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## Choosing a Stall Base

### What is the Right Stall Base for Your Barn?

Dairy producers have a tremendous variety of decisions to make when planning to build or remodel a free stall facility. Cow comfort is the first and most important consideration in this process, as milk production increases with comfort! This is followed by the life and costs per year of the individual components and the labor required to maintain them. Where stall bases are concerned, it comes down to the base's effect on the cow, the rate at which the

base loses its cushioning ability, maintenance costs, labor costs to keep bases clean, bedding availability and cost and manure handling cost and convenience.

There is a tremendous difference between stall bases in cushioning ability and how quickly it is lost.<sup>2,3</sup> The most commonly used bases are foam, rubber-filled, rubber mats, sand and waterbeds. Foam bases lose their cushioning ability faster than any other major base type. Rubber crumb or crushed rubber pieces immediately follow

the foam bases. Rubber mats follow next, but provide little cushioning ability when new. Sand bases need to be cleaned and re-filled daily to provide a consistent level of comfort.<sup>4</sup> Waterbeds have the same cushioning ability after ten or twenty years as they had on the day they were installed.

A stall base's ability to move with and protect a cow's skin from abrasion is of the utmost importance when high quality bedding such as straw or sawdust is in short supply. Dry, stone-free sand and waterbeds move easily with the cow, thereby preventing abrasions and swollen hocks. Sand bases require specialized manure handling systems and must be maintained level full to achieve the highest level of comfort, lying times and hock health.<sup>4</sup> Waterbeds require modest amounts of maintenance, little bedding and work well with digesters. A daily dusting with powdered lime is used successfully as the only bedding on many dairies utilizing waterbeds.



Cow resting in a well-designed stall  
on a dual chamber waterbed.



### What Do Cows Prefer?

Cow preference studies have repeatedly shown cows choose the softest available base or the one with the greatest amount of bedding<sup>5</sup>. Base preference may change seasonally. When cows are provided a variety of bases to choose from, cows prefer foam, rubber-filled mattresses and rubber mats for standing. For lying, cows choose bases with the greatest cushioning ability first: foam, sand, rubber-filled bases with a foam layer, rubber-filled bases and rubber mats.<sup>6</sup> During periods of cold Wisconsin winter weather, waterbeds are the most preferred base.<sup>6</sup> This is most likely because waterbeds retain heat from the cow and stay warm. Cows are often

initially afraid of waterbeds, as they move when the cows step on them.

### Effects on Cow Health and Injuries

Open wounds and swellings on hocks are related to base type and the amount and frequency of bedding<sup>7</sup>. Cows on mats and mattresses are most affected by lesions, while cows on sand and waterbeds are least affected. The difference in lesions between cows on sand bases and cows on waterbeds is the location of injury. Cows on sand-bases suffer injuries from the concrete curb when the sand is not level with the curb.<sup>4</sup> The point of the hock becomes abraded through contact with the curb.

Cows on waterbeds generally suffer hair loss on the hock if powdered lime is not applied at least every other day. When cows develop open wounds or swellings on hocks, additional bedding, more frequent bedding or better quality bedding may allow healing and prevent new injuries.

Base type and management may also result in knee and thigh lesions. Dairies with recycled sand or rubber-filled mattresses had the highest rates for knee lesions. When sand is recycled, the fines are lost and only the coarse grains remain. Bloody thigh lesions were found on more than one-third of dairies with rubber-filled mattresses<sup>7</sup>.

*Cow resting in a well-designed stall on a rubber-filled mattress bedded with dry wood shavings.*





This condition is seldom seen on dairies that provide sand bases or waterbeds.

There is little difference in somatic cell counts in cows that lie on different base types (Figure 1). Here, stall dimensions are correlated with somatic cell count, cow age, hock injuries and lameness. Somatic cell count is correlated with stall length and width in barns fitted with rubber-filled mattresses. Cows on farms with longer, wider stalls have lower somatic cell counts. In barns with sand-based stalls, cow age is positively correlated with stall length. This is most likely due to the extra comfort afforded to the older, larger cow because the stall bed is longer and she is protected from abrasion against the concrete curb. Hock swellings are correlated with stall length regardless of base type. Shorter stalls result in higher rates of swollen hocks. Cows with severely swollen hocks are found on dairies with narrow stalls. This is likely due to the cows' inability to easily shift position in narrow stalls.

The percentage of cows reported lame is correlated with somatic cell count and neck rail height across all stall base types. Somatic cell counts and lameness incidence appear to increase together, which may provide

Figure 1  
*Somatic Cell Count by Stall Base Type\**

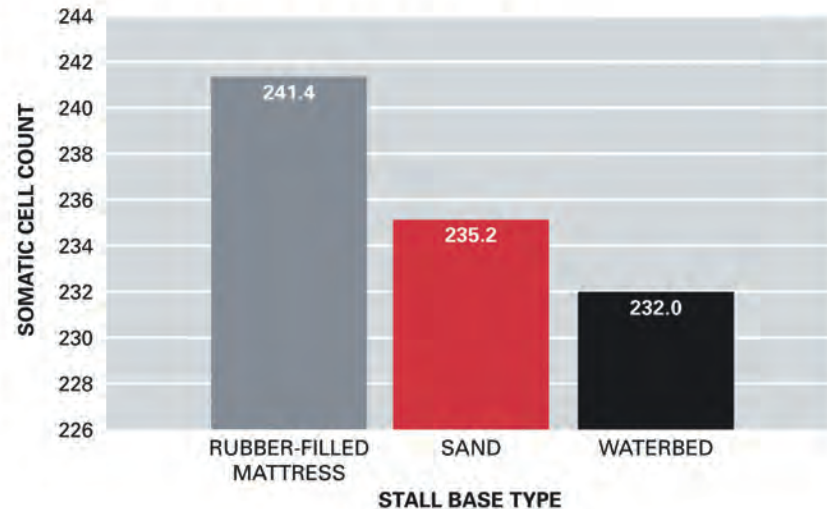
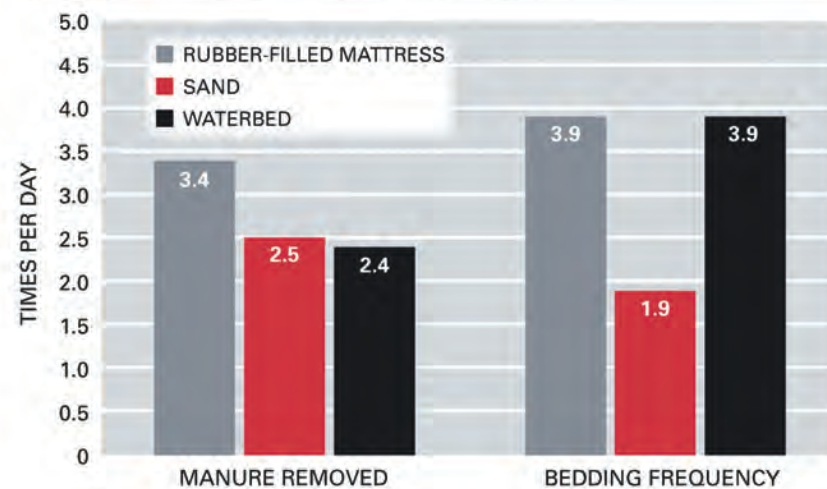


Figure 2  
*Manure Removal and Bedding Frequency*

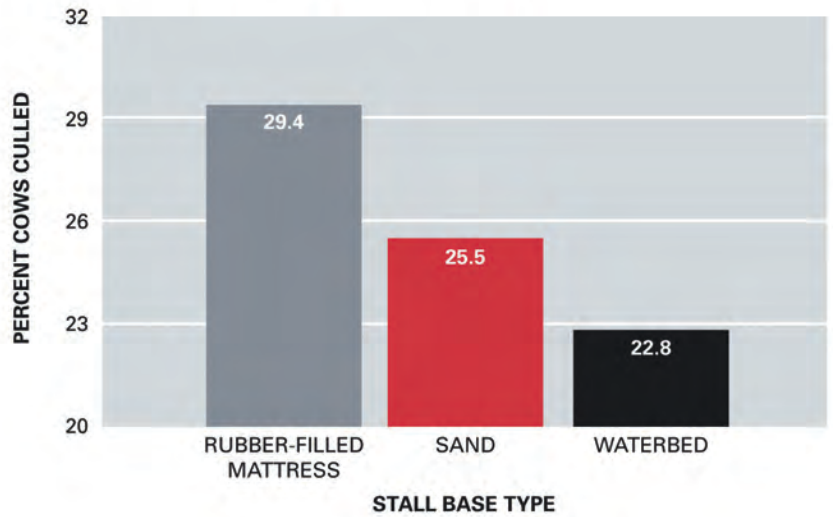


additional incentive to prevent lameness. If cows are routinely seen standing half-in and half-out of the stalls, neck rails should be raised. The percentage of lame cows is correlated

with the number of times per day manure is removed from sand-based barns. Barns with rubber-filled mattresses were cleaned more frequently (Figure 2).

\*All graphs in Figures 1 – 6; Reference footnote 8

Figure 3  
**Percent Cows Culled by Stall Base Type**



Dairies with waterbeds have the lowest annual cull rates, while dairies with rubber-filled mattresses have the highest cull rates (Figure 3). The cull rates for dairies with sand-based stalls fall in-between.

*Cow resting on a well-designed deep-bedded sand stall.*





### Cow Hygiene and Manure Management

Cows kept in barns with rubber-filled mattresses or waterbeds have better hygiene scores than cows housed in sand stall barns. Sand-based free stall barns are not scraped as frequently as rubber-filled mattress free stall barns. The sand-manure mixture tends

to spatter and stick to cows' legs as they navigate the alleyways, which results in poor hygiene scores for this group.<sup>7</sup> Producers with rubber-filled mattresses or waterbeds bedded stalls four times per week, while dairies with sand-based stalls generally filled stalls twice per week or less. Dairies with waterbeds have the lowest

bedding costs and sand-based barns have the highest bedding costs (Figure 4).

There are more mature (fourth lactation or higher) cows on dairies with waterbeds (Figure 5) than in the other two base types studied (20 percent vs. 13 and 14 percent). This should be of particular interest to those interested in growing herd numbers from within or selling dairy replacements to increase income.

Severe hock injuries are correlated with somatic cell counts on dairies with rubber-filled mattresses. Hock injuries occurred more frequently and were more severe on these dairies. Since severe hock injuries are correlated with high somatic cell counts, this should provide tremendous incentive to adjust stall base management to correct this deficiency.

Producers who provided waterbeds for their cows were more satisfied with cow longevity, lameness incidence, stall maintenance labor, stall base life and bedding use and cost than those who provided sand-based stalls or rubber-filled mattresses (Figures 6 and 7). Those who provided sand-based stalls or waterbeds were more satisfied with cow comfort than were those who had rubber-filled mattresses. Producers with sand-based stalls were least satisfied with manure management.

Figure 4  
*Bedding Cost by Stall Base Type*

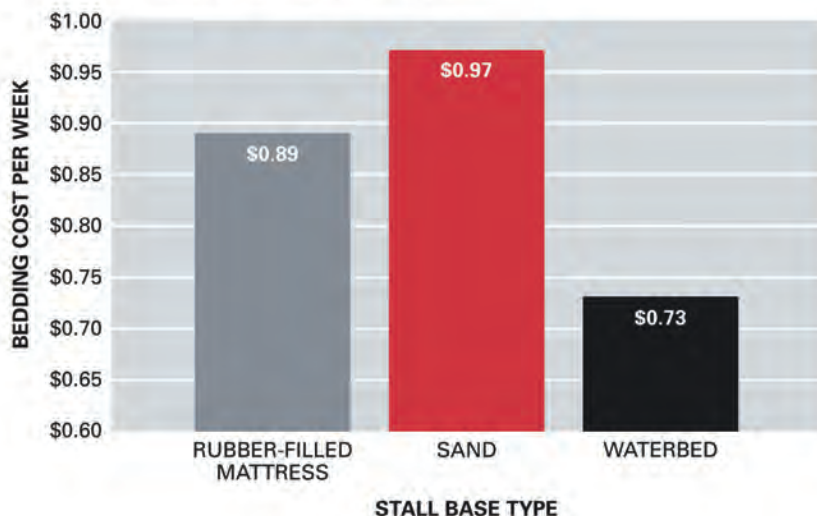


Figure 5  
*Percent Mature Cows by Stall Base Type*

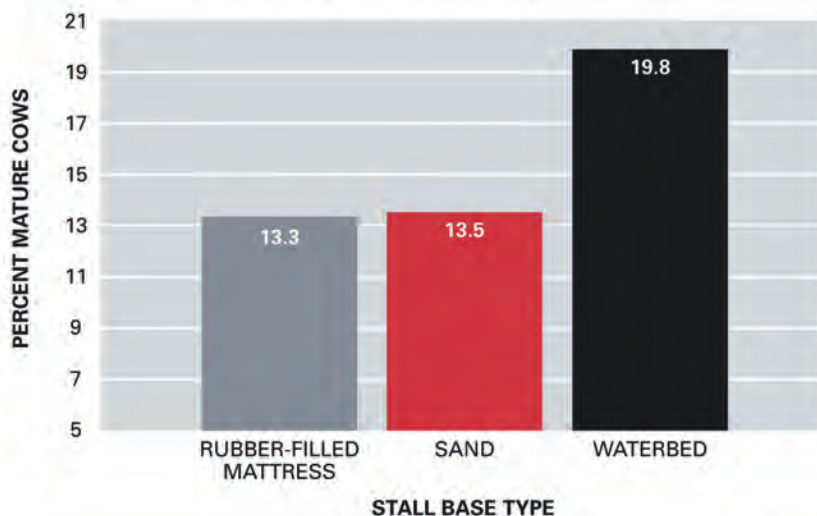


Figure 6  
*Producer Satisfaction with Cow Longevity, Lameness, Hock Injury, Teat Injury, Mastitis, Somatic Cell Count, Udder Health and Hygiene by Stall Base Type*

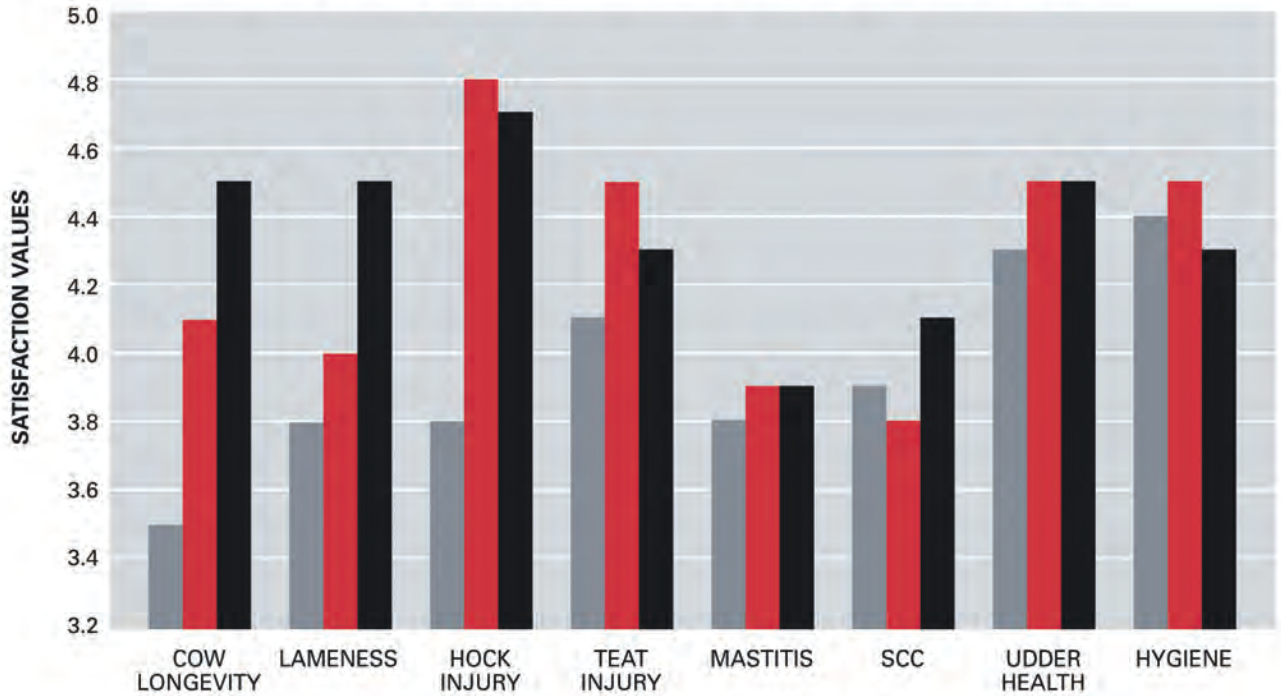
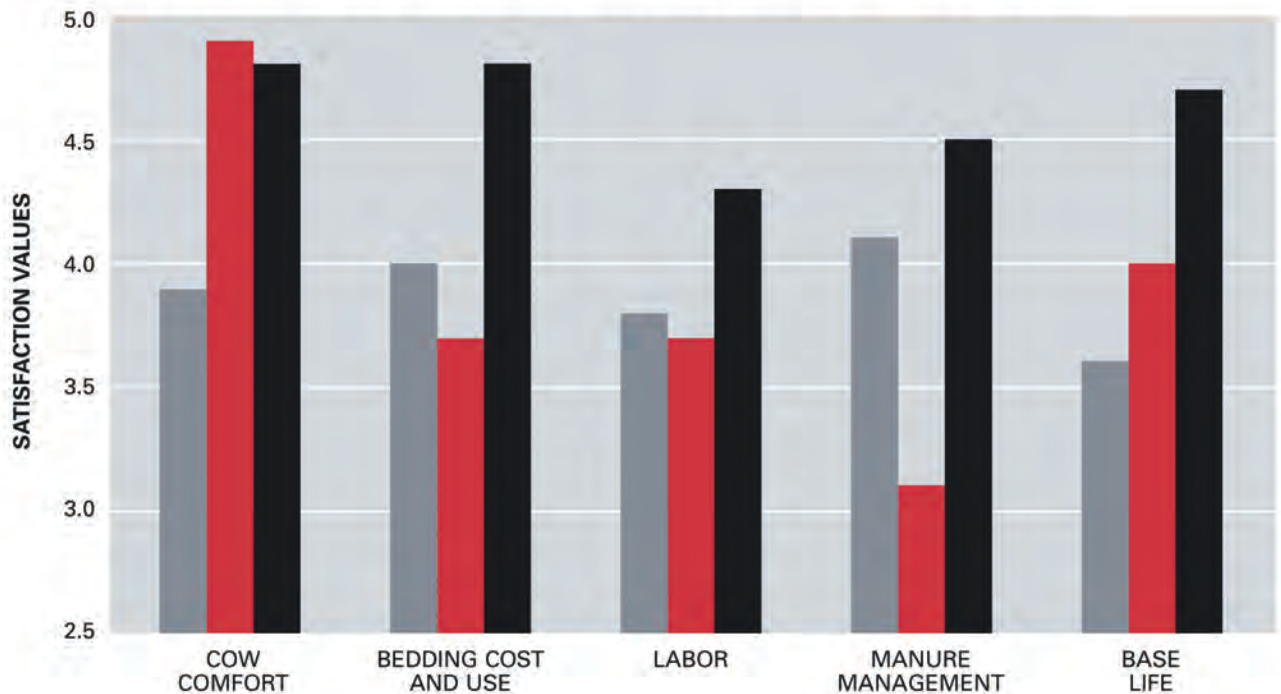


Figure 7  
*Producer Satisfaction with Cow Comfort, Bedding Cost and Use, Labor, Manure Management and Base Life by Stall Base Type*

RUBBER-FILLED MATTRESS  
 SAND  
 WATERBED





**Key points:**

- All base types can be successfully managed.
- Producers must be aware of management differences required to successfully manage the different stall base types.
- Stall dimensions should match cow size.
- Appropriate stall dimensions vary with stall base types.
- Low levels of lameness and hock injuries lead to:
  - Increased production and longevity.
  - Low somatic cell counts.
- Cow longevity increases with the length of sand stalls.
- The number of mature cows is greatest on dairies with waterbeds.
- Waterbeds and sand move with the cow, protecting the cow from abrasion and injury.
- The findings reported in this study were supported by producer satisfaction scores.

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