

# Michigan Dairy Review

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## Sand Is Great for Cows, but Other Challenges Exist

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### Introduction

The choice of free stall base and bedding is a critical decision and should reflect management style and goals. Sand is the gold standard for a freestall base and bedding. Maintaining a bed of loose sand, 6 inches minimum in depth, enhances cow comfort, improves lying time, contributes to good udder health and clean cows, and improves cow footing. The only reason for avoiding sand for free stalls, other than it not being available, is the difficulty it adds to the manure handling and storage system.

Sand in manure is abrasive to handling equipment and tends to settle in trenches, pipes, tanks, and storages. Experience has taught us that you should not put sand-laden manure in pits, pipes, trenches, or tanks which you cannot access easily in order to clean out the sand or grit that settles.

Managing sand-laden manure with daily haul or long-term concrete storages operated as skim-and-haul are time-proven methods. Additional water such as rain or milking center wastewater is usually excluded from the sand-laden manure to avoid dilution and unintentional settling of the sand.

### Why We Separate Sand

Separating sand from the sand-laden manure is an option for those who want the benefits of bedding freestalls with sand without the aggravations that accompany sand in the manure. The separation options depend largely on the reasons for removing sand in the first place. There are three primary reasons.

1. To remove most, but not all, of the sand from the manure stream with no intention of using the removed sand for bedding. Just enough sand is removed to reduce downstream problems.
2. To reclaim sand clean enough for reuse as freestall bedding and take advantage of cost savings.
3. To create a "sand-free" manure stream for further treatment as well as reclaim sand for freestall bedding.

Actually, this list of reasons mirrors the progression of our past research on sand separation. We started with the goal of removing sand from the manure stream to reduce damage to equipment and sand settling in storage. Then we discovered that we could reclaim sand without manure solids being included. The fact that small quantities of sand remained in the manure stream was tolerated. More recently, we are seeing interest in manure treatment technologies that demand a "sand-free" manure stream. No sand should remain in the manure stream, and no manure solids should be left in the reclaimed sand.

Achieving the last goal presents a complex challenge. The ideal conditions for removing sand from manure are not necessarily the same as the conditions most ideal for reclaiming clean sand for reuse. Subsequently, systems in the third category must provide a high degree of control and likely will require more than one stage of separation. Sand-manure separation is not as simple as it first appears.

### Here's How It Works

Separation involves three components – sand, manure, and water. Diluted water is added to sand-laden manure at a minimum ratio of 1:1 (water to manure). The mixture is vigorously agitated, washing the sand grains and manure solids free of mucous that holds them together. They (sand grains) then act as discrete particles in the diluted mixture, and the more dense sand grains settle to the bottom. Manure solids tend to settle as well, but, with just the right amount of buoyancy provided by moving water or injected air, the manure solids remain in suspension and are carried off with the manure stream.

Simply put, this difference in settling rates is the basis for all methods of separation currently in use – mechanical separators, cyclones, sand lanes, settling aprons and basins.

The degree of success depends on high-quality dilution water containing few manure solids and a velocity component for buoyancy to keep manure solids in suspension. In addition, choice of sand is important to the success of separation. Because sand grains vary in size and shape, they settle at different rates – coarse sand settles faster than fine sand. Unfortunately, fine-grained sands tend to settle at a similar rate as some of the manure solids which presents a challenge that can range from moderate, if some fine sand left in the manure stream is tolerable, to complex, if the goal is to reclaim sand for bedding and a sand-free manure stream.

### Conclusion

Separating sand from sand-laden manure is a straightforward process. The challenge ranges from moderate to complex with the end use of the sand and the manure stream dictating the level of control that must be built into the system. In some cases, more than one stage of separation may be required. To be effective, any separation system requires time and attention and an operational plan that is followed consistently. A follow-up article will discuss what options are available to meet these different challenges.