Cleaning Out and Restarting Your Compost Bedded Pack Barn

By Tanya France, Dr. Donna Amaral-Phillips, and Dr. Joao Costa

Compost bedded pack (CBP) barns have become an increasingly popular alternative housing system for the lactating herds of many dairy farmers in Kentucky and around the world. Past research has driven the rise in popularity largely due to the evidence that cows housed in CBP barns have improved cow comfort, heat detection, decreased lameness problems and in many studies decreased somatic cell count. However, effective management of the compost-bedding must be maintained by producers in order to successfully reap the benefits of a CBP barn. The most critical factor for managing a successful CBP barn is providing a comfortable, dry resting surface for the cows at all times.

Compost Bedding Cleanout

Compost bedding should be cleaned out once a year, with many producers doing so in the fall. Some producers will clean out the packs in the spring; it really depends on what the end product will be used for. There should be 6 to 12 inches of old bedding material remaining in the barn to help start microbial activity in the new pack. Once the bedding is removed from the barn, it can be used as a fertilizer for crops or it can be managed to produce a finished compost product and then sold.

Restarting Compost Bedding

The time of the year to start up a compost bed is extremely important and often forgotten. Producers should restart a fresh compost bed when at least the next four to six weeks of weather is expected to have highs above 50°F. This allows enough time for the bedding to begin actively composting, thus generating heat. The rate of heat production should ideally be at its peak prior to freezing temperatures. Not achieving adequate heat production through the composting process when going into winter may result in a decrease in overall heat production; in return producers have experienced increased difficulties in managing and maintaining proper bedding characteristics throughout those winter months. Many producers choose to restart their compost beds in the fall.

Figure 1. Restarting compost bedding at UK Coldstream Dairy; May, 2018

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The key requirement for compost bed start-up is to apply 1 foot of bedding, either sawdust or dry, fine wood shavings, to the barn floor. Add enough bedding so that the mixing equipment is not able to touch the barn floor, as shown in Figure 1. Several semi-loads of bedding material (Figure 2) may be necessary and is dependent on barn size, number of cows, and the size of the pack.

Addition of Bedding Throughout the Year

New bedding should be added to the pack to help maintain a dry surface for the cows to lay on which occurs when the bedding moisture is at 40-60%. Any amount higher than 60% requires additional bedding. A simple way to check moisture is to grab a handful of bedding and squeeze it. If water comes out or droplets drip from it, the pack is too wet. Frequency of adding bedding can vary, but the recommendation is to add 4 to 8 inches every one to six weeks depending on ambient humidity. Some producers add smaller amounts of bedding more frequently. Keep in mind that the frequency of adding bedding can increase during humid or wet weather, if the barn is overcrowded, and if moisture evaporation from the pack is low.

Figure 2. New sawdust used for the CBP barn at UK Coldstream Dairy; May 2018

Why is this necessary?

The general concept of composting is mixing a carbon source with organic material high in nitrogen in the correct environmental conditions, in this case incorporating a sufficient amount of oxygen throughout the pack. This mixture initiates microorganisms to begin breaking down all of those compounds, producing carbon dioxide, water, and heat. The main carbon source is the bedding material: sawdust or wood shavings. The amount of carbon required for composting is directly dependent on the amount of nitrogen that is present. The recommended carbon to nitrogen ratio is 25:1 to 30:1. This means that much more carbon needs to be present in the pack compared to nitrogen. If you can smell ammonia in the barn, the carbon to nitrogen ratio is likely below 25:1. The main nitrogen sources are manure and urine. Since nitrogen is continuously being added to the pack via the cow, the addition of new bedding or a carbon source is necessary. The addition of new bedding also helps with absorbing any excess moisture. If any one of these conditions or sources are absent, the process will not work.

Compost Bed Stirring/Tilling

Uniform stirring of the pack twice a day is an absolute requirement in producing a soft, dry surface for the cows to lie on. Aeration, which is exposing and circulating air (specifically oxygen) through a substance, in this case compost bedding, is precisely what stirring the pack does. Ideal depth of stirring should be around 12 inches using a cultivator or a roto-tiller attached to a skid steer or small tractor. Stirring at depths more than 12 inches, usually with a chisel plow, will reduce the amount of additional bedding needed and will increase the overall bedding temperature. Pack temperature should be measured at about 6 to 12 inches below the bedding surface using a long thermometer. The pack should have an internal temperature of 110-150°F to allow for effective composting. An easy and effective management strategy is to stir the pack at every milking, when the cows are out of the barn. Not only does this reduce the stress on the cows, but it also minimizes the chance of dust from tilling causing respiratory issues for the cows. Once tilling is finished, the top layer of bedding will need time to dry. Running fans located above the pack and if possible, keeping the cows off of the pack for at least one hour are ways to quicken the drying process.

Take Home Message

Successful compost bedded pack barns rely on key management practices. Understanding the process of cleaning out and restarting compost bedding is necessary for the success of this type of housing system. Key concepts include keeping 6 to 12 inches of old bedding material in the barn when restarting the pack, restart a fresh compost bed when the next 4-6 weeks of weather is expected to be above 50°F, maintain an internal pack temperature of 110-150°F, and add new bedding when the bedding moisture exceeds 60%. The end goal of any dairy producer is high milk production which occurs when cows are happy and healthy (Figure 3). Providing proper housing facilities will help achieve that goal.

Figure 3. UK Coldstream Dairy herd enjoying the freshly cleaned CBP barn; May 2018