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Effect of Stall Base Type on Dairy Cow Herd Health, Costs, Producer Satisfaction, Lameness, and Leg Lesions

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Abstract

The objective of this field study was to compare effect of stall base on herd health, stall maintenance, bedding cost, and producer satisfaction. Ninety-one dairies visited during a 4-mo period starting October 14, 2005 included 33 rubber-filled mattress (RFM), 27 sand, and 31 waterbed (WB) dairies. In this study, percent culled was higher for RFM (P = 0.001) and sand (P = 0.06) than WB stall base dairies. Percent of cows in fourth lactation or greater was higher on WB than either RFM (P = 0.01) or sand (P = 0.02) dairies. There was no difference between base types for production or somatic cell count. Bedding cost per bed per week was WB ($0.73), RFM ($0.89), and sand ($0.97). Sand beds were bedded less frequently (P = 0.01). Comparisons between RFM and sand indicate higher satisfaction for RFM regarding manure management (P < 0.0001) and higher satisfaction with sand for cow comfort (P < 0.0001). Producers with WB were more satisfied with base life (P < 0.000 1) and cow comfort (P < 0.000 1) than those with RFM. Producers with WB were more satisfied with cow longevity (P < 0.0001) as compared to RFM. Length of sand stall was correlated with longevity (0.56, P = 0.01) while percent of mature cows was greater on dairies that provided WBs (P = 0.02). This data indicates that WB may be a viable option for cows and producers, when good quality sand is unavailable or handling sand-laden manure is not feasible.

Keywords. Bedding requirement, maintenance cost, producer satisfaction, stall base

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Stall dimensions

Stall width, length, and neck rail height were recorded. Sand stall curb dimension was recorded.

In sand stalls, neck rail height was measured from the bottom of the brisket locator to the underside of the neck rail.

Leg lesion measurements scored

- Tarsal joint: lateral and medial
- Tuber calcis: lateral, medial, and dorsal
- Scored for skin lesions on a 4-point scale
- No hair loss = 0
- Hair loss = I
- Swelling = 2
- Severe swelling = 3 Hair loss patches were 1.8-cm in diameter or greater. Swellings assigned score 2 were 7.4-cm or less in diameter, while score 3 swellings were larger and may have been purulent, extensive, or bleeding. Knees were scored whenever possible without interrupting cow flow in the parlor.

Cow hygiene measurements

- Every cow in the selected pen was assigned a hygiene score between 1 and 5
- Score 1: No dried manure or manure stains
- Score 2: Cows with manure stains and no dried manure
- Score 3: Cows with wet or dried manure on the legs and udder
- Score 4: Extremely soiled cows
- Score 5: Manure and manure stains on legs, udders, and ventral abdomen

Production information collected

- Milk
- Components
- Somatic cell count,
- Number of cows in fourth lactation or greater
- Cull rate
- Death rate
- Number of cows lame on the day of visit.

Producer satisfaction values

- Milking systems
- Restraining systems
- Production and animal well-being as affected by stall base

Stall base purchase and maintenance costs

Producers reported:

- Amount of time required to bed, fill, and groom stalls per week
- Cost and amount of materials used to bed or fill stalls per week
- Frequency and amount of bedding or fill
- Frequency of barn cleaning and stall bedding
- Bedding type

Tarsal lesions

- Cows on RFM had more score 1 ($P < 0.0001$), 2 ($P < 0.0001$), and 3 ($P < 0.0001$) lesions than cows on sand or WB.
- Sand-bedded cows had more dorsal lesions ($P < 0.0001$) than cows on RFM or WB. This was likely due to abrasion with the concrete manure curb in deep bed stalls.
- Sand-bedded cows more often had medial tuber calcis lesions (20%) than RFM (13%), or WB (18%).

Knee and thigh lesions

- Recycled sand dairies had more ($P = 0.04$) hairless knees (61% of cows on the most affected dairy) than those using new sand.
- Cows on RFM had bloody abrasions on thighs on 37% of dairies surveyed.
- The two RFM dairies with the most thigh abrasions had 29%, 22%, 13%, as compared to the worst sand bed dairy (1%) and WB dairy (4%).

Stall dimensions: lameness, lesions, somatic cell count

- The greatest difference was between RFM and sand stalls ($P = 0.11$) for stall length and width.
- Sand stall length may be misleading as the concrete manure curb added 7.6-cm to 27.9-cm to the length of these beds.
- Sand stalls and RFM also had the greatest difference for neck rail height with sand at 116.3-cm and RFM at 118.6-cm.
- Somatic cell count was correlated with narrower stall width (-0.50) in RFM barns ($P = 0.01$), and with stall length (-0.46, $P = 0.01$). In sand barns, longer stall length was correlated with a higher percent of mature cows (0.56, $P = 0.01$).
- Shorter stall length was correlated with percent of cows with score 2 lesions or swellings (-0.23, $P = 0.04$), across all stalls.
- Percentage of cows with lesion score 3 was correlated with narrower stall width (-0.52, $P = 0.01$).
- Percentage of cows reported lame on farms on the day of visit was correlated with

higher SCC (0.45, P < 0.0001) and neck rail height (-0.22, P = 0.05) across all base types.
- The percent of cows reported lame was correlated (-0.38) with shorter stall length on RFM dairies (P = 0.04), and SCC (0.52, P = .002).
- Percentage of lame cows is correlated with higher SCC for sand cows at 0.45 (P = 0.02).
- In sand barns, percent lame cows was correlated with times per day manure was removed (-0.45, P = 0.03), perhaps indicating a need to increase manure removal frequency.
- Manure was removed more frequently from RFM barns than either sand or WB dairies (P = 0.05).
- Annual culling rate was higher for RFM than WB dairies (P = 0.001).

Cow hygiene

- Cows maintained on RFM or WB had better hygiene than those maintained on sand (P < 0.0001).
- Producers with RFM or WB bedded cows more frequently (P = 0.02) at 3.9 times per week, while sand dairies filled stalls 1.9 times per week.
- Dairies with RFM cleaned barns more frequently (3.4 times) per day than either sand (P = 0.05) or WB dairies (P = 0.04).
- Hygiene score was correlated with neck rail height for RFM (-0.52, P = 0.003) and WB (-0.40, P = 0.03), but not sand.
- Producers must be mindful of finding the right neck rail height for the cows in their herd, in order to maximize hygiene and minimize lameness.
- There were more mature cows, defined as being in fourth lactation or greater, on WB dairies than RFM (P = 0.01), or sand (P = 0.02).
- Percentage of cows with lesion score 3 was correlated with SCC on RFM (0.60, P = 0.001).
- There was no difference for SCC among base types.
- WB and RFM dairies bedded more frequently than sand dairies (P = 0.01), although sand dairies had higher bedding costs.

Producer satisfaction

- Producers who provided WB for their cows were more satisfied with cow longevity than those with RFM (P < 0.0001) or sand (P = 0.001).
- WB dairymen were also more satisfied with lameness prevalence than RFM (P = 0.001) or sand (P = 0.05).
- Producers who provided sand or WB were more satisfied with lameness prevalence than those with RFM (P < 0.0001).
- Regarding cow comfort, producers with sand were more satisfied than those with RFM (P = 0.05), as were those who provided WB (P = 0.01) for cows.

- Those who provided WB were more satisfied with bedding use and cost than RFM ($P = 0.05$), or sand ($P = 0.003$) dairies.
- Satisfaction with manure management was highest for RFM or WB when compared to sand ($P < 0.0001$).
- Regarding stall maintenance labor, producers with WB were most satisfied, more than RFM ($P = 0.03$), and more than those with sand ($P = 0.01$).
- When base life was considered, WB providers were the most satisfied, more than producers with RFM ($P < 0.0001$), and more than those with sand ($P = 0.01$).

Conclusions

All base types can be successfully managed. Producers must be aware of the differences in mana ement required, especially when considering a change in base type. It is 9 imperative that producers visit other dairies that are successfully using other types of equipment and technology whether building new, or remodeling old facilities. Stall dimensions must match not only cow size, but be designed with the base type in mind. Sand stalls should have as much bed length as RFM or WB in addition to the curb to improve cow comfort and reduce tarsaljoint abrasions. Reducing lameness and lesions are important not only to increase production and longevity, but to maintain low somatic cell count and maximize profit. Cows on RFM had more score I ($P < 0.0001$), 2 ($P < 0.0001$), and 3 ($P < 0.0001$) lesions than cows on sand or WB. This study indicates a relationship between cow longevity and length of sand stall. Dairies with WB have more mature cows than those with other base types. This may be due in part to the WB moving with the cow much in the same way that sand does. Producer satisfaction values support the findings of this study. More research needs to be done to determine the reasons for these differences.