FeedFIT®

FEED CENTER DESIGN

Commodity Storage

GPS DAIRY CONSULTING LLC

A total mixed ration (TMR) is generally comprised of forage and concentrates. Concentrates include ingredients which are often considered "commodities." These are ingredients which are fed to animals at rates of greater than 1 lb (0.5 kg). They provide required nutrients, such as protein and fiber, to the ration. The types of commodities available depend on geography and the types of grains and byproducts available. Common commodity products include ground corn, soybean meal, canola meal, corn gluten feed, cottonseed, almond hulls, and others.

The following will outline the considerations and typical options to store and feed dry commodity ingredients.

Considerations

The basic goals of commodity storage include maintaining feed quality, limiting feed shrink, and allowing for easy use.

To maintain quality, the commodity should be stored away from rain and snow. Adding moisture to dry commodities will increase the outgrowth of pathogens, molds, and yeasts. Moisture will also increase the inaccuracy of loading these ingredients. To maintain quality, commodity storage should allow a "first-in, first-out" inventory management so old feed does not accrue.

Example of outside storage and poor inventory management. This will lead to excessive spoilage and shrink.

Example of newly delivered feed placed in front of existing inventory.

Having multiple bays for an ingredient will allow the old inventory to be moved or to switch back and forth between bays to keep inventory fresh.

To limit shrink, ingredients should be stored and used in a way to limit exposure to wind and reduce the travel distance from the storage to the mixer location. Even with indoor storage, commodities can be prone to shrink if not handled properly. Shrink will increase if ingredients are easily mixed or spill out of the front of bays. Also, if the loader has to maneuver too quickly and make a sharp turn, it is likely to spill more feed.

Deep bays reduce shrink by limiting exposure of wind and overfilling of bays.

Mixing of commodities will lead to increased shrink.

Finally, the commodity ingredients should be stored in a way which is easy to access, scoop, and deliver the commodity to the mixer. The bays should be large enough and positioned so that the loader can easily drive in and back out. The building and bays should be easily accessed by semi-trailers to deliver ingredients.

A door placed above the back end of a bay to allow delivery trucks to deliver feed during feeding operations.

Larger inclusion ingredients should be stored more closely to where the mix is loaded, and large aprons in front of the bays will allow truck and loaders to easily access the bays.

Commodity Storage Designs:

Budget Options: Commodity storage can be greatly improved by utilizing hoop buildings, temporary structures, or retrofitting existing buildings on a dairy. There are several things to consider when utilizing these types of structures.

- Pros
  - Much more affordable than full mono-slope or enclosed commodity storage
  - Gets commodities under a roof and out of the elements
  - May be relocatable
  - Easy to locate close to forages or other feedstuffs
  - Easy to expand
- Cons
  - Likely to have higher shrink than other structures
  - Less sheltered from elements
  - Less hardy than a more permanent structure
- Consideration: As these structures are generally smaller and more portable, they can be placed in convenient locations. When placing these buildings, allow water to drain away from the storage structure and place the structure opening away from prevailing winds. They should be located close to the rest of the forage and/or bin storage to allow for quick feeding operations.

A small steel structure, typically sold as a temporary car garage, is a great tool to store single commodities.

A hoop building on concrete blocks or poured walls can serve an inexpensive commodity storage.

Open-Face Monoslope:

- Pros:
  - More affordable than an enclosed building
  - Smaller footprint
  - Can hold large amounts of commodities
  - Easy to add on to or adjust when built with expansion in mind
  - Likely able to continue feeding easily during deliveries
- Cons:
  - Commodities are less protected from the elements
  - Still loading the TMR mixer outside
  - May need a separate building to store feeding equipment when not in use
- Considerations: Make sure to leave enough space and paths so that feeding can continue during feed deliveries. It's helpful to build with expansion in mind, if possible. Allowing space on either end of the row of bays will allow for more or different ingredients to be brought to the dairy. Sizing the bays to the relative usage of the ingredient will allow for inventories to be used timely. Some bays might be too large for some ingredients on farms, so having variable sized bays (12 and 24 tons, 15 and 30 tons) can help in managing ingredients with different inclusivity in the diet. Having deeper bays does allow for lower shrink. Also, placing steel on the front of bays may help to prevent damage. Recessing the steel corners relative to the concrete will limit the equipment catching the steel so that it doesn't peel off and will last longer.

Steel-capped bays limit damage from front-end loaders. These should be recessed into the concrete.

Example Buildings:

Monoslope A

The low pitch of the roof in this deep bayed building makes tub grinding straw and adding other ingredients less wasteful as equipment can get deep into the bay for unloading and minimize commodities blowing away. While the bays aren't completely utilized for some ingredients, the over-building of this design minimizes shrink relative to other monoslope sheds. The large apron in front of the building allows trucks to easily back into the bays to deliver.

- Dimensions
  - 20' (6 m) tall at the front, 16' (4.9 m) tall at the back
  - 72' (22 m) deep bays
  - 12' (3.7 m) tall concrete walls
  - 20' (6.1 m) wide bays on center

- 12” (31 cm) thick walls

Monoslope B

A simple, four bay shed allows for storage of high inclusion and dry commodities. This shed stores cottonseed, soybean meal, ground corn, and chopped straw.

- Dimensions
  - 20’ (6 m) tall at the front, 16’ (4.9 m) tall at the back
  - 32’ (9.8 m) long bays
  - 8’ (2.4 m) tall concrete walls
  - 20’ (6.1 m) wide bays for the two outside bays
  - 12’ (3.7 m) wide bays in the middle
  - 12” (31 cm) thick walls

Enclosed Shed: Completely or partially enclosed structure

- Pros:
  - Minimal shrink compared to other non-bin structures
  - Almost entirely out of the elements
  - Able to load the TMR inside
  - Able to store feeding equipment inside
- Cons:
  - Large upfront cost compared to other setups
  - Lack of space if not set up efficiently
    - Can be difficult to continue feeding if unloading

- Considerations:
  - Ventilation: Most commodities are dry and dusty. Thus, with indoor storage and loading, dust can accumulate. Large entrances allow for dust to disseminate.
  - If the building has two rows of bays, at least 70’ (21.3 m) should be placed between bays, assuming approximately 12’ (3.7 m) wide bays. Less distance may be required if using wider bays.
  - Bays should be a minimum of 12’ (3.7 m) to allow for easy access by truck and loaders.
  - Walls should be at least 16’ (4.9 m) tall concrete or at least the height of the building walls. This is especially important at the back of the bay to prevent the loader pushing against the steel siding of the building. Often, plywood can be used to extend the walls higher.
  - The number of bays will be determined by the number of ingredients in the ration. Generally, one bay for every ingredient at an inclusion rate of 1 lb (0.5 kg) or more per head.

Opportunity Buying: Another consideration with bay and shed sizing is opportunity buying. Opportunity buying is the idea of having much more storage than your operation needs in hopes of being able to buy and stockpile feedstuffs at opportune times. Bags and larger bays and sheds are typical for this kind of storage.

Utilizing a bag to take advantage of opportunity buying

Flooring: Flooring in the loading area should be broom finished or finished roughly to provide traction for loaders. The flooring around the commodity storage should be made with concrete, not asphalt, because the amount of turning and pivoting requires the structural strength of concrete. Lower floor or "subways" can allow for faster and easier loading by front-end loaders.

Regarding a loading pit, having the least angled ramp possible while making the pit deep enough to load easily is ideal. Any ramps coming out of pits need horizontal grooves going up the ramp to allow mixers to exit in wet or icy conditions. The pit needs to be a flat surface that is long enough for the current mixer, with considerations for getting a larger or different type of mixer. Ensure the pit is easy to clean out and remove water from. A sump pump or drain in the lowest area of the pit may help.

Example of a recessed pit to load the mixer. This reduces the height that the loader must reach to fill the wagon.

This custom-built tool positions the TMR mixer in a consistent position on a level surface as well as prevents the mixer from backing into the back wall. It also places the mixer so that liquids are added in the appropriate areas and gives easy access to the center of the wagon with a loader. It is bulky enough to maintain position, but is designed to be picked up with pallet forks for ease of cleaning out the pit.