We’ve learned more about compost barns

If you’re looking for comfort, a compost bedded pack barn may work best. But we’re continuing to develop best practices.

by Jeffrey Bewley, Joe Taraba, George Day, Randi Black and Flavio Damasceno

Kentucky producers are adopting compost bedded pack barns at a rapid rate, with approximately 17% of the state’s dairy barns constructed so far. We took the opportunity to learn from these producers over the last couple years.

The compost bedded pack barn (CBPB) consists of a large, open resting area. It is usually bedded with sawdust or dry, fine wood shavings that are composted in place, along with manure, and mechanically stirred on a regular basis. Most Kentucky CBPB producers listed cow comfort as the main benefit of their system. Others cited cow cleanliness, the low maintenance of the system, and the barn’s usefulness for special needs and problem cows. Additional cited benefits include lower bedding cost, cleaner pastures, lower investment cost, less odor and fewer flies.

These barns are intensively managed to encourage composting of manure and organic material, unlike traditional straw-based bedded packs. Proper composting raises the bedding temperature and lowers the bedding moisture by speeding up the drying rate. Keeping the top layer of bedding material dry is key to managing a CBPB.

The pack is stirred at least two times per day. Stirring is typically accomplished while the cows are being milked, using various types of cultivators or roto-tillers. Facility design, ventilation, timely addition of fresh, dry bedding, frequent and deep stirring and avoidance of overcrowding are the keys to a good working compost bedded pack barn. Poor management may lead to very undesirable compost bed conditions, dirty cows, elevated somatic cell counts and more clinical mastitis.

Even when the compost process works well, mastitis pathogen levels in a CBPB are high.

A common misperception is that the heating process from composting kills mastitis pathogens. Minnesota and Kentucky research shows that mastitis pathogen levels are high in compost. The key to mastitis management is providing cows with a dry surface to rest on. Vaccination of cows with a coliform mastitis vaccine may also prove beneficial.

How do I know when it’s working?

As with any facility, the success of a CBPB hinges largely on how well it is managed. Maintaining proper aeration and stocking density are fundamental. When the pack is stirred frequently and uniformly, the manure and urine from the surface are mixed into the pack while oxygen and moisture are incorporated.

Compost management can be evaluated by looking at pack temperature and moisture. The pack’s temperature provides a good indication of the level of microbial composting activity. Your goal, measured at approximately 6 to 12 inches below the surface, is between 110 and 140°F. Temperatures can be measured with a long cooking thermometer.

If a thermometer is not available, you can feel the material (at 12 inches beneath the surface) with your bare hands. If the pack is hot almost to the point that you do not want to touch it, the temperature is likely high enough (greater than 110°F). Generally, temperatures are higher when the pack is fluffy because air promotes microbial activity. Manure, urine and microbial activity produce a pack’s source of moisture, which ideally should be between 45 and 55 percent.

As a simple moisture check, grab a handful of bedding and squeeze it. If you can squeeze water out or if water droplets drip from or appear on the surface of squeezed bedding, the pack is too wet. This is a sign that new dry bedding should be added.

But, if you cannot form a ball, the pack is too dry. This condition occurs when bedding is added too frequently. When the pack is work-

Compost bed startup in a new barn or after barn cleanout requires 1 foot of bedding to be applied to the barn floor. Starting a new bed should occur when four to six weeks of weather with highs generally above 50°F are expected. Not achieving an actively composting bed going into winter may result in low heat production that does not overcome the heat losses and poor bed performance results throughout the winter. The bedding area is generally cleared out in the fall or spring, with the used bedding applied to the land.

Uniform stirring and mixing provides a clean, soft, dry surface upon which the cows lie. Aerate the compost bed to a depth of at least 12 inches. Some producers give the pack twice during each stirring event, both lengthwise and crosswise, to further promote aeration.

New bedding (4 to 8 inches) is added to the pack before the moisture saturates to the point where the tight ball is formed. The frequency of adding bedding depends on how much evaporation occurs, how much manure and urine are introduced, as well as the season, ambient temperature and ambient humidity.

Generally, the new bedding is added every one to six weeks. Bedding usage during the wintertime is generally two to three times more than during the summer. Winter management of compost bedded pack barns is the most challenging and requires the most bedding.

First consider economics

Before building a compost bedded pack barn, construction costs must be considered, along with annual maintenance and bedding outlays. Per cow construction costs for a compost bedded pack barn are generally less than a freestall barn, despite more area required per cow. In our study, barn cost per cow (assuming 100 ft² per cow) were $1,051 ± 407 with a feed alley attached and $493 ± 196 for barns without an attached feed alley. Less concrete is used, and there is no investment in freestall partitions and bases.

While initial investment is lower for a freestall barn, annual maintenance is typically higher. For a 100-cow herd, assume a semi-truckload of sawdust (about 18 tons) is used every two to five weeks. Kentucky herds reported average bedding costs of 40 cents per cow per day. The primary limitation for compost bedded pack barns to date has been sawdust availability. These barns require three to four times the amount of bedding of a typical freestall barn.

If you are considering a compost bedded pack barn, make sure you have a reliable, cost-effective, timely supply of sawdust available. Consider how sawdust prices affect daily and annual bedding costs. If the pack is not managed well, the higher risk of exposure to environmental mastitis pathogens can add to your costs. We have developed an investment analysis tool (http://on.hoards.com/UK-dashboard) to help dairy producers evaluate investment in new housing facilities. In our next article, we will discuss compost bedded pack barn design features.