TAKE HOME MESSAGES

- Compost bedded dairy barns offer excellent cow comfort which can lead to increased cow longevity and improved milk production.

- The bedded pack requires twice daily tilling to remove the manure from the surface, create a dry, soft bed, and provide adequate aeration for proper composting.

- It is suggested to construct the compost bedded barn to fit the floor plan for a freestall design in the event of switching from loose housing to freestall housing.

- Compost bedded pack seem to provide for cleaner cows and reduced somatic cell count when compared to other bedding choices in a loose housing environment.

During the past several decades, loose housing of dairy cattle has given way to freestall barns in light of less labor, cleaner cows and reduced bedding costs when compared to the conventional straw bedded-pack. However, a new concept in loose housing called compost bedded dairy barns has been gaining attention throughout the Midwest. There are a number of reasons for the compost barns popularity including improved cow comfort, improved heat detection, greater cow longevity, reduced sizing for long term manure storage and less costly manure handling.

A number of compost dairy barns are being built in the Midwest, as well as Illinois, by producers who want to upgrade or add to their current cattle housing needs. In addition, producers are looking at compost barns for special needs cows and dry cows because of the improved cow comfort and reduction in lameness problems. Producer testimonials also suggest that compost bedded-packs are instrumental in lowering herd somatic cell counts and reduced incidences of mastitis. However, excellent milk cow prep is still essential to achieve this goal and produce high quality milk. Research is being conducted at universities and on-farm to help discover answers to “best management practices” and correct facility design. In the meantime, the recommendations for constructing and managing compost barns is coming from the experiences of producers currently using these barns.

The composting bedded-pack is created by mixing the livestock feces and urine with a fine particle bedding source like sawdust or wood shavings. This mechanical mixing of the carbon and nitrogen sources allows for an aerobic condition (oxygen environment), which creates a breakdown of the organic matter into a rapidly decaying compost material. The bacteria needed to breakdown the manure and bedding will grow best with a carbon-nitrogen ratio of 25:1 to 30:1 and moisture of 50 to 60 percent. The optimum temperature for composting is 130 to 150 degrees Fahrenheit. Achieving a compost temperature of 130 degrees F for 3 to 5 days will efficiently compost the organic material, and lead to the destruction of pathogens, fly larvae and
weed seeds. A properly managed compost bedded pack will provide a fluffy, soft, dry, and relatively odor free bed for the animals. It also appears that the twice-a-day stirring helps to keep the bedded pack dry.

**BARN AND FEEDING AREA DESIGN**

The following information has been cleaned from research and on-farm observations reported by University of Minnesota Extension and research staff members. A compost barn is designed similar to current freestall facilities to maintain proper ventilation and cow comfort. In addition, the open curtain sidewall, properly sized feed alley length and width, and correct interior measurements for freestalls/alleys provides an option to easily retrofit a compost barn to a freestall barn in the future. Some of the major barn design includes:

- Provide a 4 foot solid wall plus a 10 to 12 foot open sidewall (14-16 ft. sidewall) on compost barns. The taller sidewalls are needed for optimum air flow and the height is helpful to get unloading access for a semi-trailer to deliver and unload in the barn.

- A 4 foot concrete wall between the bedded-pack and adjacent feed alley is needed to position the bedded pack. Taller than 4 feet may restrict air flow through the barn and less than 3 feet will restrict bed depth and require more frequent manure hauling. Place a cable or fence above the wall on the feeding floor side to prevent cows from stepping off when the compost bed is reaching capacity height.

- Provide adequate eave overhang to reduce moisture (rain and snow) from entering the bedded pack. A 3 to 6 foot overhang is recommended depending on barn layout.

- Construct open ridges to provide proper ventilation. Recommend 2 inches of opening for every 10 feet of building width. Good ventilation will aid in reducing animal respiratory problems associated with fine sawdust particles carried by air borne dust out of the barn.

- Bedded area needs to allow for a minimum of 80 square feet of resting area per cow for large breeds and 65 square feet per animal for Jersey cows. Overcrowding may lead to increased somatic cell count levels, increased bedding needs and potential for increased teat injury.

- Adequate fans are required for ventilation, to remove heat, provide air movement for cow comfort, and aid in keeping the bedded pack surface dry. These could be ceiling type fans or box fans.

- Use a dirt/clay base under the bedding. Also consider adding 1 foot of limestone to base.

- Provide 2 feet of linear bunk space per cow with 12 to 14 feet concrete feed alley width and covered bunk.

- Locate waterers away from the compost bedded area to avoid wetting the compost pack and to prevent a build-up of bedding pack depth around the waterer.

**BEDDING SOURCE AND MANAGEMENT**

Until further research suggests differently, the bedding source of choice is sawdust or wood shavings because of its fine particle size which allow for ease of tilling, absorbency, and
encourages accelerated bacteria growth. However, experience dictates that green or wet sawdust is not recommended. Some major recommendations include:

- Start the compost bedded pack with 18 to 24 inches of fluffy sawdust/wood shavings. This may require approximately 3 or more semi-trailer loads of sawdust to get started in a 10,000 sq. ft. bedded area barn (125 Holstein cow barn).
- Aerate/till the pack twice daily when the cows are removed from the barn. This is extremely important in order to facilitate faster aerobic decomposition and keeping the bedded surface dryer and nearly level for improved cow comfort.
- Till the pack to a depth of 10 to 12 inches to provide adequate aeration and mixing of the feces and urine. Uniform mixing action is important and it is recommended to till in opposite directions to improve the blending and aeration of the bedded pack.
- Stirring equipment can vary from a front end roto-tiller on a skid loader to a cultivator mounted on a tractor.
- Avoid deep ridges or holes when tilling that would impede cow comfort and safety.
- Wear breathing filters/face goggles when adding new bedding and while stirring the bed.
- Fresh bedding material is added when the bedded pack gets moist enough to stick to the cows flank and belly. This usually requires 1 semi load of new sawdust over the three to four week period for 125 cows. However, other housing conditions like overcrowding or humid/wet weather will require adding fresh sawdust more frequently. Adding fresh sawdust once or twice per week versus a semi load all at one time may improve the composting efficiency. To do this would require having on-farm storage for sawdust.
- Use of covered commodity bay or other storage structure would allow producers to stockpile sawdust when it is available at a lower cost and have the material available for bi-weekly additions to the bedded pack.
- Well managed bedded packs will allow for cleaner cows and reduced somatic cell counts.
- Clipping or singeing udders is helpful to reduce the amount of bedded material carried on the cow’s udder. However, excellent cow pre-milking prep is extremely important with compost barns as with all housing options.

MANURE HANDLING AND STORAGE

In loose housing barns where the barn serves as a means of storage, producers can reduce the size of outside manure storage. Producer experiences from Minnesota dairies estimate that 75 percent of the daily manure produced per cow is deposited on the bedded surface. Therefore, only 25 percent that falls on the concrete feed alley will be scraped and stored in a long-term structure. Based on data from the American Society of Agriculture Engineers (ASAE) and reported in the Midwest Plan Service publication, a mature Holstein lactating cow will produce an average of 148 pounds of manure (feces and urine) daily. This equates to 2.4 cubic feet per day. Therefore, assuming that 25 percent of the daily volume is scraped and stored as a semi-solid, a 100 cow herd using a loose housing facility would need a manure pit 25 ft. x 50 ft. x 8 ft. to have adequate storage for the required 6 months storage in Illinois. This compares with a pit
50 ft. x 110 ft. x 8 ft. for a 100 cow freestall facility when all of the manure is scraped and stored in a 6 month storage facility.

**PROS AND CONS**

The compost bedded barn creates a number of benefits for dairy producers and can be a very good alternative for dairy cattle housing. However, it also requires careful and consistent management. Limited research has been available to assist producers in understanding and applying the best management practices for top results. Most of the recommendations to-date is based on dairy producer experiences. Following are some thoughts to ponder.

- Estimated compost dairy barn building cost is $1500 to $1800 per cow space.
- Kiln-dry sawdust ranges in cost from $750 to $1,150 per semi load.
- Cost of bedding per cow per day is higher for compost barns ----- sand at $8.00/ton with a sand usage of 50 lbs. per cow per day = $.20/cow/day. Sawdust at $1000 per semi load and refresh 1 semi per 100 cows every 3 to 4 weeks = $.48 to $.33/cow/day.
- Improved herd longevity is credited to compost barns due to improved feet and legs, increased reproductive efficiency, and reduced somatic cell counts.
- Labor needs remain approximately the same for compost versus freestall barns.
- Reduced culling rates due to increased longevity allows for the herd to grow in size or provide extra heifers to sell as breeding stock.
- Expensive concrete manure storage needs are reduced when accounting for the manure/compost pack as a major storage unit.
- Animals in compost bedded pack barns are subjected to more dust and concern for air quality which can lead to increased respiratory and eye irritations.
- Experience from producers list availability of kiln dry sawdust as a major concern.