

# POLY TANKS

for Farms and Businesses



...preventing catastrophic failures

# Poly Tanks for Farms and Businesses

## Preventing Catastrophic Failures

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# Introduction

Plastic tanks are commonly used on farms and by commercial application businesses for efficient storage and transportation of water and other liquids such as pesticides and fertilizer. These polyethylene tanks, called poly tanks, are popular for several reasons:

- They are available from many suppliers and retailers.
- They cost significantly less than tanks made from other materials.
- They are compatible with many liquid products used by farmers, commercial applicators, and commercial businesses.
- Manufacturers offer a diversified product line for transportation, storage, and application uses.
- They offer design flexibility.
- They are relatively light-weight and easy to handle.
- They are corrosion resistant; i.e., they won't rust.
- They are relatively impact resistant.
- They can be designed so that the amount of liquid in the tank is clearly visible.
- The larger capacity tanks allow growers to purchase and store greater quantities of product.

Poly tanks are excellent containers for storing a wide variety of products.



Above: A poly tank used to carry product on a sprayer.





While the benefits of poly tanks are many, there is a potentially serious drawback: at some point, they will fail. No product is designed to last forever. A poly tank's useful life depends on a number of factors, including the quality and amount of poly material used to manufacture it, the materials stored in it, and whether its specific use is storage or transport.



Poly tanks are used for

- agricultural fertilizer transportation (top left);
- right-of-way herbicide applications (top right);
- outdoor storage of fertilizers (middle right);
- and for golf course herbicide applications (bottom right).



If a poly tank is left outdoors over a period of time, ultraviolet (UV) radiation from the sun degrades the polyethylene, changing it from a tough, resilient material to a hard, brittle one and making the tank more prone to breakage.

Poly tanks have a limited use-life. They degrade quicker when misused, neglected, or used beyond their design specifications. The goal is to replace the tank before it ruptures; the hard part is knowing how to assess the structural integrity of the tank to determine when replacement is necessary. Continued use of an old tank can be a serious economic and environmental mistake when its structural soundness falls below its original design capability.



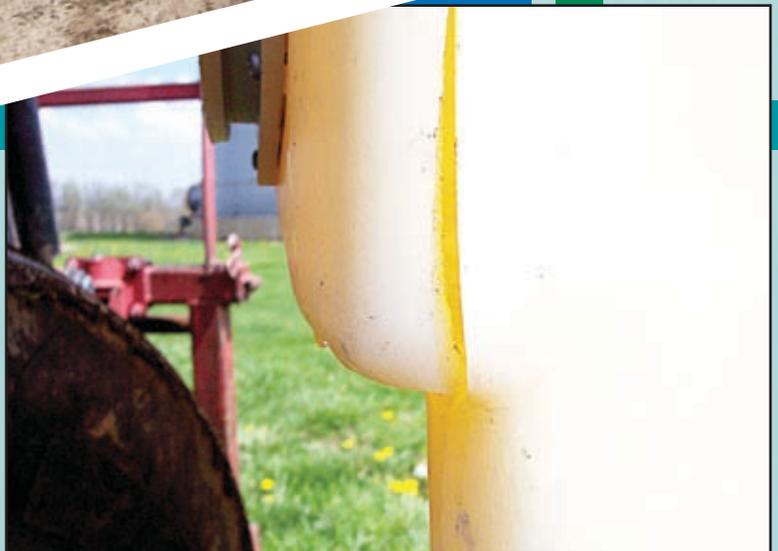
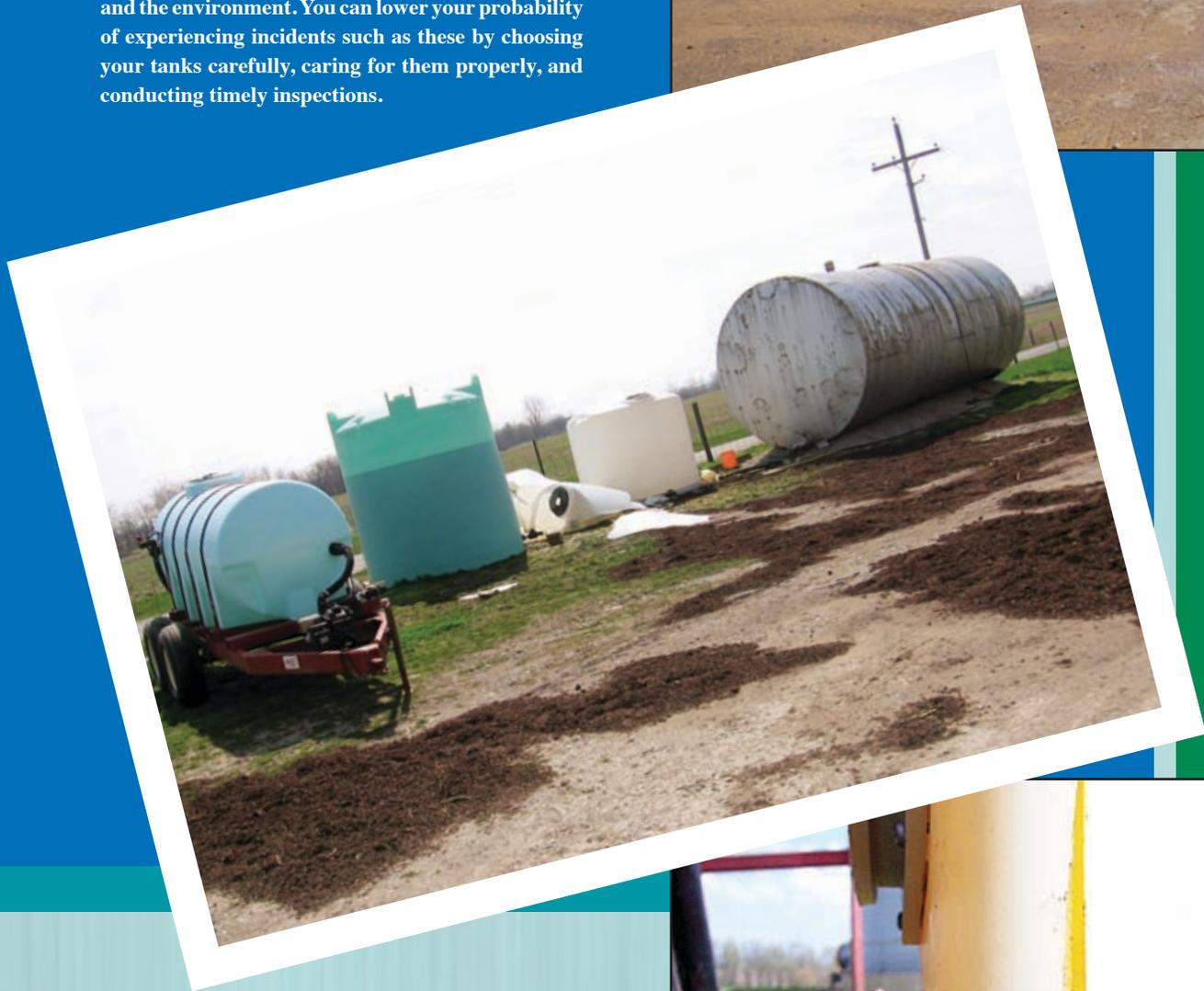
A young farmer in Kentucky recently experienced a tank failure (above) resulting in the release of 5,000 gallons of water. The force of the water moved rock 50 feet onto a grain bin ledge with a 16-inch vertical wall. Rock was deposited on the top of the wall over a span of 10 feet. A 3-inch pump mounted on five 2-foot pieces of angle iron (buried) was pulled out of the ground. Number 57 rock was moved as far as 150 feet.



**Right:** This poly tank failed (cracked) after being pulled across a railroad track.



Catastrophic failures can endanger people, property, and the environment. You can lower your probability of experiencing incidents such as these by choosing your tanks carefully, caring for them properly, and conducting timely inspections.





Routine inspections can reduce the likelihood of product loss, costly cleanup, and legal proceedings.

The photos on this and the following page show the aftermath of a release. Due to the placement of the poly tank, its contents flowed into a nearby ditch.



Knowing when to replace a poly tank is very, very important. No one likes spending money unnecessarily, but poly tanks can – and do– rupture “for no apparent reason.” When they do, the loss is not limited to the value of the spilled material; the cost of cleanup can far exceed the value of the product itself. In some cases, regulatory fees for restoring the environment are added to the bill as well. Poly tanks have a limited operational life; you should view their replacement as the equivalent of changing tires, oil, filters, and hoses on your vehicles and equipment. Failure to perform routine poly tank inspections and maintenance can prove disastrous.

Failing to do routine inspections and maintenance can result in a catastrophic tank failure. This publication explains how to evaluate tank designs, provides management strategies that can extend the tank’s longevity, offers inspection techniques to identify tanks that need to be replaced, and offers disposal options for out-of-service tanks.

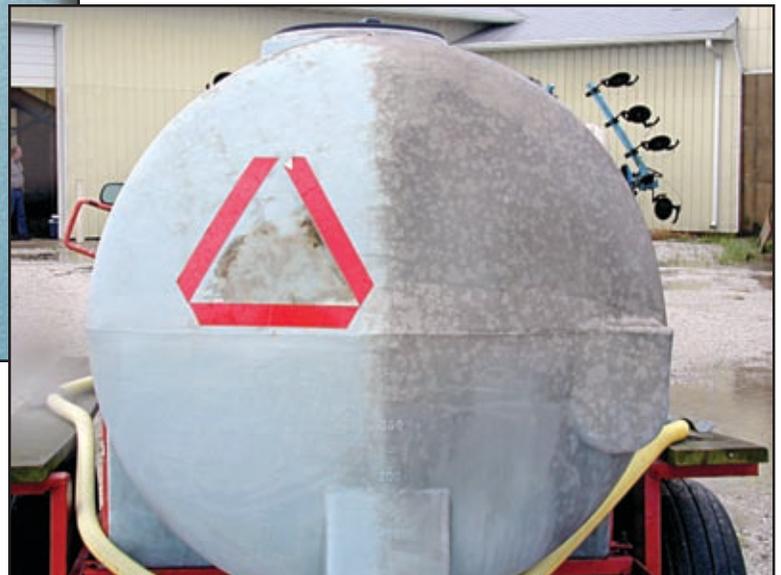


If your tank were to fail, where would the contents go? Think through the possibilities before choosing its placement.



## Tank Material Construction

Poly tanks are built with highly durable, chemical-resistant resins formulated for today's pesticides and fertilizers. They are built to the internal specifications of the manufacturer, not according to a national standard. The resins used in the manufacture of poly tanks are either high density linear polyethylene (HDLPE) or high density cross-linked polyethylene (XLPE). In general, both materials work well for the storage and transport of most pesticides and fertilizers, but XLPE is more chemical resistant and durable (although generally more expensive) than HDLPE. Contact the chemical manufacturer if you are uncertain whether an HDLPE tank will work for the products you store and/or haul.



The polymer compound used in the manufacture of poly tanks contains ultraviolet protection. Even so, sunlight degrades the tanks, over time.

Poly tanks generally are manufactured by using a process known as rotational molding. A powdered polymer compound with an ultraviolet (UV) protection package is poured into a two-piece mold. The amount of UV protection varies by tank type and manufacturer. The mold is clamped shut and heated in a hot oven. During the heating process, the mold is tumbled in two directions; as the powdered polymer melts, the tumbling causes it to coat the inside of the mold. Once completed, the mold is moved into a cooling chamber where the temperature is slowly decreased. The completed tank is then removed from the mold.

This process molds poly tanks as a single piece. A visible external seam—known as the parting line—gives the impression that two pieces are joined together. But the parting line is merely an external cosmetic artifact from the manufacturing process; it represents the juncture of the two pieces of the mold, not the tank itself.



Notice the **parting line** on this tank.

**SPECIFIC GRAVITY.** A tank's specific gravity rating is a measure of its ability to hold materials. The specific gravity of a substance is a comparison of its weight per unit volume to that of water. Manufacturers have designed tanks with specific gravity ratings of 1.0 to 1.9 or more. Higher specific gravity ratings indicate a greater ability to withstand hydrostatic stresses caused by a stored liquid.

Understanding the significance of specific gravity to poly tank evaluation begins with the weight of water: 8.334 pounds per gallon. The specific gravity of water is 1.0, and the specific gravity of all other substances is relative to the weight of water. For example, a poly tank with a specific gravity of 1.0 is designed to hold the weight of water or any other liquid that weighs 8.334 pounds (or less) per gallon.

Tanks not only come in various sizes, but with different specific gravity ratings as well.



A poly tank rated at 1.5 specific gravity is designed to handle the weight of a liquid product 1.5 times the weight of water ( $1.5 \times 8.334$  pounds); so a 1.5 specific gravity tank is built to withstand the internal forces of liquids weighing up to 12.5 pounds per gallon. A tank rated at 1.9 specific gravity can store products weighing up to 15.8 pounds per gallon ( $1.9 \times 8.334$ ).

In general, the weight of liquid fertilizers ranges from 10 to 12 pounds per gallon. Specifically, 10-34-0 liquid fertilizer weighs 11.67 pounds per gallon, while 28-0-0 liquid fertilizer weighs 10.7 pounds per gallon. Most pesticides weigh slightly below or just above the weight of a gallon of water. At a minimum, fertilizers should be stored and handled in poly tanks with at least a 1.5 specific gravity rating. A good rule of thumb is to purchase a tank with a specific gravity rating at least one increment higher than that of the product you intend to put into it.

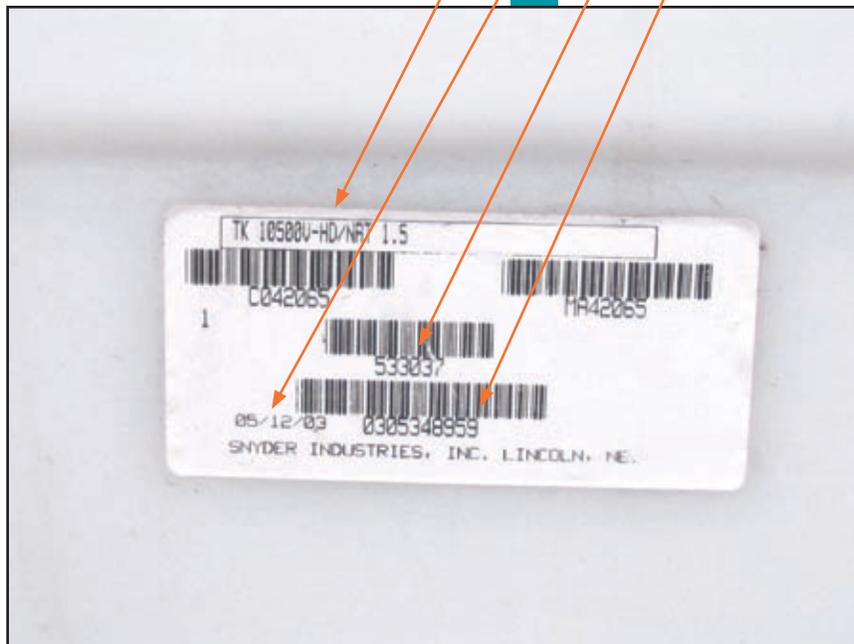
The specific gravity rating tag may no longer be attached to the tank, and it is impossible to guess it based on the tank's appearance. Ask your dealer for the specific gravity rating of the tank you're considering, review the manufacturer's catalog, or examine the tank specification sheet. In some cases, the specific gravity rating is part of the product code. Some manufacturers stamp information on the side or top of the tank. These variations make purchasing used tanks a real challenge.

HD 1.5

Manufacture date

Part number

Serial number



Poly tank manufacturers code their tanks as indicated by the highlighted numbers (right). Refer to your tank's code when contacting the manufacturer to determine its specific gravity rating.

Manufacturers normally attach a tag to the poly tank (top photo). This tank tag indicates a high density 1.5 tank.



**THICKNESS.** Tanks must account for the internal forces required to hold the specific gravity of any given product. Wall thickness is a major factor in the ultimate strength of a tank.

Tank wall thickness and overall design are two of the most important factors in determining its specific gravity rating. When purchasing a poly tank, first consider the specific gravity of the heaviest liquid you will put into it; then look for tanks with that specific rating, or higher.



The manufacturers of poly tanks have determined critical stress points, which are different for transport versus storage tanks, and strengthen those areas during the molding process.

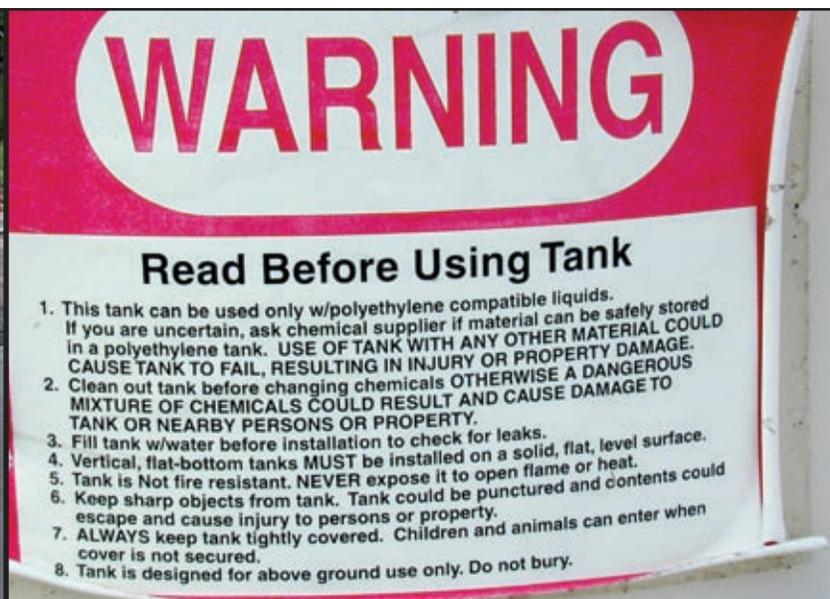
**EXTREME TEMPERATURES.** Extreme temperatures usually do not impact good quality polyethylene tanks. Quality tanks are designed to withstand expansion and contraction caused by extreme hot and cold. Results of tanks tested to  $-40^{\circ}\text{F}$  demonstrate that freezing does not damage poly tanks. Constant, sustained temperatures above  $100^{\circ}\text{F}$  may weaken tanks, but this is seldom a factor since our temperatures don't remain above  $100^{\circ}\text{F}$  for long periods of time.

**WATER DETERIORATION.** Poly tanks do not decay or rust in standing water or in contact with the ground; and any mold or algae that might develop on the inside is removable with an algicide.

**PRODUCT COMPATABILITY.** HDLPE tanks are compatible with most pesticides and fertilizers. However, poly tanks manufactured to hold fertilizers and pesticides should not be used for gasoline or diesel fuel because they can break down and soften the plastic. Pure biofuels such as B-100 can be stored in poly tanks built to American Society for Testing Materials (ASTM) D1988 standards with a 1.9 specific gravity rating. But some manufacturers' warranties do not cover tank failure due to 100 percent biodiesel or blended modifications.

Petroleum-based oils also permeate and soften plastic, but the process is much slower than with gasoline. Oil should be stored in poly tanks with a 1.9 (or higher) specific gravity rating.

Petroleum products should be held only in poly tanks specifically designed for them.



Experience has shown the importance of selecting valves, gaskets, and hoses that are compatible with the products to be stored in the poly tank. In certain cases, replacing a gasket with one that will stand up to biodiesel makes an HDLPE tank acceptable. Using compatible equipment prevents component failure and product release.

Read and heed all attached warnings on the use of poly tanks.



## Tank Design: Vertical Storage and Horizontal Transport

Poly tanks have two distinct use designs: vertical tanks (also called stationary, upright, or hockey puck tanks) and horizontal tanks (side-to-side, transport, application, or leg tanks). The significant design differences between vertical and horizontal tanks dictate how they should or should not be used. Using a tank outside its design specifications voids the manufacturer's warranty and increases the odds of tank deterioration, tank failure, costly cleanup, and lost inventory.

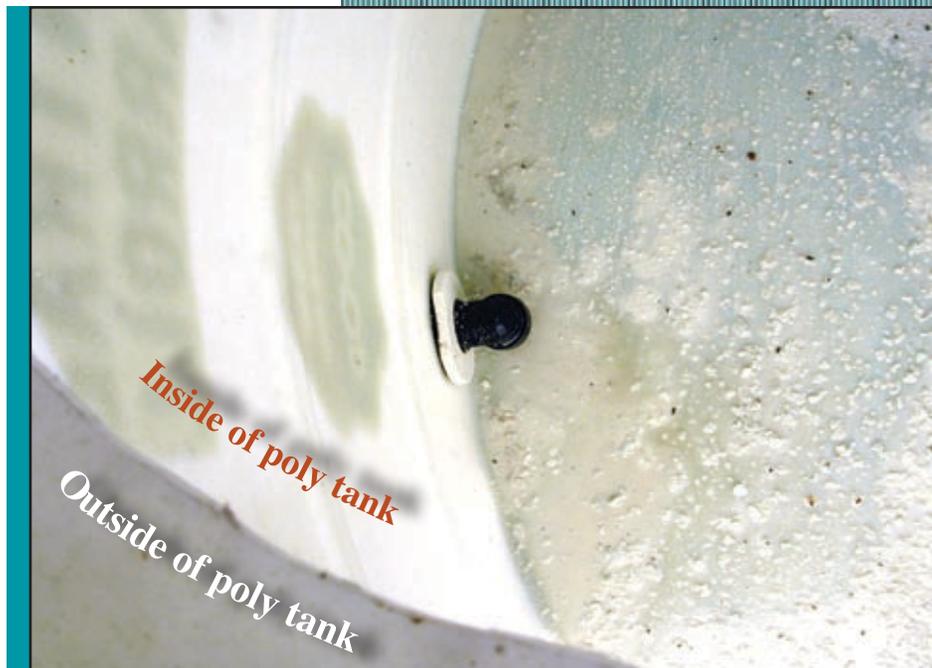


The storage tanks in this photo are being misused as transport tanks.

Vertical tanks are flat- or cone-bottomed, cylindrical tanks designed and manufactured specifically for stationary placement on a reasonably smooth, level surface. As the tank is filled, the pressure of the liquid forces the wall to flex outward. As the tank is emptied, the walls revert to their original shape. This movement of the tank wall is determined by the depth and specific gravity of the liquid. Manufacturers strengthen tanks by making the plastic thicker where the sidewalls meet the bottom; this is where the pressure is greatest.



Vertical storage tanks (above and below) are designed for stationary placement.



Vertical tanks are made for stationary use only, but many come with tie-down connectors for anchoring them to the ground; empty tanks can be set askew – or blown over – during high winds if not tied down. The connectors on vertical tanks are not strong enough to secure loaded vertical tanks to the bed of a truck or trailer for transport.



Vertical storage tanks should be secured. Notice the tie-downs on the tank shown in these two photos.

Horizontal tanks are designed for placement on trucks, trailers, and field sprayers, but they also may be used as stationary tanks. Pressure points on horizontal poly tanks are much different than those found on vertical tanks. Liquids move from front to back when the truck stops and accelerates, creating a surging effect that exerts pressure on the front and back walls.



A storage tank used for transport (above) can fail at the points where its tie-downs are attached. See breakage from this type of failure in the middle photo. Storage tanks are not designed for the rigors of transport.

The two photos at the bottom of this page show someone's meager attempt to secure a storage tank. There is no safe way to do it, so don't!





Vertical storage tanks (above) show deformation caused by the owner's attempts to secure them onto a trailer. They were not designed for transport. In the photograph below, water stands in an indentation made by the over-tightening of a tie-down.





These photos show attempts to supplement tie-downs with brackets and wooden blocks.

The tie-down features on horizontal tanks are more substantial than those on vertical tanks. Horizontal tank tie-downs commonly are pipe hoops or metal bands capable of holding a loaded tank in place if the truck or trailer stops suddenly. The hoops and bands also support the sides of the tank.

Both vertical and horizontal tanks should be properly secured in place without bulging or looking deformed. Although tanks are designed to change shape slightly when filled, they must not be squeezed out of shape by straps or tie-downs. A deformed tank indicates too much stress on the polymer, which in combination with UV exposure and the weight of the material contained may cause the tank to fail.

Large capacity horizontal tanks greater than 1,000 gallons generally are equipped with internal plastic baffles that reduce the force of liquid as it surges from one end of the tank to the other.



The transport tank (left) has legs and is secured onto the bed of the truck with metal tie-down hoops.

A view inside a transport tank (right), showing the baffles that help control liquid contents during transport.





These horizontal tanks (left) also have legs. Some are secured to the trailer with metal hoops, others with metal bands.

This photo demonstrates the use of specific **brackets** and **webbing** to secure the tank to its **saddle**, which is bolted to the truck.



# Warranty

Manufacturers usually guarantee their tanks to last three to five years from the date of manufacture, not the date of purchase. Most tanks have three-year warranties, but longer warranties are provided on more durable tanks such as those with a 1.9 specific gravity rating. The date of manufacture often is imprinted on the tank as part of the serial number, but not always. If you cannot clearly determine the manufacture date of a failed tank, have the manufacturer look up the serial number.

Most warranties cover the tank if used according to the manufacturer's specifications and if failure occurs during the warranty period. Coverage is for workmanship and materials only. Under these terms, a defective tank would be repaired (if possible) or replaced at no cost to the original owner. Warranties do not cover the replacement cost of lost product or environmental remediation due to a release or spill, nor do they cover tank failure where the material stored had a specific gravity higher than the tank's rating. Read the manufacturer's warranty to find out what is and is not covered.

Establish a file marked "Poly Tanks" for all shipping papers, warranties, delivery tickets, etc.; while your tank is new and clean, record serial numbers and parts numbers that are stamped on or into the plastic or written on a decal, and file them for future reference. Such information is commonly required to file a warranty claim with the manufacturer.



This tank was manufactured in June, 2004.



The warranty for these poly tanks (left) is void because they are being used for transport.

The owner of this tank (right) claims that it is properly supported. But without metal hoops, it is not.



# Six Questions to Ask when Purchasing a Poly Tank

Price can be a factor in deciding which poly tank to purchase; but when comparing tanks, be sure they have the same or very similar specifications. Ask about the specific gravity ratings and tank warranties; consider your intended use of the tank (storage or transport) and the products you will store in it.

Consider the following questions when purchasing a poly tank:

**Question 1.** *What size poly tank do I need to purchase?* Many variables affect the decision on what size tank to purchase. Large capacity tanks don't have to be filled as often, which can save time, labor, and transportation costs; and they offer the following benefits that can contribute to efficiency:

- Better product pricing because you can store bulk materials.
- Smaller space requirement than for multiple small tanks totaling the same volume.
- Single tank and pump requirement versus setups for multiple smaller tanks.

One disadvantage of large horizontal transport tanks is the weight they impose on trucks and trailers. Before purchasing a large tank, make sure your vehicle and/or trailer axles, tires, and brakes are capable of handling its filled weight. Never install a large tank on a truck or trailer not designed to carry the load.

Small tanks offer different advantages:

- They cost less per tank (although not necessarily per gallon stored).
- Their small capacity might exempt you from storage facility requirements such as dikes.
- Less material is spilled and lost if a release occurs.
- They can be used on a wider array of trucks and trailers.

**Question 2.** How will I use the poly tank? The choices are straightforward. Vertical stationary tanks are designed for storage at ground level only. Horizontal transport tanks are designed for mounting onto a truck, trailer, or sprayer for mobile operations, but they also can be used for storage on the ground.

Upper right and middle photos: It is important to decide *before you purchase a tank* whether you need it for storage or for transport.



Lower right photo: Vertical storage tanks should not be used for transport.

**Question 3.** *What specific gravity rating should I select?* Determine the specific gravity rating of the products you will store and transport before selecting a poly tank. Store or transport fertilizers and pesticides in tanks rated at least 1.5 specific gravity. A rule of thumb for vertical stationary tanks: 1.5 specific gravity is sufficient if the tank remains indoors throughout the year; if it is placed outdoors, under roof; if it is placed in a properly constructed dike of adequate size; and/or if it is used infrequently.

A 1.9 specific gravity tank used and maintained in the same manner as its 1.5 specific gravity counterpart lasts longer and offers more security and peace of mind to the owner. A more expensive tank rated at a 1.9 specific gravity might be considered if the following scenarios are likely:

- Tanks will be mounted on a truck or trailer.
- Tanks will remain outdoors year-round.
- Tanks are extremely large.
- Tanks will be refilled many times during the year.
- Tanks will be placed near a water source (e.g., pond, creek, well).
- Tanks will be neither diked nor contained.
- Tanks will be used to store heavy materials such as 10-34-0 fertilizer.



Consider purchasing a higher quality tank for transportation or chemical applications.



**Question 4.** *What level of service do I expect?* Poly tanks can be purchased from internet suppliers or farm supply stores. Always consider these service questions:

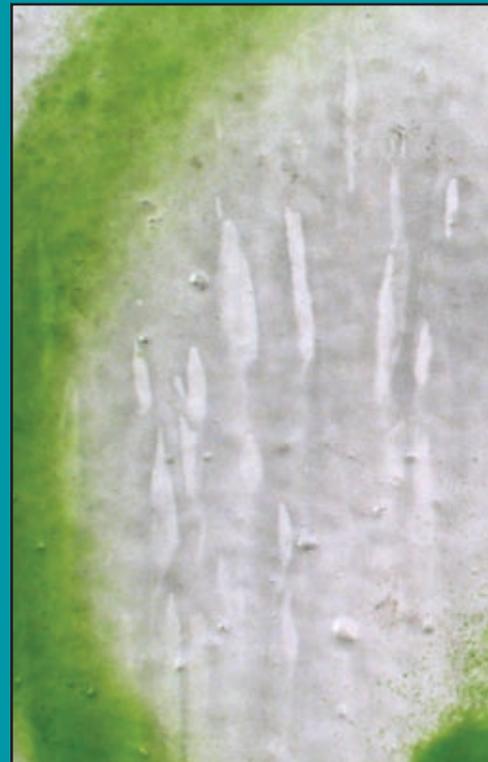
- How important is the warranty?
- Will the vendor service the tank if service is required under warranty?
- Does the vendor carry compatible parts such as hoses, gaskets, and tank fittings?
- How does installation of fittings (by the user) affect the warranty?



**Question 5.** *How much does the poly tank really cost?* With facts gathered from answers to the previous questions, you can use price to decide where to buy. First, compare all features and determine the tank best suited to your intended uses; then compare the services available through various vendors. The lowest-priced tank may or may not be the best deal.

**Question 6.** *How does the polyethylene tank compare with other materials used to manufacture tanks?* Materials used to manufacture tanks include fiberglass, steel, and stainless steel. Each has its own strengths and drawbacks. Tanks made from other materials may last longer than poly tanks and are generally more expensive.

Below: This tank was so rusted that a knife was easily inserted.





Tanks eventually fail, no matter what material they are made of.



# Poly Tank Installation

Choose the best location. Place the tank properly. The few minutes it takes can lessen the likelihood of a spill and reduce the impact in the event of tank failure.

## Vertical Stationary Tanks

The decision on where to locate a tank usually centers on accessibility: you have to be able to get to it easily. But if you're installing a replacement tank, take time to reconsider the location; placing it where the old one stood might not be the best decision.



## Location

Always evaluate surface and subsurface concerns when selecting the location for a tank – even a replacement tank. Consider for a moment what would happen if a tank were to split open, releasing its contents. Where would the product go? Could it flow into a well or creek? While convenience and accessibility are valid reasons for selecting a location, the potential environmental impact of a spill or leak is equally important. The ideal location is clear of drainage tiles, wells, septic tanks, ditches, and ponds.

In a real life example, a poly tank broke open and released 2,500 gallons of liquid starter fertilizer onto the ground (see photo below). It was unfortunate, yes, but the tank had been placed in a perfect location and the fertilizer flowed down a dirt driveway, accumulating at the edge of an agricultural field. Cleanup was easy, and the spilled material did not contaminate drinking or surface water nor kill any fish.



Page 36: Tanks do fail, so it is important to know where a spill would travel. Sometimes the handiest location is the worst location — especially without containment.



A properly placed tank, even if maintained and used correctly, can degrade from sunlight and fail. Therefore, it is important to choose the proper location and to conduct routine inspections.



## Surface Considerations

The area beneath the tank has to be free of sharp rocks and other objects that could cut into the tank, over time, and cause a leak.



A level surface is important for supporting a tank. The tanks in these photos were not properly installed.



Small stationary tanks (less than 2,000 gallons) and medium tanks (2,000 to 6,000 gallons) should be installed on compacted soil, sand, pea gravel, or concrete. The base must be solid, level, not subject to erosion, and at least four inches deep; if loose fill is used, the base must be framed by a material that will not decay. Tanks that hold 6,000 gallons or more always should be placed on a properly designed concrete pad.

Vertical stationary tanks need to be in a well-drained area not subject to flooding. Tanks have been known to “float” off site or to shift as heavy rains wash away the fill, creating an unstable base. All outdoor vertical tanks should be anchored to the ground as facilitated by the tie-down connectors on the tank.



Vertical storage tanks properly installed on a level surface and secured to the base.

## Security of the Area

Pesticides and fertilizers stored in poly tanks must be secured from theft and vandalism. Follow these advisories:

- Keep all tank valves closed and locked when not in use or when no one is on site.
- Place tanks as far away from roads as possible to reduce the threat of vandalism.
- Place tanks in areas where there is adequate dusk-to-dawn or motion-sensitive lighting so they are visible from the house or shop.
- If possible, fence the tank area to discourage intrusion, and lock the entrance gate.
- Limit key access to authorized persons.
- Keep forklifts and other equipment away from tank sites.
- Post NO TRESPASSING or KEEP OUT signs and other regulatory signs, as required.
- Inspect facilities, tanks, gaskets, fittings, hoses, pumps, and valves regularly; watch for leaks and signs of tampering.
- Maintain an accurate inventory of pesticides or fertilizers stored in the tanks, and label the tanks.
- Inform law enforcement to conduct periodic inspections if no one is on site on a regular basis.
- If tanks are located away from the main farmstead or facility, post contact phone numbers at the storage location.
- Keep a list of emergency numbers handy: fire department, law enforcement, medical assistance, county emergency management.
- Establish procedures for notifying appropriate law enforcement when evidence of tank tampering or vandalism is discovered.



# Horizontal "Transport" Tanks

Horizontal tanks are mounted to steel skids or fastened to trailers. If they have legs, each entire leg must rest on the trailer. Those without legs must rest in a cradle that supports them from end-to-end and surrounds one-third of their circumference.



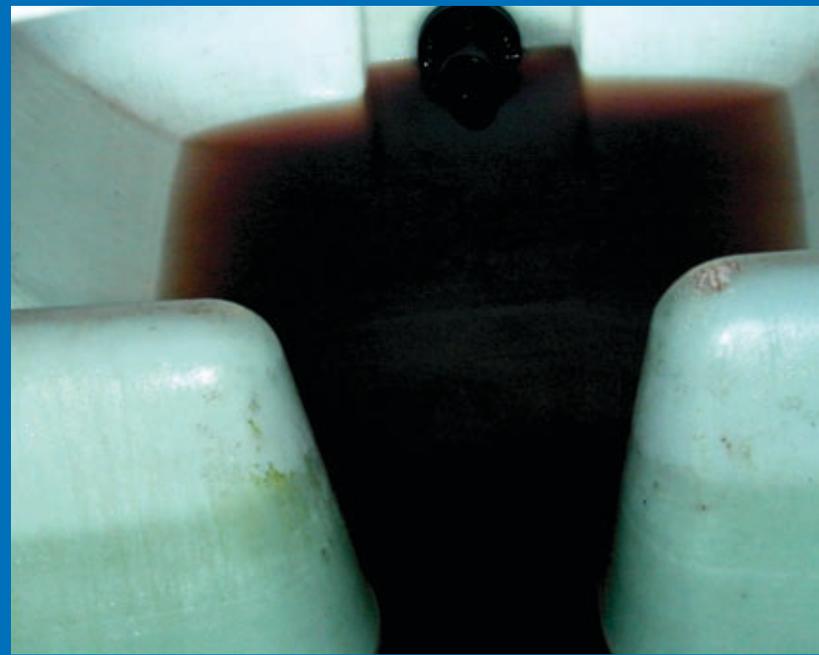
## Baffles

Poly tank manufacturers recommend that horizontal transportation tanks that hold more than 1,000 gallons be mounted lengthwise on the truck or trailer. If mounted across the width of a truck or trailer, the baffles would be out of position to control the content as it surges forward and backward during transit.

Portable baffles are small structures placed into the tank to take up space but not much volume (less than 1 percent). They dramatically reduce liquid surge within a horizontal tank. The tank size (length, width, height), tank volume in gallons, tank shape (round, oval) and lid opening diameter contribute to the size and number of baffles needed.



Baffles must be positioned opposite the direction of travel to be effective in slowing the forward and backward surge of liquid in transport. The tanks in the upper left-hand photo are mounted improperly, and the baffles inside the tanks would be ineffective. The tanks in the bottom photo are mounted properly.





Portable baffles can be added to poly tanks.





Baffles reduce liquid surge.

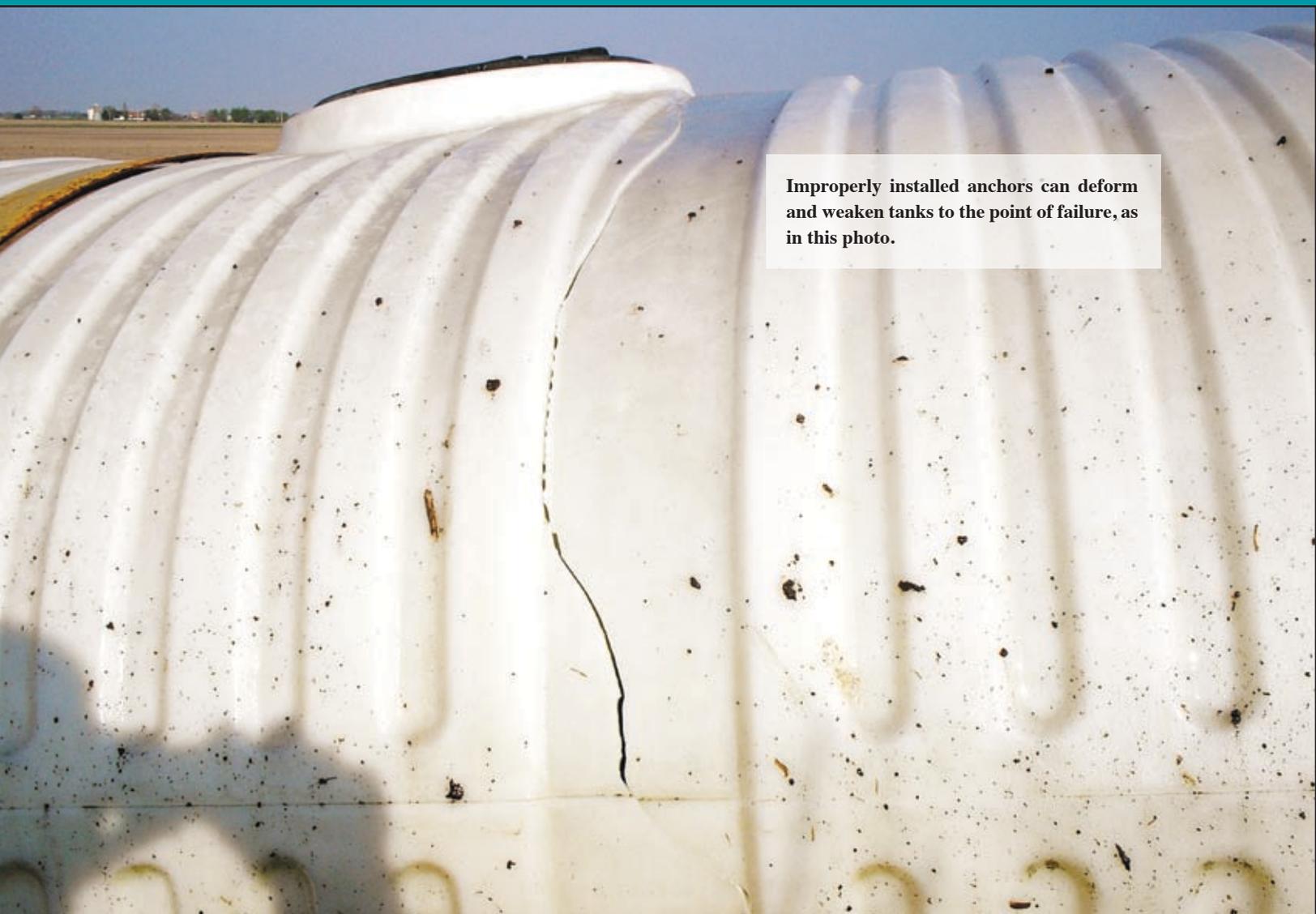
## Metal Bands and Hoops

Horizontal tanks and horizontal leg tanks sometimes require metal bands, straps, or hoops for structural strength and stabilization during transit. There is little difference in performance between bands and hoops on tanks under 750 gallons because of their smaller volumes. Bands often are made of sheet metal, which has excellent tension strength; however, the bolts that hold the metal to the trailer or cradle can become weakened by pressure from large tanks. Large tanks may require stronger fastening systems. Unlike bands, hoops are made of structural steel tubing or pipe and can withstand the powerful forces exerted by liquid contents when a transport vehicle stops quickly.



The tanks shown above are nicely supported with metal hoops.

Metal straps or tubular hoops that run across the top and down the sides of the tank to anchor it and support the sidewalls require tightening, but always be careful not to over-tighten them. Over-tightening prevents poly tank walls from expanding adequately when filled. That is, when the tank fills, the sides push outward; and if the straps or hoops are attached too tightly, the tank becomes deformed – and weakened – at the point of contact.



Improperly installed anchors can deform and weaken tanks to the point of failure, as in this photo.

Pull the strap or hoop over the tank so that no gap remains. Fill the tank with water and look again for gaps; tighten a little at a time until no gaps exist, being very careful not to over-tighten. Watch for evidence of stress, such as deformity, warping, or bowing, and recheck straps and bolts at regular intervals.



# WARNING

## TIGHTEN BANDS/HOOPS AFTER FILLING

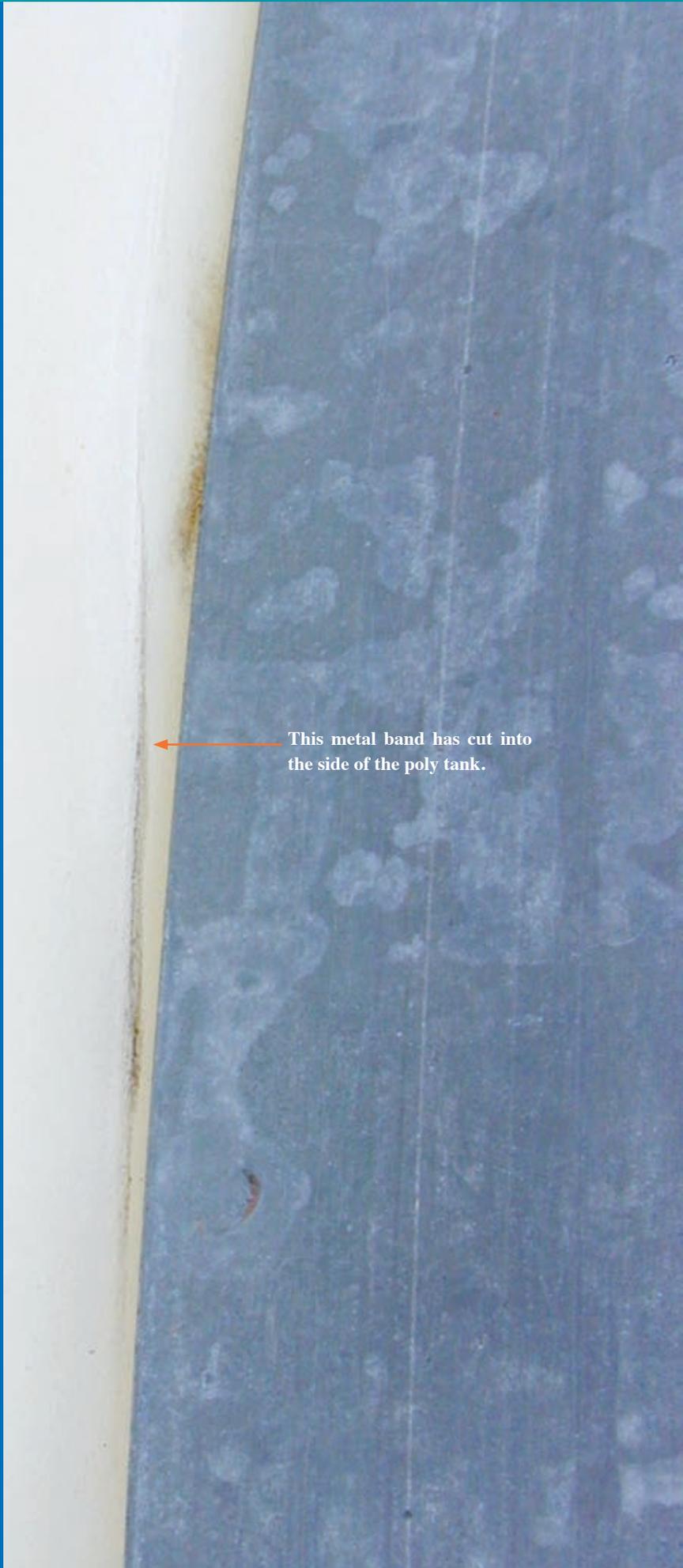
BANDS AND/OR HOOPS SHALL BE TIGHTENED TO REMOVE ALL GAP BETWEEN BANDS/HOOPS AND TANK BEFORE FILLING AND AFTER FILLING BUT NOT CAUSING TANK DISTORTION.

 **SNYDER**  
*industries, inc*

P.O. BOX 4583, LINCOLN, NE 68504



Additional webs and blocks can help secure tanks as long as they do not deform them.



This metal band has cut into the side of the poly tank.

## Load Capacity Considerations

Hauling full poly tanks on trucks and trailers raises important legal and safety issues. In most states, a special permit is required if the combined weight of the vehicle(s) and the load exceeds 80,000 pounds. Most drivers intend to stay below the limit; and since the average empty tractor/trailer combination weighs about 28,000 pounds, only about 52,000 pounds of cargo can be hauled legally. A 2,500-gallon poly tank filled with liquid fertilizer could weigh up to 27,500 pounds. Always consider the number of loaded tanks plus all support equipment (minibulks, hoses, pumps, etc.) when estimating the weight of your load. If your overloaded truck or trailer were declared out-of-service by the Indiana Commercial Motor Vehicle Enforcement Division, you would have to off-load some cargo to make the load legal.

From a safety perspective, trucks and trailers need to be equipped to handle the maximum allowable weight they can carry; that is, their steering, tires, wheels, bearings, suspensions, and brakes must be designed to withstand the stress imposed by the load. Manufacturers assign Gross Vehicle Weight Ratings (GVWRs) for trucks and trailers; the GVWR represents the maximum load the truck or trailer can safely carry, including the weight of the vehicle itself. If the combined weight exceeds the GVWR, it means that you cannot safely transport the load – or, perhaps, even stop it efficiently. If you are involved in an accident under these circumstances, your insurance company may not honor your claim.

How close to the weight limit do you want to be?



Over time, cargo weight can bow the frame; and continual moisture deteriorates wood supports. Notice the signs of rotting wood in this photo.



Below: Notice how the weight of the tank has bowed the frame of the transport vehicle.



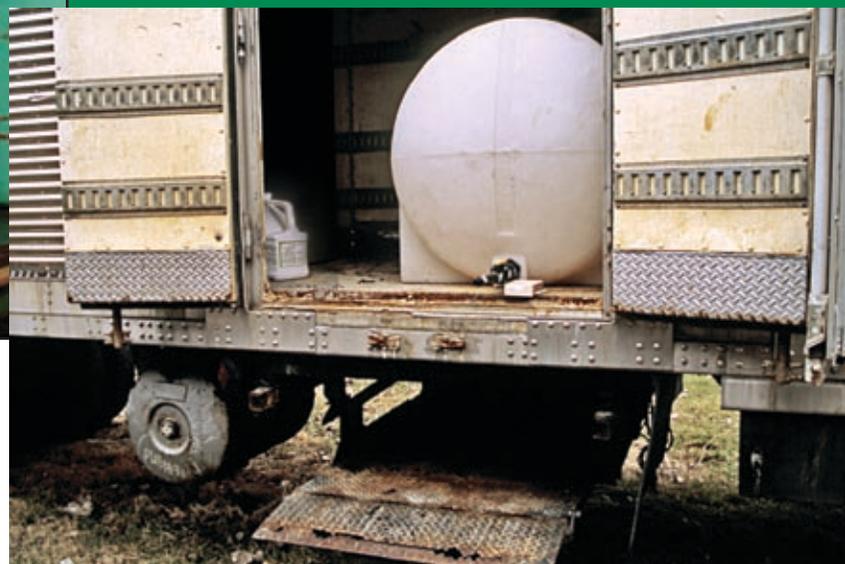
## Transportation Security

Attention has shifted, over the years, to safeguarding loads transported on our highways. Concern about theft of product, acts of vandalism, and even threats of terrorism has increased our diligence in protecting the chemicals we haul.

- Vehicles used to transport pesticides should be kept locked when not in use.
- Pesticide and fertilizer application equipment should be locked, if possible, and attended at all times if they contain any product whatsoever; all unattended equipment must be empty.
- Tank valves should be closed and secured with chains, padlocks, or other devices when unattended.
- Lids on unattended tanks must be closed and secured.
- Tanks and equipment should be inspected daily, before each use; look for signs of tampering, vandalism, or leaks.
- Procedures should be in place for notifying appropriate law enforcement officials when tank tampering or vandalism is discovered.
- Tanks should not be left in unsecured areas, along roadsides, or in fields.



Exposed tanks are subject to vandalism and damage during transport. Enclosed tanks can be secured and locked.



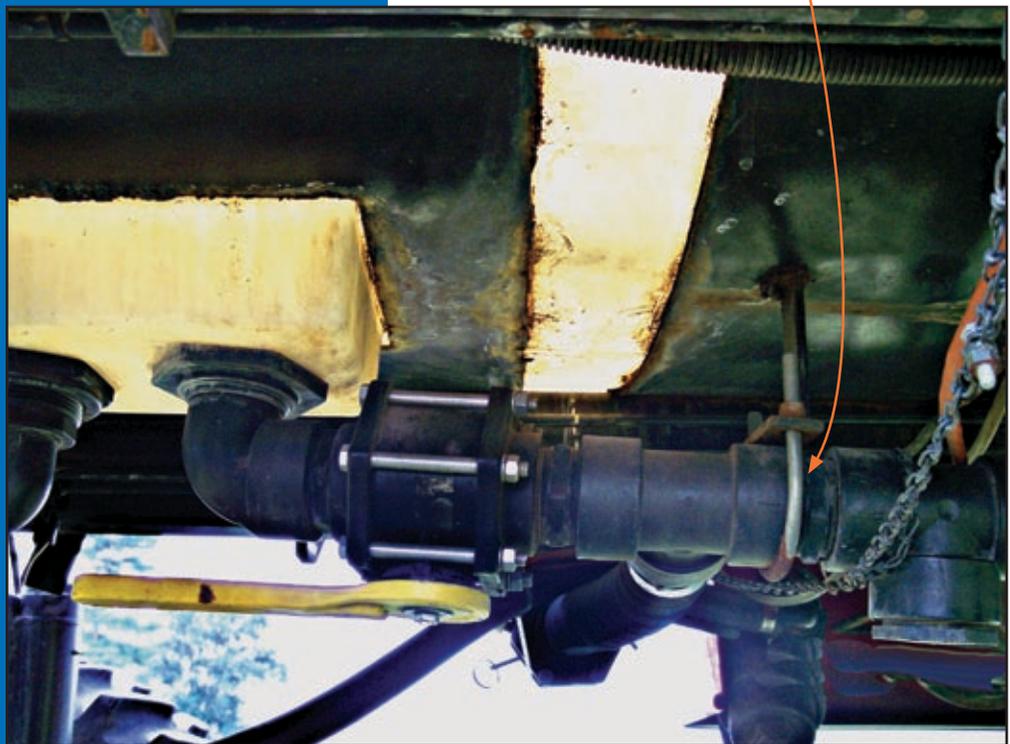
# Poly Tank Attachments and Venting

The manner in which attachments are placed on poly tanks can decrease useful tank life. A system completely plumbed with stainless steel or solid plastic pipe is too rigid, causing excessive stress on the tank valve and bung area. Flexible connections, like hoses, are preferable. Keep everything as short, lightweight, and flexible as possible.

The most common valves used on poly tank systems are stainless steel or poly ball valves, and there are two options for their placement. The first option is to use flexible hose between the fittings and the ball valve. This is especially important if the ball valve is heavy, because placing the valve some distance from the poly tank keeps its weight from pulling down on the plastic. The one problem with this approach is the inability to stop a leak if the flexible hose fails.



A second option is to attach a lightweight ball valve as close to the tank as possible, followed by a flexible hose. This allows the flexible hose to pulsate as the fluid is pumped from the tank, and the valve allows the tank to be shut off in the event of hose or pump failure. Valves can be supported with a wood block, chain, or "C" clamp to alleviate tank stress from the weight of the valve and hose.



Make sure all connections allow the tank to flex. Also make sure hoses don't hang over the trailer or truck bed, since their hanging weight can weaken the plastic area around the fittings. Rigid supports and excessive weight around fittings can decrease a tank's service life; blocks placed under ball valves and hoses – after filling the tank – can reduce this type of stress.



Tanks come equipped with a vent, usually built into the lid or the tank itself, that allows the tank to breathe during loading and unloading. An improper or nonfunctional vent can cause tanks to swell excessively during loading or to collapse during unloading. The higher flow rates of larger pumps may require the installation of additional vents by either the tank manufacturer or the owner. When using large capacity pumps, additional tank venting can be accomplished by opening or removing the lid, but you must be sure to replace the lid before moving the tank.



# Water Testing the New Poly Tank

Fittings can loosen or a tank may be damaged during shipment from the factory; and sometimes, brand new tanks are shipped from the manufacturer with an undetected defect. Therefore, many new tank warranties require that a water test be conducted before the tank is used. First, install all attachments (e.g., ball valve, tank fittings, hoses) and set the tank in its designated location. Then fill it with water and let it sit for a few days to see if it leaks. If the new tank is found to be defective, contact the manufacturer for a settlement under warranty.

## Routine Inspection

A few simple maintenance procedures can increase the use-life of a tank and prevent a spill or reduce its impact.

### Pre-Trip Inspection of Horizontal Transport Tanks

It doesn't matter if you inspected your horizontal tanks before hauling them two hours, two days, or two weeks ago. Always repeat the process before sitting in the driver's seat. Inspect the following details on horizontal tanks prior to transport:

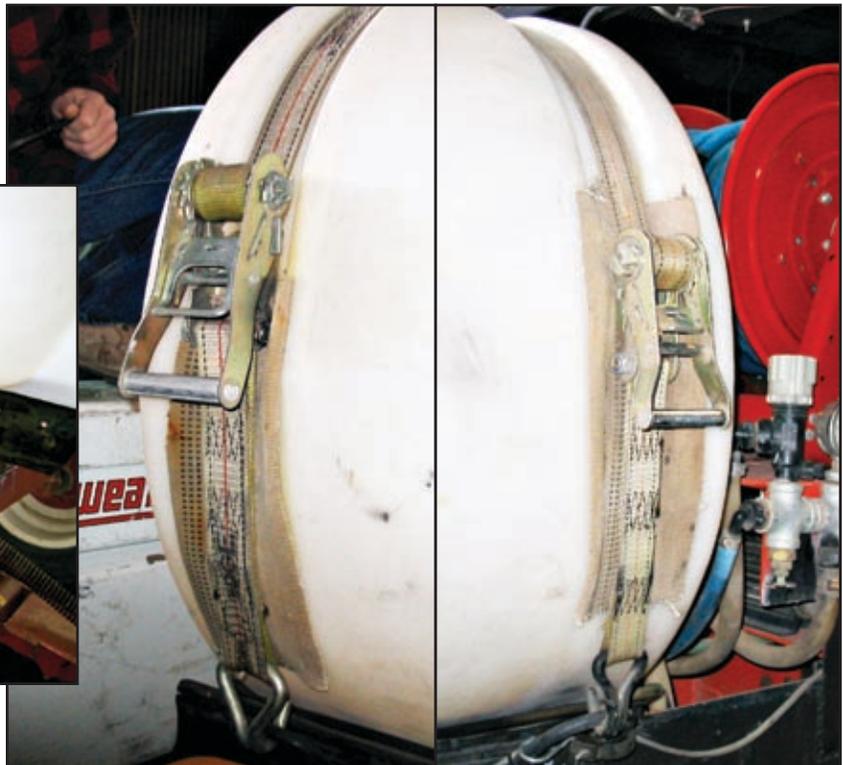
- Missing, broken, and bent bolts on the hoops or bands.
- Leaks around valves, tank bungs or lids, or plumbing.
- Cracks or splits in hoses.
- Improperly secured hoses.
- Improperly secured covers.
- Vents in the lid or tank that are obstructed or clogged.

Check continually for movement of horizontal tanks on transport vehicles. Tanks held in place with metal straps should be inspected numerous times during the season since they can cut into the tank if it shifts forward or backward. Place thin rubber or foam underneath the metal straps to prevent this. Metal hoops usually do not need this type of protection.

Below: A tank that shifts during transportation might need to be supported by additional brackets.



Below: Notice the “cut” piece of plastic caused by rubbing against the metal frame. The fix is to cut part of the metal frame lower than the tank.



Above, right: The rear part of the tank has properly placed pads underneath the metal buckles.

Above, left: The front section has metal-to-plastic where the pad has slipped below part of the buckle.

Below: A piece of “rub” hose is used to protect the hose under pressure from rubbing on the frame of the transport vehicle.



## Vertical Storage Tank Site Inspection

Visually inspect your tanks each time you fill them; watch for physical damage such as holes, dents, and abrasions. Make sure that the base on which vertical tanks rest remains solid. Animals can burrow underneath, causing the base to become uneven. Keep a record of each inspection in case liability or warranty issues are raised.

Threaded poly fittings sometimes develop leaks when left dry over the winter, so be sure to check them in the spring. Some of the older poly tanks are plumbed with black iron fittings versus poly fittings, and after years of use the iron starts to decay from the inside out. Take a close look at these fittings as well; you might want to consider replacing them with the newer poly fittings.



**This storage tank collapse was the result of a clogged vent.**



A block is needed to support the valve on this tank.

## Tank Longevity: How Long Can I Expect the Tank to Last?

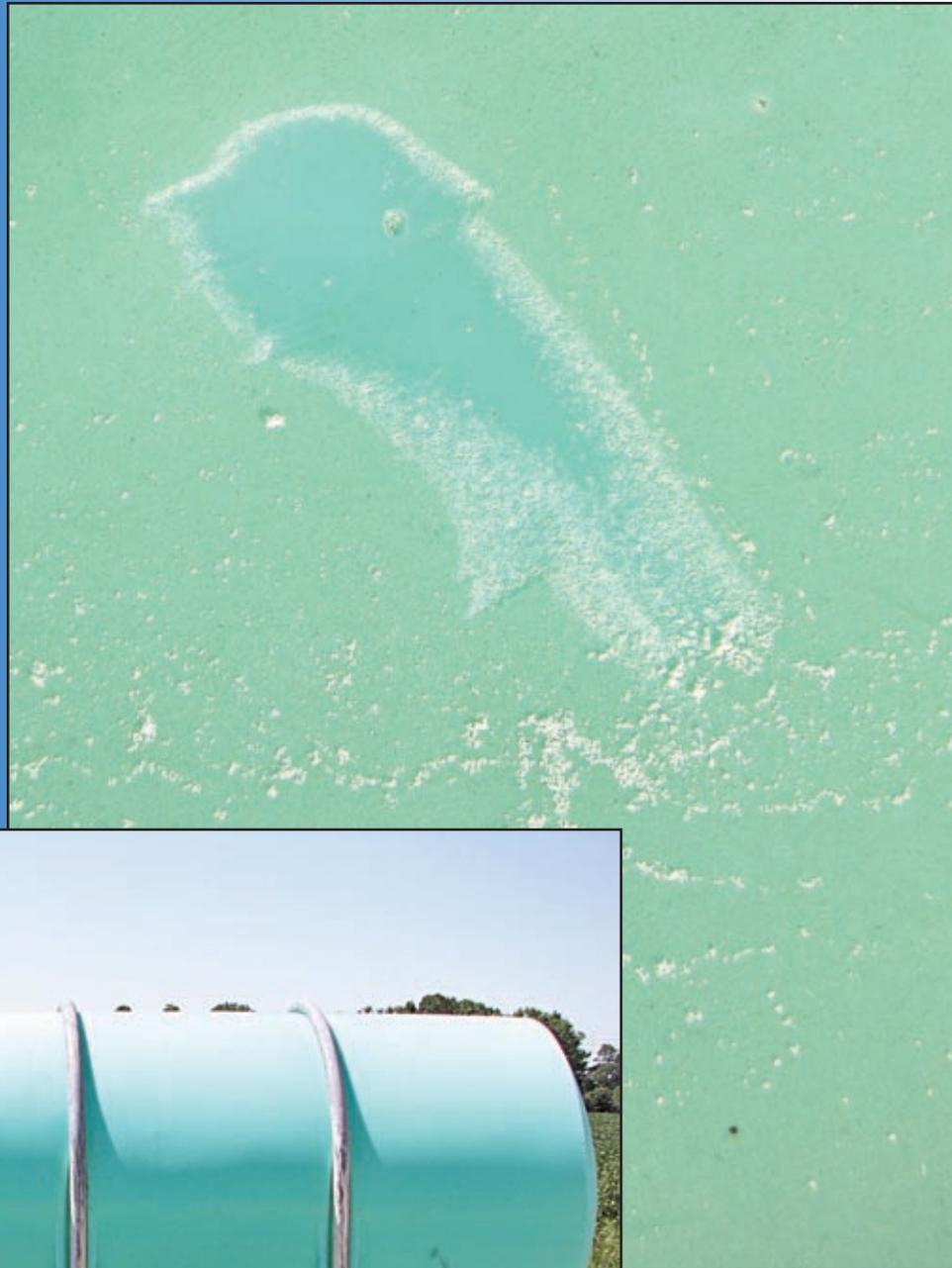
Tank owners expect their storage, transport, and application tanks to last well beyond the three- to five-year manufacturer's warranty. But, how long will a tank last? How old is too old? There are no definitive answers.

Keeping a tank under cover as much as possible helps protect the polyethylene from deterioration caused by UV radiation. Most UV damage occurs to the outside of the tank, beginning on the outside wall and spreading inward over a number of years, making the plastic brittle and rigid. An uncovered outdoor poly tank generally can be expected to show signs of UV damage within five to eight years.



Tanks left outdoors are subject to more sunlight degradation and weathering than tanks kept indoors.

From a distance, the tank below looks fine. But on closer inspection (right) you can see evidence of UV radiation damage. The plastic material has broken down from exposure to sunlight.



Color plays only a very small part in reducing UV breakdown of polyethylene. The color red, green, black, yellow, blue, or white is added as a dry blended pigment during the molding process, but it does not add UV protection.



Some poly tank manufacturers use color to separate product lines; e.g., a 1.5 specific gravity tank may be white, and a 1.9 specific gravity tank may be blue. Some use color as a marketing tool. But you should not rely on tank color as an indication of specific gravity, especially when comparing tanks made by different manufacturers.

The following questions have been raised about what can be done to prevent UV degradation:

- *Can a poly tank be painted to reduce UV penetration?* Polyethylene tanks are very similar to Teflon, chemically, so paint does not stick well to the tank surface. However, some paints contain solvents that allow the paint to “bite” or absorb into the plastic; these solvent paints usually will not weaken the tank. In some cases, paint manufacturers recommend abrading the area to be painted;

but while this will help the paint stick to the tank, it will also promote increased deterioration of the plastic.

Most paints will crack as the tank flexes during expansion and contraction. There are flexible paints on the market that can build up a membrane



The degradation process is promoted when the plastic is abraded in preparation for painting. While its benefits are limited, painting can provide some protection when the tank is used for storage.

over the tank; however, these paints scratch and chip easily and require continual repainting to keep the membrane intact.

Another disadvantage to painting a tank is that it prevents visual inspection of the tank when using the black marker (see page 68); it also prevents viewing the contents through the tank walls. There seems to be little value in painting as a means of reducing UV damage to poly tanks.

- *Does covering the tank with a tarp or black plastic reduce UV damage?* Tarps do offer limited UV protection, but even good quality tarps need to be replaced often, due to breakdown from sunlight and rain. Getting tarps to fit over tanks and getting them properly secured is difficult.
- *Does the tank have to be totally enclosed to prevent UV degradation?* The best management option is to keep the tank away from direct sunlight when not in use, preferably inside a building with the doors closed. A partially enclosed structure that does not protect the entire tank does not provide sufficient UV protection.

## Factors that Influence Longevity

The only way to truly assess tank deterioration and damage is to conduct routine inspections each fall and spring. Base your decision to replace a tank on the findings – or on the warranty expiration date, if feasible. The following factors contribute favorably to tank longevity:

- High specific gravity rating
- Infrequent refilling
- Protection from UV radiation
- Stationary placement



Attempts to secure a tank actually can deform the plastic, as demonstrated by the dents in the green tank below.

The strap on the white tank actually cut into the plastic.



# Fall and Spring Tank Inspections

Whether a tank is a few years old or 20 years old, the only way to be sure it is structurally sound is to perform inspections before use in the spring and again at the end of the application season. The spring inspection, prior to filling, provides reassurance that the tank can safely store or transport the fertilizer or pesticide that you intend to place in it. Fall inspections are particularly recommended to provide forewarning of the need to purchase a new tank before spring; i.e., if your tank is found to be defective or deemed unserviceable, you have ample time to consider a replacement.



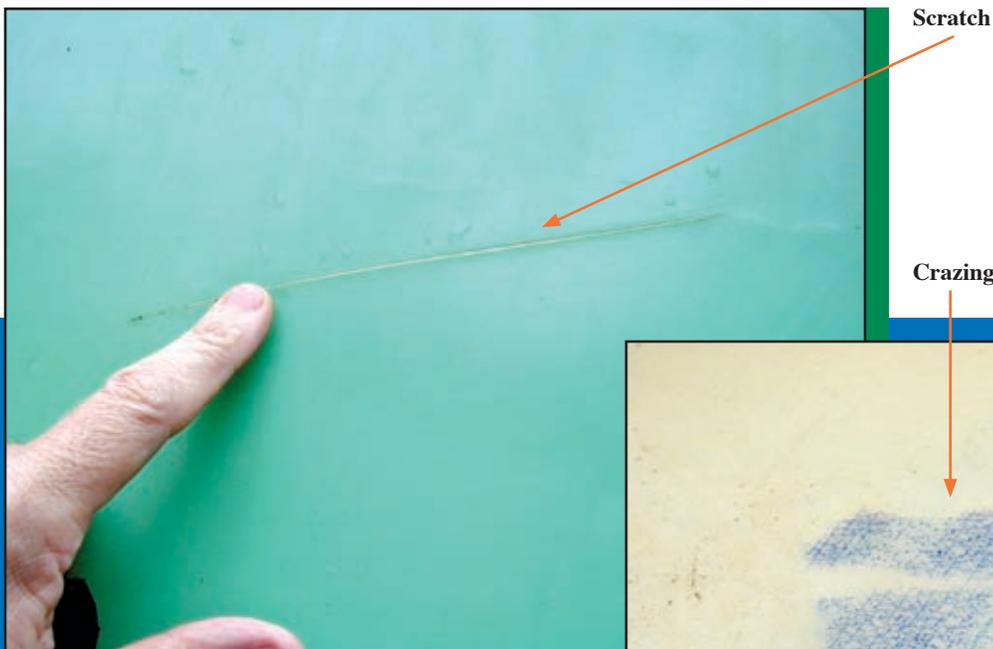
Inspections should begin at the time of installation and be conducted continually throughout the life of the tank.



It is difficult to visually determine a good tank from a bad tank. Three simple inspection techniques – writing with water-soluble ink, candling with light, and hitting with a baseball bat—can pinpoint weakened walls and stressed areas around the fittings.

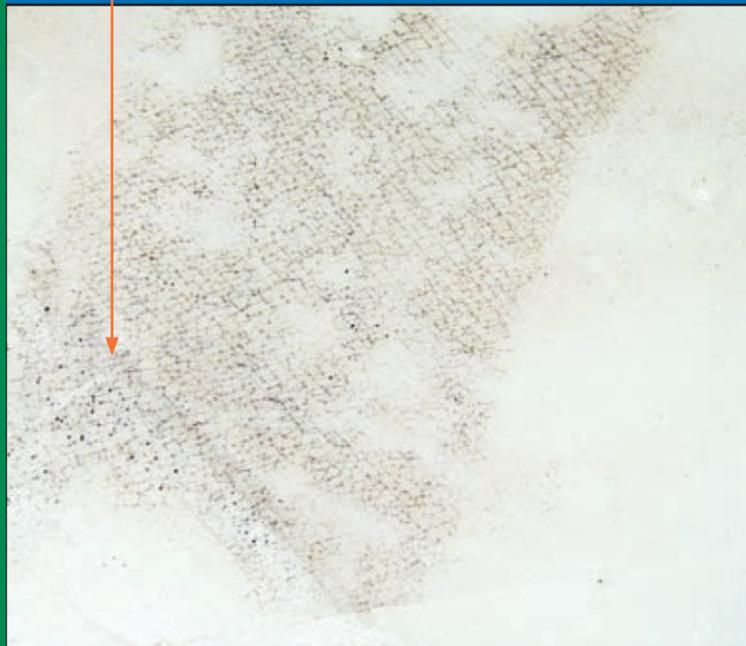
It is important to know the difference between surface **scratches**, **crazing** within the tank wall, and **cracks** that extend through the tank wall. Crazing is the development of very fine cracks within the tank wall, usually appearing as a network of fine lines that cannot be felt with a fingernail. The tank will still hold liquids, but its structural integrity is significantly reduced. Crazing occurs in both high density and cross-linked poly tanks; it can be a sign of serious deterioration within the plastic, which leads to cracks and fractures. Cracks can be felt with a fingernail. It is common for the poly material around the crack to appear whiter than the surrounding polymer. Most scratches displace minute amounts of polymer but remain superficial.

- **Scratches** are open to the surface; displaced material is evident on the tank's surface; fingernail catches.
- **Crazing** is displayed as a patchwork of fine lines.
- **Cracking** causes no displaced material; very abrupt lines may run parallel or cross at right angles; UV cracking has a dry-rot or alligator-skin look in advanced stages; fingernail may catch.





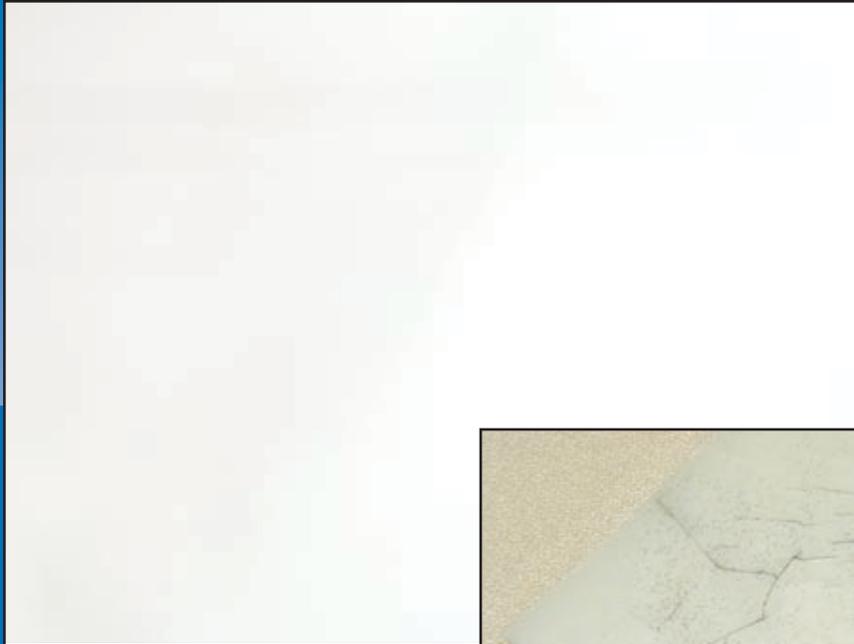
Crazing



Crack

Candling reveals crazing of this poly tank.





Above: Good, clear plastic without marks.  
Right: Degraded plastic showing crazing and cracking.

## Marking the Tank with a Water Soluble Marker

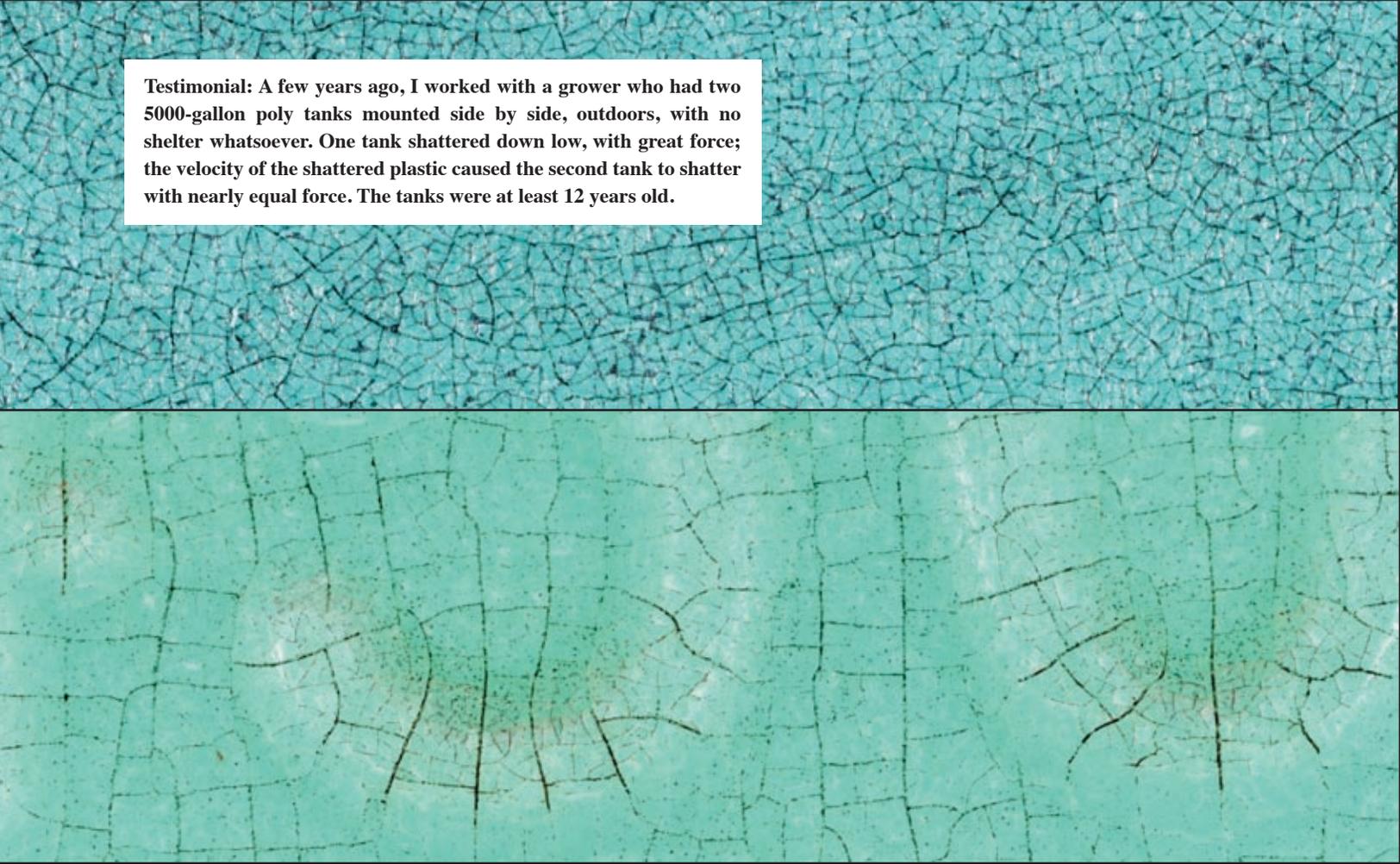
Crazing may signal UV damage. UV crazing, which is very difficult to see, forms in areas where the tank gets maximum sunlight exposure; the lines become more visible when you “color” the tank with a water-soluble marker. The inspection is performed by rubbing the marker over several six-inch by six-inch sections on the sides of the tank exposed to sun, on its top, and around fittings. Quickly rub off the ink with a dry cloth or paper towel. The ink left behind has penetrated the surface of the tank.

Crazing is one of the first signs of deterioration, so tanks with crazing should be checked often. Consider using crazed tanks for water only.



If rubbing the ink off reveals no obvious signs of crazing or cracking, the tank probably is good for another season of use. If the ink reveals cracking or spider webbing where the lines go in all directions, classic UV radiation damage is indicated. Advanced deterioration to the plastic presents a checkered or “dry rot” appearance (see page 70), indicating loss of elasticity. A tank displaying such symptoms should be replaced – or at least not used for fertilizers or chemicals.

The appearance of parallel lines signal early UV damage and the need for continual inspections. Tanks with parallel lines in the plastic around fittings should be replaced immediately or used for water only.



**Testimonial:** A few years ago, I worked with a grower who had two 5000-gallon poly tanks mounted side by side, outdoors, with no shelter whatsoever. One tank shattered down low, with great force; the velocity of the shattered plastic caused the second tank to shatter with nearly equal force. The tanks were at least 12 years old.



**This tank looks serviceable, but closer inspection reveals extreme crazing, which is a sign of UV degradation.**

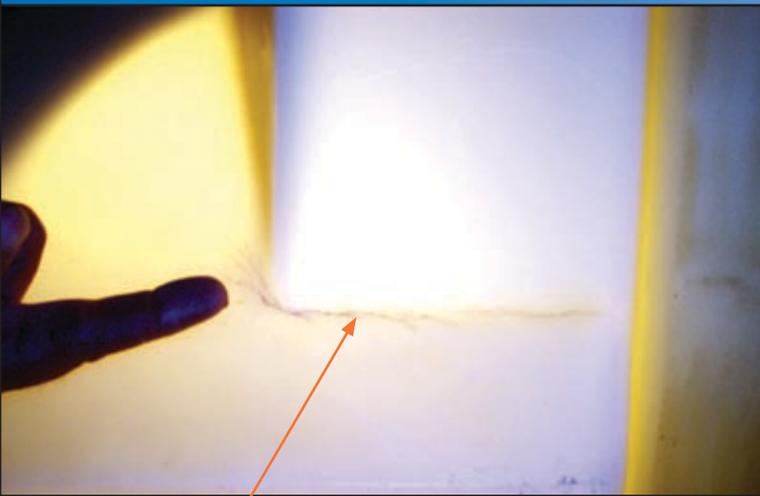
# Candling: Visual Inspection with a Light

Candling consists of placing a bright, cool light source inside a poly tank while conducting a visual inspection from the outside (do not use a hot lamp, as it could melt the tank). Defects and cracks usually show up as areas or lines of different light intensity.

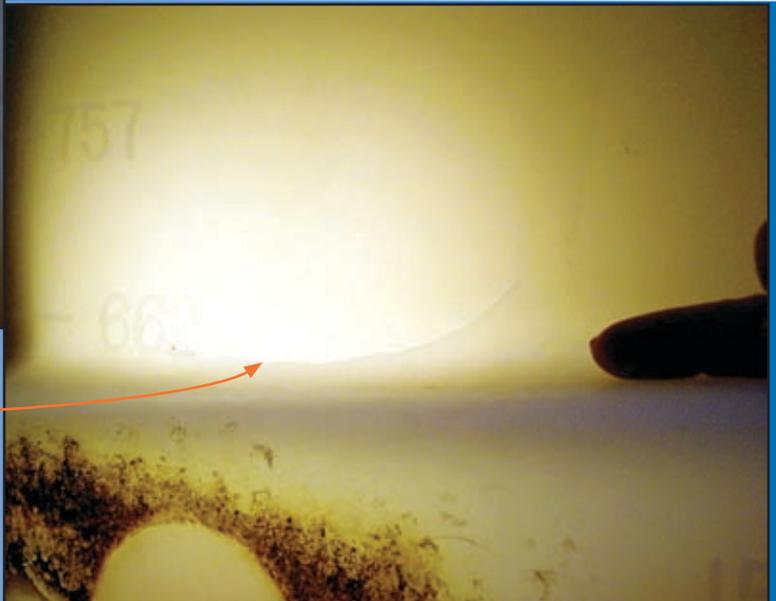
Repeat this procedure with the light on the outside of the tank and someone looking through the fill neck or manway. Do not enter the tank. A camera, camcorder, or other optical device may be helpful in recording the inspection from the top of the tank.



Use a light source to help locate defects when inspecting poly tanks. The technique is called "candling."



Cracks



## Hitting an Empty Tank with a Baseball Bat

An empty tank showing UV cracking can be further evaluated by striking it with a baseball bat. Most people are afraid to hit their tank with a bat, fearing that they might break it, but that's just it: if it breaks, it should not be in service. Cracking an empty tank with a bat is a better option than risking it breaking when filled with fertilizer or pesticide.

A good tank has the flexibility to bend outward as it is filled and inward as it is emptied. Tanks that are brittle (i.e., that exhibit excessive or advanced cracking) have lost the ability to flex under pressure and to rebound when impacted. The brittleness of an empty tank can be tested with a solid swing of a baseball bat where signs of cracking were discovered during the water-soluble ink inspection. Hit the tank along the sides and top where they receive the most sunlight; then check the tank for signs of breakage. It is impossible to crack a good tank using this method because the polymer is strong and resilient; if the tank cracks or breaks open when hit by a bat, you may have saved yourself from disaster.



The tank above showed significant UV damage; and when tested using the ball bat method, it broke open. The plastic was brittle across the width of the tank (right).





**A water soluble marker inspection of these tanks revealed crazing, so a bat was used to determine the integrity of the plastic — it failed!**



# Repair of Poly Tanks

Most poly tanks with crazing or cracks, and those made from cross linked polyethylene, cannot be repaired. Repair of polyethylene tanks is risky and not recommended. Manufacturers sell kits for repairing small surface scratches or pin holes in high density linear polyethylene tanks. But few adhesives or caulks adhere to polyethylene, and other means such as plastic welding are best left to professionals. Even if a tank can be repaired, there is no guarantee that the repair will hold once the tank is filled. A repaired tank should be used for water only. It is best to replace a damaged tank.





## Reuse or Recycle Old Tanks

High density linear polyethylene (HDLPE) can be recycled into other products. Conversely, high density cross-linked polyethylene (XLPE) cannot be remolded and recycled.

All tanks, whether recycled or deposited in a landfill, should be triple rinsed prior to disposal. After rinsing, they should be broken or cut into smaller pieces before being recycled or put in a landfill. Contact your local recycling center for information on recycling HDLPE tanks.





Water tanks may be used for other purposes instead of being cut up for disposal. Tanks that have held chemicals may not be reused.



## Containment of Poly Tanks

Most states have regulations defining the quantities of stored pesticides and fertilizers that constitute "bulk storage." You are considered to maintain bulk storage in Indiana under the following conditions:

- When you have a single tank with a rated capacity more than 2,500 gallons of liquid fertilizer.
- If more than 7,500 gallons of liquid fertilizer is stored at a single facility.
- If a pesticide is stored in a container larger than 55 gallons (however, you may store mini-bulks for less than 30 days outside of containment).

Specific Indiana requirements can be found in 355 IAC 5 (pesticide regulations) and 355 IAC 2 (fertilizer regulations). Refer to PPP-63, *Bulk Pesticide and Fertilizer Storage on Indiana Farms*, for more information on Office of Indiana State Chemist containment regulations.



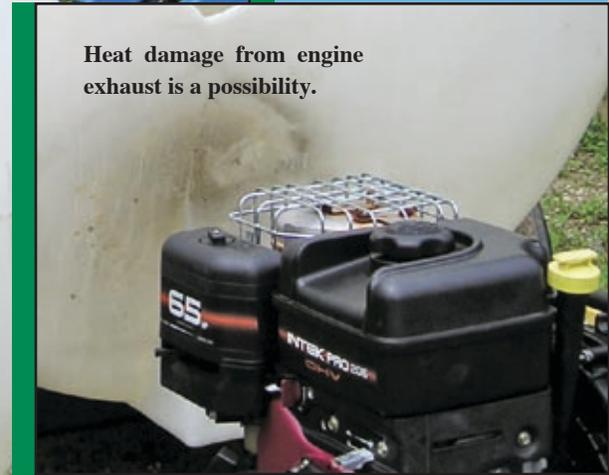
## Know What Your Insurance Policy Covers

Many farm and commercial business insurance policies do not cover pollution from fertilizer or pesticide spills. It is critical for business owners and farmers to consult with their insurance representatives to confirm what is and is not included in their coverage. Some insurance companies now offer specialized pollution coverage, but policyholders must read all endorsements to make sure their coverage is not compromised or negated by exclusion.

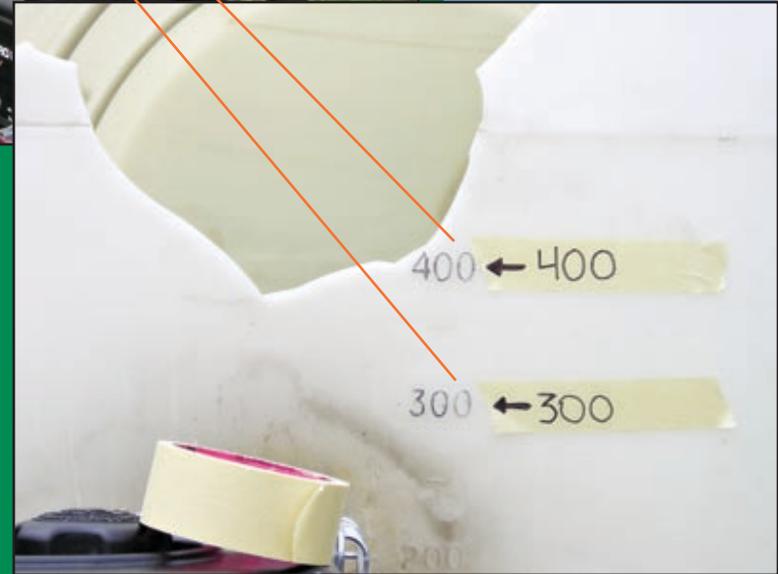




Heat damage from engine exhaust is a possibility.



Ask your insurance agent whether your policy covers the cleanup of a chemical spill at your facility or on the road. Could a thorough inspection have prevented this failure?

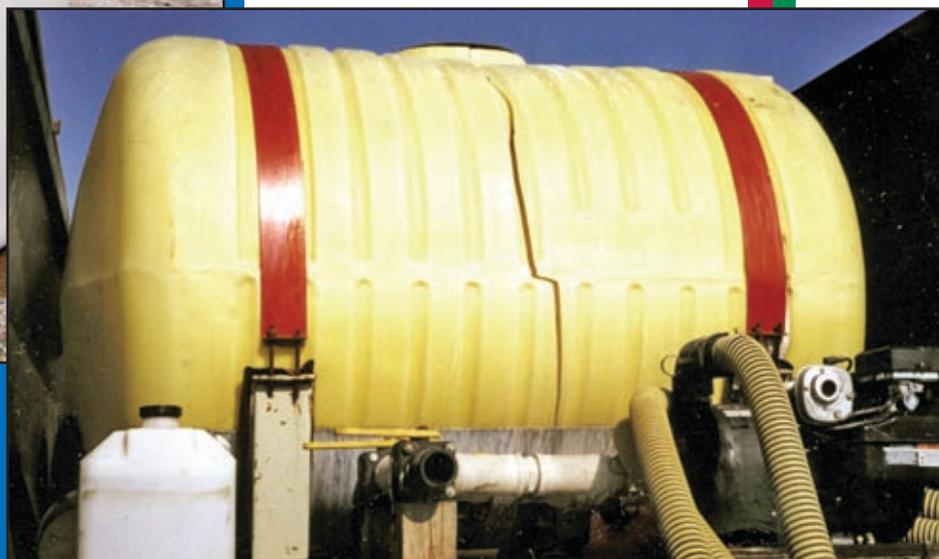
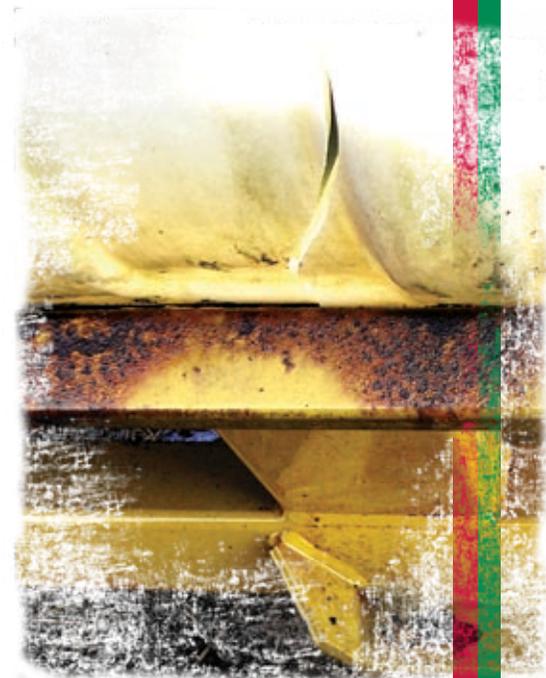


Your insurance agent can tell you whether cleanup and product replacement costs resulting from a ruptured stationary or vertical poly tank are covered under your property or vehicle policy. Ask whether policy discounts are available for things like conducting and documenting annual and biannual inspections and for diking your storage tanks. See PPP-49, *The Insurance Policy: Protecting Your Business by Understanding Your Policy*, for additional insight on what to ask.

# Notification in the Event of a Spill

You've had that old poly tank for ten years. You bought it new, kept it maintained as best as you could, and used it only in the spring. It's never given you any problems until now: the old tank has failed. Liquid fertilizer is spilled all over the ground, trickling down to the drainage tile at the edge of the property – and the water in a nearby ditch is discolored. Whom do you need to call? Your insurance agent? Your neighbor? The Environmental Protection Agency?

I've had a spill! Whom do I call?



It is important to know that all spills require a spill response and cleanup regardless of reportability. Indiana has a spill rule found under 327 IAC 2-6.1 in the state regulations. By definition, a “spill” is any unexpected, unintended, abnormal, or unapproved dumping, leakage, drainage, seepage, discharge, or other loss of petroleum, hazardous substances, extremely hazardous substances, or objectionable substances. The term does not include releases to impermeable surfaces when the substance does not migrate off the surface nor penetrate the surface and enter the soil. Generally, spills that damage the waters of the state, impact or may impact drinking water, are beyond a facility boundary, exceed the “reportable quantity” (as determined by EPA regulations), or are within a wellhead protection area require immediate reporting to state, local, and sometimes national officials; the 24-hour spill reporting number is (888) 233-7745. Immediate cleanup is required as well. Your Local Emergency Planning Committee (LEPC) has information to help you pre-plan notifications in case of a release. It is the responsibility of owners and/or operators of facilities and modes of transportation to report spills. Failure to report spills in a timely manner can result in fines and penalties.

## Conclusion

High density polyethylene tanks have been used successfully by growers and commercial pesticide application businesses for years. They are less expensive than stainless steel and fiberglass tanks and offer ease of movement when empty, along with rust resistance. Polyethylene tanks are low maintenance and relatively reliable for storing and transporting agricultural and commercial liquids.

While the benefits of poly tank ownership are well established, the risk of tank failure is real. Like any piece of equipment, poly tanks need to be inspected and maintained to ensure that the benefits of use outweigh the risk of tank failure and product release.

Experience has shown that environmental, management, and design factors determine how long a tank will last, and that annual or biannual inspections help prevent the unexpected and potentially catastrophic release of contents due to tank failure.

These maintenance strategies help extend a poly tank's useful life:

- Selection of the right tank for the intended use, based on specific gravity.
- Use of the tank as intended – vertical tanks for storage, horizontal tanks for storage or transportation.
- Protection from UV radiation.

Never purchase a used tank without knowing its history. If you intend to buy a used tank, or an inexpensive one that appears in good operating condition, take the time to conduct a proper inspection; and secure information from the manufacturer if at all possible. Without exercising these precautions, you may encounter sudden tank failure resulting in an expensive spill and cleanup, reporting obligations, and costly downtime.

The information in this publication is intended to assist you in making an informed decision on the purchase, maintenance, inspection, and ultimate disposal of poly tanks.



Properly installed, properly used poly tanks – when inspected continually – are cost effective storage and transport containers.

# Acknowledgments

Work on this publication was partially supported with outreach funding from the Indiana Water Resources Research Center (IWRRRC) at Purdue University.

The following individuals provided numerous comments on early drafts of this publication, which greatly improved its technical accuracy.

Michael Baise, Indiana Farm Bureau  
Gerry Blase, Asplundh Railroad Division  
Don Biehle, Purdue University  
Jerry Boger, Jackson Jennings Co-op  
Greg Bossaer, Purdue University  
Darrel Chambers, Michigan Millers Mutual Insurance Company  
Mike Corbitt, Univar  
Kim Emshwiller, Vision Ag  
Jim Erwin, Marion County Health Department  
Jerry Fankhauser, Purdue University  
Greg Harding, Minnesota Department of Agriculture  
Cress Hizer, Agribusiness Council of Indiana  
Robert Lyons, Lyons Family Farm  
Ted McGaughey, Co-Alliance, LLP  
Brad Peas, Agrochem  
Jamie Southard, Effingham Equity  
Matt Wagner, Banjo Corporation  
Phil Walker, Purdue University  
Brad Wilson, Wilson Fertilizer  
Phill Zimmerman, Fertilizer Dealer Supply, Inc.

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