

# Memo

**To:** Tom Astbury

**From:** Ruth Douglas

**Date:** December 5, 2007

**Subject:** Solution(s) To The Cattle Lameness Problem On Our Farm - Investigation Analysis And Results

## Executive Summary:

Lameness in the milking cows on our dairy farm has negatively impacted milk production and reproductive performance. The cause of this lameness has been attributed to the poor free-stall design that we currently have. Economic losses to the farm as a result of this lameness prompted me to research solutions to this problem. My research investigation pointed to five solutions that would help to alleviate our lameness problem and improve cow comfort. A set of criteria was identified and used to evaluate each solution. After careful analysis and thoughtful evaluation of these solutions, I recommend that we install mattresses into each of the free-stalls and bed each free-stall with wood shavings twice per week.

## Current Situation of Our Farm's Cattle Lameness Problem:

The free-stalls that are presently in our barn are very shallow and neither holds nor keeps in enough wood shavings to provide the cows with adequate protection from the concrete below. Consequently, our cows have become lame. (See Appendix/ Attachments Table 1: Free Stall Dimensions.) Lameness includes swollen knees and hocks with 'hock sores' as a result of the rubbing against the concrete floor. Currently, we bed the cows with 9 kg per stall of wood shavings once per week. By the end of the week, however, the cows have pushed/ pulled out most of the shavings and do not have enough shavings under them when they lay down as protection from the concrete floor of the free-stall. The cows are reluctant to lie down and/or get up since it is painful for them. This problem leads to reduced milk production as a result of stress caused from the lameness and from not being able to lie down, or lying down too long. This stress also contributes to a decline in reproductive performance. Both this reduced milk yield and reproductive performance directly affects the efficiency and profitability of our farm.

## Investigation – Approach, Findings, Criteria, Evaluation

### **How the investigation was tackled:**

In order to find out which solution will provide the greatest benefit for our cows, I used my past and current hands-on experience in the dairy industry and on our farm, my practical knowledge of dairy cattle, and my contacts within the dairy industry to conduct the necessary research to obtain information required in order to make the appropriate decision of what the best solution(s) to the problem is. I talked to other dairy farmers in the industry, industry service personnel, and a

local veterinarian. I also looked at recent research studies, via the internet, that had been performed at the UBC Dairy Education and Research Centre, and at other universities across North America.

### **Solutions to the Problem:**

Both my investigation and the information that I gathered revealed that in order to improve the cow comfort on our farm and alleviate our lameness problem a change needs to happen to the free-stall surface that the cows lay on, so that the cows are comfortable and relaxed. Based on the set of criteria used in evaluating each possible solution and the current situation of our farm, there are five potential solutions to this problem, each having its pros and cons.

#### **- Put shavings in the free-stalls more frequently**

By bedding the stalls more frequently more shavings are under the cows at any one time than if the stalls were bedded only once per week. This does not increase the amount of shavings used, but just distributes the allotted amount of shavings equally over the week. (4) (1) (6)

#### **- Put down mattress as a cushion**

This protects the cows from direct contact with the concrete floor and prevents severe rubbing of their knees and hocks, and 'hock sores' from developing. An additional benefit is the use of a mattress. It helps to absorb the shock and lessen the pain when the cows drop to their knees while in the process of lying down. Mattresses should not be used alone but in combination with a bedding material, i.e. wood shavings. (2)(3)

**- Replace old free-stalls with new ones**

New stalls allow you to build the stall to fit the cow and maximize cow comfort. This solution has the most potential for change depending on the measurements of the existing barn. (4)

**- Change the type of bedding; use sand**

Sand is excellent as alternative bedding. It is easy to get and provides good cow comfort. Two drawbacks of sand is that it requires specialized equipment to handle, and it wears down equipment faster which increases equipment replacement frequency. (2)

**- Curb height increase using plastic dimensional lumber**

By increasing the height of the curb the depth of the stall is increased, too, which keeps more shavings in the stall over a longer period of time. This is a viable solution if the top of the curb is fairly flat and wide. It is easy to do and a good long-term solution. (4)

**Set of Criteria chosen to Evaluate Solutions and Why:**

Each criterion was carefully chosen to address a certain aspect of our farm situation.

○ **Does it improve cow comfort?**

Milk yield and reproductive performance in each of the cows is related to cow comfort, and also directly affects farm economics.

- **How effective is the solution for alleviating the current situation?**

The level of effectiveness of each possible solution will have an impact on whether or not it is used because we want to maximize the return from our farm's limited input resources.

- **Is it economically feasible?**

Because of our farm situation we have limited financial resources that we are able to allocate for any improvements to our current free-stalls. We need to find the solution that gives us the most benefit for the limited resources that we have.

- **Does it have minimal environmental impact?**

This is a very important and critical criteria because we are located within an environmentally sensitive ecosystem. There are by-laws in place that we have to follow, so the less impact we have on the environment around us the better.

- **Does it have a minimal labor requirement?**

This is directly correlated with our limited time and resources. The labour is a large, long-term expense for our farm in the current situation. The last thing we want is to increase the cost of labour by implementing a solution that is labour intensive.

- **Are the results long-term?**

If we are going to spend the time and money to make the improvements, regardless of how big or small they are, then we want the results to be long-term to optimize efficiency of our farm and limited resources.

## **Evaluation of Solutions Based on Set Criteria:**

Each solution was evaluated based on the above set of criteria (See Appendices “Table 2: Free-stall Solutions Comparison”):

- **Does it improve cow comfort?**

Cow comfort is a key factor in improving efficiency and profitability on our farm. Four of the five possible solutions satisfied this criterion:

- Replace old free-stalls with new ones. New stalls can be built to fit the cows, allowing for maximum comfort and benefit.
- Put down a mattress as a cushion. This will reduce the impact for when the cows lay down and provide a softer area to lay on instead of the concrete floor. It also keeps the cows from injuring themselves.
- Put shavings in the free-stalls more frequently. This results in more bedding under the cows throughout the week, and also helps to keep them clean and protected from the concrete floor of the stall, whether it is a mattress or bare concrete.
- Change the type of bedding (use sand). The sand works well to absorb the impact for the cow when she lies down.

Only one possible solution did not satisfy this criterion:

- Increase curb height using plastic dimensional lumber to keep more bedding in the stall. Since our stalls are short this would have caused our cows even greater discomfort because they would have been lying directly on top of it instead of in front of it.

- **How effective is the solution to alleviate the problem?**

Mattresses and sand are both good because they protect the cows from the concrete floor and prevent injury. New stalls are best because you can ensure that they are built to bring maximum comfort to each cow. Bedding twice per week is also good because it allows for more shavings under the cow, however it does not protect the cow from the concrete floor or from injury. Curb height is a good concept, but because of the dimension of our free-stalls it does not work on our farm.

- **Is it economically feasible?**

The cost for each of the solutions is based on the current market price. Bedding the cows more frequently costs \$3.00 per stall per week; this is equivalent to the original cost of bedding the stalls. Installing the mattress is a \$130.00 one-time cost. Building new stalls is a very expensive long-term solution at \$330.00 per stall, which does not include rubber mats or the necessary weekly bedding costs. Using sand for bedding is also an expensive option because it requires the construction of new stalls that are deeper to hold the sand in, increased labour and an investment in new equipment to manage this type of system, Moreover, equipment wears out faster. Plastic dimensional lumber to increase the curb height proves to be an economically feasible, long-term solution at a cost of only \$20.00 per stall.

○ **Does it have minimal environmental impact?**

No environmental impact:

- Mattress

Beneficial environmental impact:

- Wood shavings - these decompose very well, and can be used as a soil amendment for soil structure when the manure is put on the field.
- Sand - when put out on the fields with the manure, sand is a good soil amendment that helps with field drainage.

Minimal environmental impact:

- New stalls – have the possibility of minimizing the amount of bedding needed, or be the same as regular bedding.
- Plastic dimensional board - keeps more shavings in the stall; use less.

○ **Does it have a minimal labor requirement to implement?**

Several of the solutions only have a one time labour requirement. (This does not include the regular bedding that is necessary for the stalls.) They are:

- New stalls
- Plastic dimensional lumber
- Mattress

Solutions that require an ongoing minimal labour input are:

- Bedding the cows twice per week
  - Using sand, bed once every two weeks
- **Are the results long-term; 10 years or more?**
- \*Installing Mattress. Yes; the mats last approximately 10 years.
  - \*Building new stalls. Yes; stalls will last 20+ years.
  - \*Plastic dimensional lumber. Yes; the lumber lasts approximately 10 years.
  - Change to sand bedding. No; stalls are re-bedded bi-weekly and since equipment wears out faster, and needs replacing sooner, it is a more expensive solution.
  - Bedding with wood shavings more frequently. No; stalls have to be re-bedded twice per week.
- \* This does not take into account the fact that the stalls need to be bedded regularly.

## **Conclusions and Recommendations:**

Table 2 (see appendices) illustrates the comparison of chosen criteria. From this information the following conclusions can be stated:

1. Construction of new stalls is the most effective solution to alleviate our lameness problem. Sand, mattresses, and bedding with wood shavings twice weekly are all effective secondary alternatives.

2. Cow comfort is best achieved through new stalls. Sand, and mattresses used in conjunction with wood shavings are also good choices for cow comfort. Stalls bedded with wood shavings and mattresses prevent the cow from injury either from the concrete or from rubbing against the bare mattress.
3. Wood shavings and sand both have a beneficial environmental impact since they can be used in the field to help improve soil fertility by acting as soil amendments. New stalls and curb height increase have minimal impact because they reduce the amount of shavings used and therefore put out in the manure. Mattresses have no impact on the environment.
4. Mattresses, new stalls, and curb height increase have the lowest labour requirement. Bedding with shavings requires a little more because of the extra time on the tractor. Using sand for bedding has the highest requirement as the sand is heavier, equipment needs to be replaced more often, and more specialized equipment is required to manage a sand system.
5. The cheapest solution is the curb height increase: \$34 per stall, but this still requires bedding on a weekly basis. Sand stalls are second cheapest: \$20 per stall per year, but requires expensive specialized equipment. Mattresses and bedding with wood shavings twice weekly are both good secondary alternatives: \$130 per stall, and \$130 per stall per year, respectively. The most expensive solution was building new stalls: \$330 per stall, not including mattresses or necessary bedding.

6. New stalls have the best long-term results of 20+ years. Second are mattresses and curb height increase at 10 years. Bedding stalls bi-weekly using sand or weekly using wood shavings has the least long term effect.

Based on our farm situation and my investigation results of possible solutions to our cattle lameness problem, each of the recommended solutions has its pros and cons and no one solution by itself is best suited for our farm. After careful analysis and evaluation of each solution, I recommend that we (1) install mattresses, and (2) bed each stall with wood shavings twice weekly, since both are effective solutions, economically feasible, have a high score of improved cow comfort, have a beneficial impact on the environment, and require low labour input.

Mattresses are long-term, while bedding with wood shavings must be done twice weekly, but this is outweighed by the benefits to cow comfort. The only cost involved would be for the purchase and installation of the mattresses for each stall, as we are already bedding with wood shavings. We would not have to increase the amount of wood shavings we use since we are already bedding with 9 kg of wood shavings per stall once weekly.

In conclusion, these two solutions satisfy the set evaluation criteria and will have the most effective, beneficial impact on our cows by improving cow comfort while increasing the efficiency and profitability of our farm.

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## Pictures - The situation/ problem on our farm (Pictures taken by Ruth)

Our free-stalls – there is a lot of shavings in them, but it gets pushed aside and out of the stalls, exposing the concrete floor of the stall.



Notice how short our stalls are. This is why we are not able to use plastic lumber to increase the curb height.

The result of our poor free-stall design:  
'hock-sores' (right), swollen hocks (below)



Pictures – Alternative solutions  
(Pictures from Google Images)

Wood Shavings



Mattresses



New stalls

Sand bedding



Plastic Lumber



Ring Top

Appendices/Attachments:

<p style="text-align: center;"><b>Table 1: Free-stall Dimensions</b> For solid-front stalls</p>		
	<b>What our farm has</b>	<b>Recommended (7)</b>
<b>Length of stall</b> - front to back	81 inches (6.75 feet)	90-96 inches
<b>Width of stall</b> – divider to divider	48 inches (4 feet)	48 inches
<b>Height</b> - floor to bottom rail of divider	20 inches (1.66 feet)	11 inches
<b>Height</b> – floor to neck rail	42 inches	46 inches
<b>Height</b> – top of curb to floor of stall	1.75 inches	Optional, 0- 3inches
<b>Neck rail</b> - distance from wall at front of stall	32 inches (2.66 feet)	30 inches
<b>Curb</b> – height from alley floor	8.5 inches	8 inches
<b>Curb</b> – width from front to back	7 inches	Optional

Appendices/Attachments (con't):

Table 2. Free Stall Solutions Comparison *						
	<i>Current Situation</i>	<b>Mattress</b>	<b>Sand Bedding</b>	<b>New Stalls</b>	<b>Bed 2x /week (wood shavings)</b>	<b>Curb Height Plastic Lumber</b>
	<i>Bed 1x /week (wood shavings)</i>					
<b>Effectiveness</b>	<i>Okay</i>	Good	Good	Best	Good	Good
<b>Comfort (Scale: 1= low 5=high)</b>	2	4 with shavings 3 without shavings	4	5	3	2
<b>Enviro Impact</b>	<i>Good</i>	None	Good	Good	Good	Good
<b>Labour (Low, Med, High)</b>	<i>Low</i>	Low	Med/High	Low	Med	Low
<b>Cost (includes labour, material, equipment costs)</b>	<i>\$3.00/stall/week</i>	\$130/stall	\$20/stall/year	\$330/stall	\$3.00/stall/week = \$130/stall/year	\$26 /stall/material \$8 /stall/labour =\$34/stall
<b>Other costs</b>	<i>None</i>	Bed cows weekly, optional	\$ new equipment	Mats, and Bed cows weekly	None	Bed cows weekly
<b>Long Term</b>	<i>Weekly</i>	10 years	Bi-Weekly	20+ years	Weekly	10 years

\*Based on a 60 cow dairy farm

(1) (6) **Figure 13.** Tucker and others (Univ. British Columbia) showed lying time and perching time for rubber-filled mattresses with 0, 1, and 7.5 kg of sawdust bedding. The two lowest levels of bedding represent common practice in mattress-bedded barns. Lying time increased and perching time decreased with the addition of bedding to the mattresses.

