangement such that it allows the necessary movement between the coupler body and the coupler sleeve.

**Why Is A Breakaway Coupling Used?**

A breakaway quick coupling is installed on an anhydrous ammonia applicator when a trailing nurse tank is used to supply the anhydrous ammonia to the applicator. It's primary purpose is to separate or breakaway and shut off the flow of ammonia in the event of a separation of the applicator and nurse tank at the mechanical hitch. If the hitch separates either because the pin comes out or because something breaks, the hose becomes the only connection between the nurse tank and the applicator. The breakaway coupling is in the system to avoid putting so much pull force on the hose that it ruptures and sprays pressurized ammonia. A breakaway quick coupling is designed so that when properly mounted and maintained, it will uncouple with a pull force lower than that which would damage the nurse tank hose. Since 1972, American National Standard ANSI K61.1 “Safety Requirements for the Storage and Handling of Anhydrous Ammonia” has specified that a breakaway type self closing coupling must be used if the applicator tank is towed.

![Fig. 2 A 1-1/4 inch anhydrous ammonia breakaway quick coupling shown connected and mounted in a multidirectional swivel clamp.](image)

**How Does It Work?**

A breakaway quick coupling consists of a female half, also called a coupler or body half, a male half, also called a tip, nipple, or male tip, and a swivel clamp to mount the female half. Figure 2 shows a 1-1/4 anhydrous ammonia breakaway coupling, Figure 3 shows a 1 inch coupling. Figure 4 shows a cross section view of an anhydrous ammonia quick coupling in the disconnected position. Figure 5 in the fully connected condition. When uncoupled, or disconnected (Figure 4), the poppet valves in each half are closed by their valve springs, thereby stopping the flow of ammonia to the atmosphere. The perch supports the valve spring and provides guiding for the poppet valve. The perch also acts as a stop for the valve in the open position to assure that the poppet valves in each half remain opened the proper amount to provide maximum anhydrous ammonia flow through the coupling when the 2 halves are connected. When the coupling is either fully connected or fully disconnected, the sleeve spring positions the body and the sleeve so the sleeve prevents the locking balls from rising up out of their ball holes.

![Fig. 3 A 1 inch anhydrous ammonia breakaway quick coupling shown disconnected and mounted in a multidirectional swivel clamp. Two styles of male half are shown, one with a pipe thread connection, the other with an acme thread.](image)

**Connecting**

To connect, the male half is pushed into the female half.

**Fully Connected**

When fully connected (Figure 5) the poppet valves in both halves are wide open against their perch to allow maximum anhydrous ammonia flow.

**Disconnecting or Breakaway**

The disconnect sequence is the same whether the disconnect is intended or a breakaway. When the pull on the male half exceeds the force of the sleeve spring, the ball body will move and release the male half. The male half is then pulled out of the socket. The poppet valve springs close the poppet valves in each half to stop any discharge of anhydrous ammonia. *This also traps anhydrous ammonia under pressure in two places.* One is in the nurse tank hose from the tank to the male half of the breakaway coupling. The other is between the female half of the breakaway coupling and the meter or the ground. *The pressure in both of these locations must be bled off before attempting to reconnect.*
Intended Disconnect vs Breakaway

Intended disconnect is when a person disconnects the coupling such as for inspection or to change nurse tanks. Breakaway is when the system puts enough pull force on the nurse tank hose to disconnect the coupling before the hose ruptures. As previously noted, one case where this occurs is when the hitch pin comes out or some part of the hitch breaks and the nurse tank hose becomes the only connection between the anhydrous ammonia applicator and the nurse tank. If the tractor and the applicator are moving forward, the applicator will try to tow the nurse tank by means of the hose. In normal field conditions, this would require more pull force than the hose is capable of handling. To prevent hose rupture and the resulting ammonia spray, the breakaway coupling will, if properly mounted and maintained, separate or disconnect before the force gets high enough to damage or rupture the hose.

How to conduct a regular coupling inspection

A regular coupling inspection must be performed before each applicator use. In the case of rented or borrowed equipment, regular inspection must be done each time the applicator is returned from one user and before it is issued to another user. Following is the procedure for a regular coupling inspection. See the section titled "What to Look For" for more inspection details.

1. Very important! Put on gloves and goggles, and have emergency water available. Do this whenever you are working on anhydrous ammonia equipment.

2. Close all valves, including the nurse tank valve (if connected to a nurse tank), the nurse tank hose valve (if present) and the applicator flow meter.

3. Slowly open the bleed valve on the coupler to relieve any pressure between the coupler and the meter. Direct all bleed holes away from your face and body when doing this. Do this in an open area.

IMPORTANT NOTE If the coupler does not have a bleed valve, it means it was built before 1983 and must be discarded and replaced with a new coupler which includes a bleed valve.

4. Slowly open the bleed valve on the nurse tank hose valve to relieve any pressure in the nurse tank hose. Direct all bleed holes away from your face and body when doing this. Do not proceed until all flow from both bleed valves has stopped.

5. Pull on the male half until it separates from the female half. This can require 50 to 100 pounds of pull or more. Separation is quite sudden, so use care so you don’t fall when separation occurs. If the male half is not connected to the nurse tank hose, connecting it to a length of hose with the other end of the hose open provides a good gripping means to pull on the male half. If you are unable to disconnect the breakaway coupling by pulling on the hose attached to the male half, the applicator must not be used. The breakaway coupling must be removed and replaced with a new one before the applicator can be considered fit for use.

6. Using a screwdriver or some other appropriate tool, push open the spring loaded poppet valve in each coupling half by pushing on the small end of the poppet. Release it and confirm that the springs return the poppet valve to the fully closed position without hesitation or binding. If the poppet valve in either half sticks or binds, the applicator must not be used. The half with the sticky poppet or the complete coupling must be replaced before the applicator can be considered fit for use.

7. Pull the ball body of the female half toward you enough to allow the locking balls to move outward into the forward sleeve undercut. Confirm that each locking ball moves freely in its ball hole. If dirt or corrosion prevents the locking balls from moving
freely the female half of the breakaway coupling must be cleaned and lubricated per the manufacturer’s instructions or replaced before the applicator is used.

8. Visually inspect the mounting clamp and the connection between the female half of the breakaway coupling and the meter. Confirm that mounting bolts are tight and that the clamp pivots both side to side and up and down. If it does not, the applicator must not be used. To assure proper separation of the breakaway coupling it must be able to pivot in all directions to allow the nurse tank hose to make a straight pull on the male half. The female half of the breakaway coupling must have multidirectional swivel capability before the applicator can be considered fit for use. Multidirectional swivel clamps are available from anhydrous ammonia coupling suppliers.

9. Reconnect the male half to the female half by pushing it into the socket of the female half. If the male half will not easily connect and latch, connection can also be made by pulling the ball body of the female half forward against the sleeve spring, inserting the male half, and allowing both the body and the male half to move back and latch. See what to look for section for more detail on checking the connect/disconnect functions.

10. Close all bleed valves.

What to look for

There are two things a properly mounted and maintained anhydrous ammonia breakaway coupling will do in a breakaway situation:

1. Separate or breakaway before the pull force on the nurse tank hose gets high enough to cause damage to it.

2. Immediately upon separation, shut off the flow of ammonia from both the male and female half of the breakaway coupling.

Separation Function

The coupler ball body should move smoothly (not necessarily easily) when pushed or pulled while the sleeve is mounted in the clamp. If it doesn't move smoothly because of corrosion or dirt, the breakaway coupling must be replaced or cleaned and lubricated per the manufacturer's instructions before the applicator is used. If disconnecting, step 5 above, or reconnecting, step 9 above, requires a great deal of effort, requires several attempts, takes more than one person to accomplish, or cannot be accomplished at all, the breakaway coupling must be replaced before the applicator is used. The clamp should pivot freely vertically and horizontally. Multidirectional swivel clamps have been furnished with anhydrous ammonia breakaway coupling since 1983. If the applicator does not have one it must not be used until it does.

Ammonia Shut Off Function

The ammonia flow is stopped by the closing of the poppet valves in each half of the breakaway coupling. The poppet valves in each half are closed by valve springs and are guided by the poppet valve stem sliding in the bore of the perch. This function is checked in step 6 above. If the breakaway coupling is left connected for a period of time, such as over the winter, for the entire application season, or is never disconnected, corrosion can start between the valve stem and the bore of the perch. If enough time goes by without a disconnect, the corrosion will make the poppet valve action sticky and ultimately bond the parts together such that the valve spring will not be able to close the valves. If inspection step 6 shows that stickiness has started or the valve motion feels gritty, or the valves will not close at all, the applicator must not be used until the breakaway coupling is replaced.

Very Important!

A number of conditions described above indicate that something needs to be repaired or replaced before the applicator is used. Because the fertilizing season is so short there might be a tendency to put off the indicated action until the end of the season or some other more convenient time.
DO NOT PUT IT OFF! Accidents and breakaways are not scheduled events that occur at convenient times. They can happen very near the time the applicator is used. The time spent doing needed replacement or repair looks pretty short when compared to a lifetime of blindness, no sense of smell, or disfigurement from ammonia burns.

Scheduled Replacement
Experience has shown that the aging characteristics described above become much more likely after about 3 years of service. This is why, for more than 10 years, the manufacturer of Pioneer anhydrous ammonia breakaway couplings has recommended that they be replaced after 3 years of service. Like any piece of mechanical equipment, the useful service life of an anhydrous ammonia breakaway coupling is determined by factors such as, but not limited to: frequency of use, storage conditions, use of corrosive additives, and the frequency and level of maintenance. This means that some anhydrous ammonia breakaway couplings may have a useful service life longer than 3 years. If an anhydrous ammonia additive such as Dow Chemical Company's N-Serve is used the useful life of the breakaway coupling may be less than 3 years and more frequent replacement will be required. These additives shorten the life of rubber and metal parts that they come in contact with in anhydrous ammonia application systems. If these additives are used, the need for frequent inspection and timely replacement of anhydrous ammonia applicator system components, including the breakaway coupling, cannot be overemphasized.

Date Code
Since 1972, all Pioneer anhydrous ammonia breakaway couplings have had a code stamped on both the female half and the male half which tells when they were built. The code is two letters with the first letter designating the month and the second letter designating the year. The letters may be preceded by 2 numbers which indicate the day of the month the coupling was built. This is what the letter codes mean:

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Example: Date Code VG means August, 1999. Since 1990, Pioneer anhydrous ammonia breakaway couplings have also had “Replace Before 19XX” markings on each half where the XX represents the year 4 years after the coupling is manufactured.

Summary
An anhydrous ammonia breakaway coupling is a device that is specified by American National Standards covering anhydrous ammonia application equipment. It is in the system to provide hose protection and ammonia shutoff in the event of a breakaway. The mere existence of the breakaway coupling in the system does not assure that it will provide protection against unintended ammonia discharge. The breakaway coupling requires proper installation as well as regular inspection and maintenance to assure that it will perform it's functions when called upon to do so. Some of the risks of not inspecting and maintaining the breakaway coupling and the other ammonia application equipment are lost or impaired sight, lost or impaired sense of smell, severe ammonia burns, damaged equipment, or lost crops. This article has described how, in less than 10 minutes, or less time than it takes to read the article, the anhydrous ammonia breakaway coupling can be checked to assure that it is ready to do it's job if needed. Couplings that fail this inspection must not be used.