

Handling Liquid Feed Commodities

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Ethanol production has increased in the region in recent years. Consequently, the availability of liquid byproducts such as corn condensed distillers solubles also has increased.

Liquid feeds are useful for conditioning rations, improving palatability, reducing ration dustiness and providing nutrients to livestock. Many liquid byproduct materials are available for use in beef cattle rations. In addition, a number of commercial liquid supplement products also are available.

Byproducts, including corn condensed distillers solubles and condensed steep liquor, are high in moisture and subject to freezing during the winter. Others, such as molasses and molasses-based products, are lower in moisture but will thicken at low temperatures, making pumping difficult.

Due to the liquid nature of these byproducts, tanks, pumps and other equipment designed to handle liquid feeds are needed to utilize them. The objective of this publication is to provide guidelines for installing equipment to handle liquid feed commodities.

Equipment Options

In North Dakota's winter climate, producers essentially have two options for installing tanks and pumps designed to handle liquid feed commodities. The first is to bury the tank underground, and the second is to house the tank and pumping equipment indoors.

In most cases, storing liquid feed commodities outside is not an acceptable option, given harsh winter conditions that can occur in this region. For low-moisture products such as molasses or molasses-based supplements, storage indoors allows easier pumping as well. Freezing problems and a high level of frustration will result from improper storage.

Figures 1 and 2 give diagrams of the installation of the underground and above-ground storage systems.

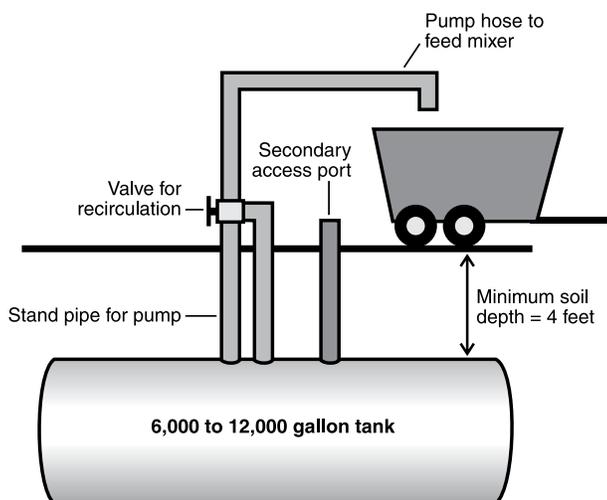


Figure 1. Typical setup for underground storage tank for liquid byproducts such as corn condensed distillers solubles.

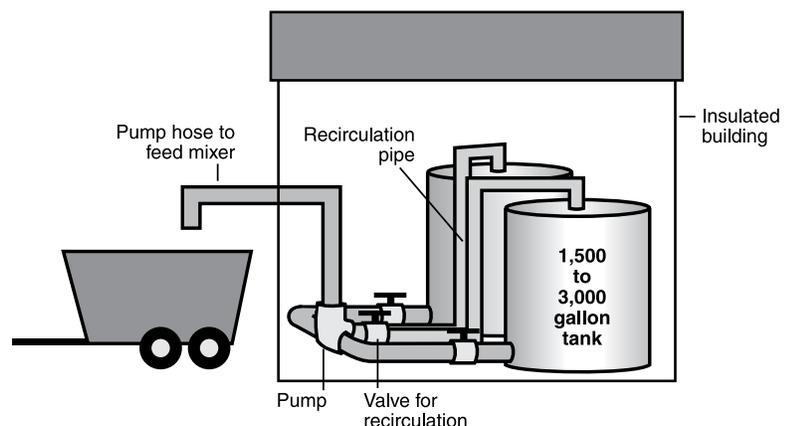


Figure 2. Typical tank setup for above-ground liquid supplement storage in a building.

Selection and Installation Considerations

Buried Tanks

Advantages

- Essentially no worries about freezing the commodity if the tank is buried 4 feet (or more) deep
- The hoses can be drained easily after each use
- May be less costly than erecting and heating a building for tank storage

Disadvantages

- Possibility that the tank will rust and leak
- Difficult to determine if a leak has occurred
- Must excavate the tank to repair any leaks
- Difficult to visually measure and monitor commodity usage
- Cannot be moved easily once it is placed underground

Indoor Housing of Liquid Tanks

Advantages

- Easy to repair and maintain the pump, tank and associated equipment as needed or when problems occur
- Easy to visually measure tank volume and monitor commodity usage
- Tanks and equipment can be moved relatively easily

Disadvantages

- Cost of building construction is typically greater than the cost of tank burial
- Insulated building may be required to prevent freezing. In most cases, supplemental heating from a furnace or other heating source will be required to keep the products from freezing. Some products, such as corn condensed distillers solubles, will leave the plant at temperatures of 120 to 140 degrees Fahrenheit. These products will provide some heating in the building, but external heat sources likely will be required to keep the product from freezing.

Producers should consider the following prior to purchasing and installing liquid-handling equipment.

- Type of product to be handled (commercial supplement, molasses or other sugar byproducts; corn condensed distillers solubles; condensed steep liquor)
- Volume of liquid commodities that will be handled
- Whether delivery of a tanker load (50,000 pounds or approximately 6,000 gallons) of product can be accepted
- Amount of feed needed on a daily basis
- Feeding method (mixer wagon, lick wheel, other)
- Cost of liquid supplements relative to other feeding options, such as dry supplements or other high-moisture feeds

Types of Equipment Needed

Tanks

Typically, polyurethane (poly) tanks are used in above-ground applications. Metal or steel tanks typically are used when tanks are buried.

Condensed distillers solubles can be hot (greater than 140 F) when loaded onto tanker trucks. Some plastic tanks are not rated to hold materials at these temperatures and structural damage to the tank may result if hot materials are placed in them. Consequently, livestock producers should check with the tank manufacturer prior to filling the tanks with hot liquids.

Above-ground tanks can be horizontal or vertical and have a flat or conical bottom. All types are functional for handling liquid byproducts and supplements. Tanks with a conical bottom require a metal stand because the pump and hoses will be placed at the bottom of the cone. Conical bottom tanks allow all of the material to be pumped easily from the tank.

An access cover for buried tanks provides an entry point for cleaning the tanks, removing any sludge buildup, allowing for inspections and dropping in a second pump in case of breakdowns with the primary pump.

Blending Products: Separate tanks should be used for each liquid feed commodity or product. Mixing products in the same tank sometimes can result in reactions that make pumping difficult or cause ingredients to separate or precipitate. Products can be blended with other ration ingredients in the feed mixer without problems.

Pumps

Positive displacement pumps or gear pumps are typically most effective in handling liquid commodities. For tanks housed indoors, the key is to keep the distance from the bung of the tank to the pump as short as possible. This minimizes the chance of freezing problems in the hose.

Many producers have utilized manure pumps in buried tank applications to recirculate and pump corn condensed distillers solubles (corn syrup). These pumps are typically a minimum of 5 horsepower and are electric-powered.

Pump capacity should be considered prior to purchase. The pump and motor should be large enough to deliver the product to the feed mixer efficiently in a short period of time. Small pumps will result in inefficient recirculation and long mixer loading times.

Some raw commodities such as corn condensed distillers solubles or corn steep liquor are corrosive, resulting in increased maintenance issues for pumps and tanks. Other products such as molasses-based supplements are typically less corrosive.

For above-ground applications, one pump can be used to service several tanks, provided proper hoses and valves are set up to direct flow properly.

Why is Recirculation Necessary? In some cases, bulk commodities such as corn condensed distillers solubles can separate during storage. Recirculation is the process of mixing the liquid supplement by pumping it out of and back into the tank. This process mixes and agitates the product. Agitation or recirculation helps mix and blend the separated components back into a homogeneous mixture prior to placement in the feed mixer.

Other products can precipitate or “salt” out prior to feeding. Most commercially prepared products contain a suspension agent to help prevent micro-ingredients from separating. However, agitating and recirculating these products is a good idea to ensure even distribution of all ingredients prior to feeding. Most feed labels on commercial products will indicate the time necessary to adequately agitate these products.

Associated Handling Equipment

Hoses that carry product from the pump to the mixer or delivery vehicle or into recirculation should be equal to or larger in diameter than the hose leading to the pump. Restricting output volume will lead to excess pump wear and an inefficient pumping process. Outlet hoses should be set up to allow material to drain back into the tank or into the mixer. Freezing problems will occur during winter months if material is allowed to remain in the outlet hose.

Cost

Table 1 details the estimated costs associated with underground and above-ground storage applications. Taking advantage of used or reconditioned materials will lower costs.

Table 1. Cost estimates for underground and above-ground liquid materials handling systems.

Underground Tanks		
Item	New Cost*	Used Cost*
6,000-gallon steel tank (12,000-gallon tank \$7,500)	\$6,250	\$600–\$2,000
Vertical manure pump	\$4,500	\$600–\$1,250
Excavation work	\$1,500	\$1,500
Miscellaneous costs (hoses, valves, other materials)	\$1,250	\$600–\$1,000
Above-ground Tanks		
Item	New Cost*	Used Cost*
2 3,000-gallon poly tanks or 1 6,000-gallon poly tank	\$2,500	\$600–\$1,200
1.5- to 3-inch pump (depending on tank size and pumping volume)	\$1,500	\$400–\$1,000
Insulated building (minimum 10-foot ceiling for 6,000-gallon tanks)	\$6,000- \$10,000	\$3,500- \$4,000
Miscellaneous costs (hoses, valves, other materials)	\$1,250	\$600-\$1,000

*All costs are approximate.

Other Recommendations

Sampling: Liquid feed commodities such as corn condensed distillers solubles can vary greatly in moisture content from load to load and plant to plant. Sample each load and conduct moisture analysis prior to feeding.

Backhauls: Backhauling is the process of hauling another load with the same truck and trailer rather than returning to the plant or place of origin empty. It helps trucking companies lower costs because the fixed costs associated with the truck can be spread over more loaded miles.

Liquid feed commodities should not be backhauled in trucks which have transported chemicals, petroleum products or other products that may be hazardous or toxic to livestock. Livestock can die or become seriously ill due to ingestion of hazardous substances.

Foaming: Some liquid byproducts, particularly corn steep liquor, can foam during storage. Adequate tank head space is required to deal with these situations as they arise. If foaming occurs, tanks should be cleaned thoroughly before adding additional product.

Heating: Some liquid byproducts such as corn condensed distiller's solubles are approximately 140 F when they leave the plant. The heat from these products can provide some or all of the heat necessary to heat properly insulated storage buildings. The design of building heating systems and insulation should take this into account.

Mixing: The addition of a "spreader" to the end of the discharge hose may help distribute the liquid product in the feed mixer more rapidly and facilitate rapid, even mixing. See Figure 3 for a diagram of a simple spreader that can be installed at the end of the discharge hose.

Liquid feed materials should be added to the mixer after all other ingredients have been added to the ration. Thorough mixing should occur for two to four minutes after the addition of the liquid material (depending on the mixer type).

Summary

The availability of liquid byproducts is increasing throughout the upper Midwest. Additional handling equipment will be required to handle liquid byproducts. Producers with questions on proper handling of these materials should visit existing feedlots to view successful installation and handling practices.

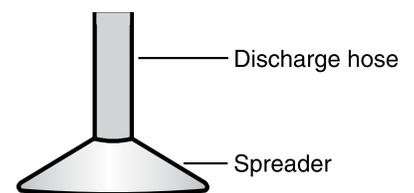


Figure 3.

This publication was originally authored by Greg Lardy, Department Head, Animal Sciences Department.

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