The Bovine Perfect Sleeper or Use Of Shredded Rubber Filled Polyester Mattresses to Prevent Injury To Dairy Cattle Housed in Tie Stalls

W. Underwood, *DVM, MS*
D. McClary, *DVM, MS*
J. Kube, *MS*
Lilly Research Laboratories
Greenfield, Indiana, 46140

Abstract

To reduce foot/leg injury and to improve cow comfort in 84 dairy cattle housed in tie stalls for 20 hours per day, woven fiber mattresses, constructed with shredded (1 inch diameter) tire rubber (nonsteel-belted) and a heavy weight industrial fabric, were placed in each tie stall. Approximately 300 pounds of shredded tire rubber were used per mattress at a cost of $0.05/pound, or $15.00/mattress. Three different fabric materials were examined. Type 1 fabric was a 9 oz (per square yard) polypropylene bag with rolled lap seams. Fabric type 2 was a 14.4 oz woven seamless polypropylene, while type 3 was a 20 oz woven seamless polyester/nylon. Type 1 mattress materials cost $33.50/stall, required less time and lumber to construct, but developed holes in the fabric within 1 to 4 months. Type 2 mattresses cost $34.30/stall, required more time and lumber, but had a duration of 3 to 6 months. Type 3 mattresses cost $29.50/stall, required the same time and lumber as type 2, and had a duration of 4 to 10 months. All three mattresses greatly reduced the incidence of leg and udder injuries. Mattress surfaces could be easily cleaned, but required a wood shaving cover to reduce friction on body contact areas and absorb moisture. The total amount of bedding used was greatly reduced. It was concluded that the shredded rubber filled mattresses improve health and comfort in cattle housed in tie stalls and that the heavier-duty, polyester, woven fiber materials appear more suitable for heavy use.

Introduction

Dairy cattle housed in tie stalls commonly experience trauma to the legs, udder and feet from concrete flooring (Fig. 1). Furthermore, firm, uncomfortable stalls tend to discourage cows from lying down, thus increasing stress on feet and legs and reducing milk production. Unfortunately, simply covering the concrete with firm rubber mats does not significantly reduce the incidence of trauma or injury. To reduce the incidence of injury in 84 dairy cattle housed in tie stalls for 20 hours per day, woven fiber mattresses were constructed with shredded tire rubber and a heavy weight industrial fabric. Different fabric types and mattress construction were evaluated for cow comfort, cost and durability.

Figure 1. A typical hock lesion seen in dairy cattle housed in tie stalls without mattresses.

Materials and Methods

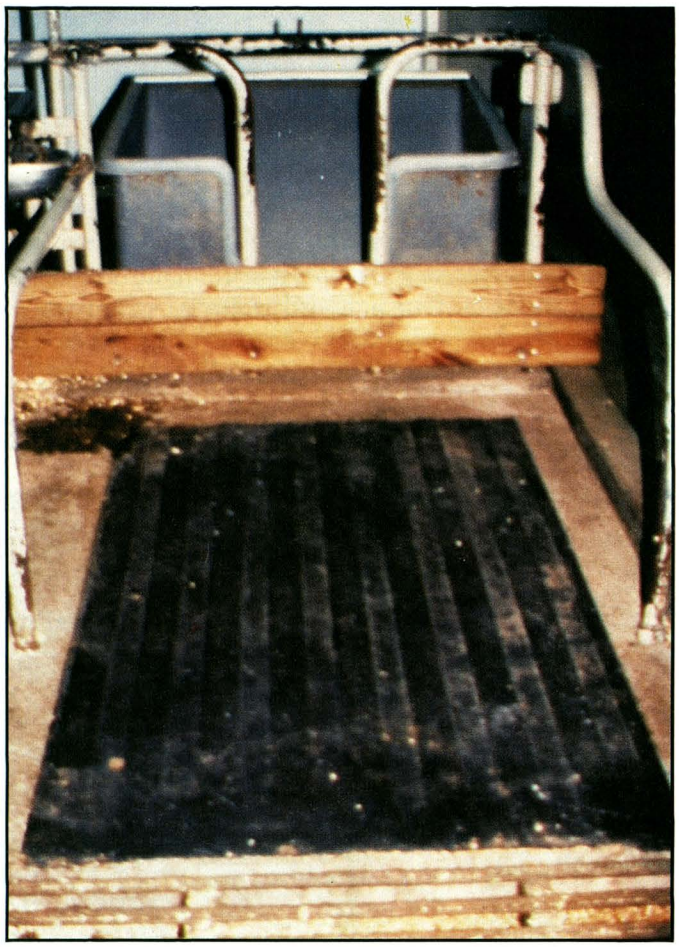
Housing

Eighty-four Holstein dairy cattle were housed in an 88 tie-stall barn for 20 hours per day over a period of 18-22 months. Each tie stall was approximately 4 feet wide by 6 feet long and had a concrete base with a firm rubber mattress covering (Fig. 2).

Rubber

Shredded (1 inch diameter) tire rubber from nonsteel-belted tires was used for mattress filling (Rubber Material Handling Inc., Chicago, Il). The shredded rubber cost $100/ton.

Figure 2. Common dairy cattle tie stall: 4 feet wide by 6 feet long on a concrete base with a firm rubber mattress.



Mattress fabric and construction

Three different fabric materials were examined. Type 1 fabric was a 9 oz (per square yard) polypropylene bag with rolled lap seams (Miller Bag Co., Minneapolis, MN). All bags were 4 feet wide by 7 feet long and cost $21.00/bag. Each bag was filled with approximately 250 pounds shredded rubber and attached to the tie stall by 2 x 4 inch treated lumber with eye hooks and bolts (Fig. 3).

Type 2 fabric was a black 14.4 oz woven seamless polypropylene (TR Polymats, Inc., Mannsville, NY) that cost $4.85/foot and came in rolls 96 inches wide. Type 3 fabric was a red 20 oz woven seamless polyester/nylon combination (North Brook Farms, Weedsport, NY) that cost $3.45/foot and came in 86 inch wide rolls.

Type 2 and 3 mattresses were constructed by anchoring 2 x 4 inch treated lumber (approximately $5-8.00 per stall) into the concrete around the front and sides of each tie stall with concrete screws (Fig. 4A, B, and C). A 4.5 foot wide by 7 to 8 foot long piece of heavy woven fabric, either type 2 or type 3, was attached to the stall surface with a wooden cleat approximately one foot from the back of the tie stall. The stall surface was

Figure 3. Mattress using type 1 fabric: a 9 oz polypropylene bag with rolled lap seams.

then covered with approximately 300 pounds of shredded rubber, and the fabric was folded over the top of the rubber (Fig. 5A, B, and C). The mattress was fastened to the tie stall by screwing 1 x 4 inch treated boards into the 2 x 4 inch lumber along the stall sides (with the fabric sandwiched between the two boards). All mattresses were covered with a small amount of wood shavings to reduce friction on body contact areas and absorb moisture.

Results

Type 1 fabric and materials cost $33.50 per stall and required approximately 0.5 man-hours of labor to install (Table 1). These bags lasted only 1 to 4 months before developing holes from wear. Approximately 250 pounds of shredded rubber were used per mattress at a cost of $0.05/pound or $12.00/mattress.

Figure 4. Construction of type 2 and type 3 mattresses showing: A) placement of 2 x 4 inch treated lumber around the tie stall, B) the shredded rubber fill, and C) securing of each mattress to the tie stall.

Figure 5. Mattress construction diagram: A) anchor wood frame to stall floor with "Tapcon" screws overlapping approximately 18 inches of material, B) fill inside of frame with approximately 300 pounds of shredded rubber and fold material over the top of the shredded rubber, and C) fasten material with wooden cleates screwed into wooden frame below.

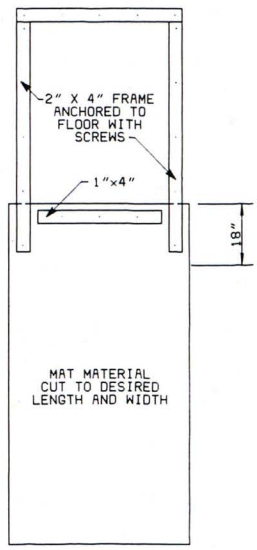


Fig. 5A

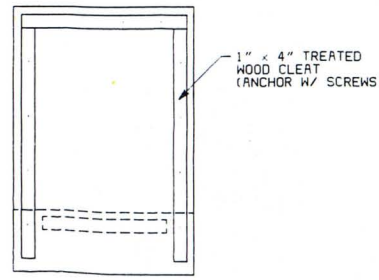


Fig. 5B

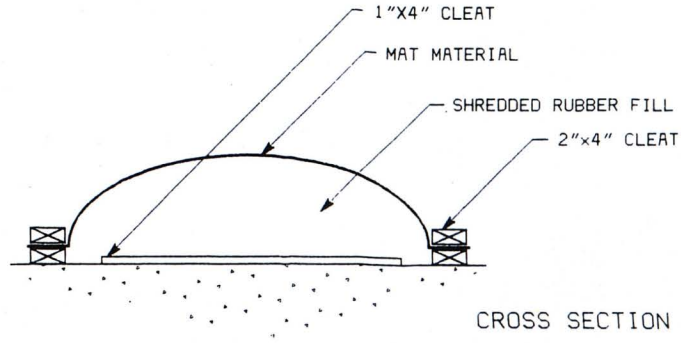


Fig. 5C

Type 2 (14.4 oz polypropylene) fabric and materials cost $34.50 per mattress and required approximately 1.3 man-hours per stall to construct. Mattresses utilizing type 2 fabric lasted 3 to 6 months before developing enough wear to warrant replacement. Approximately 300 pounds of shredded rubber were used at a cost of $15.00/mattress.

Type 3 fabric (20 oz polyester/nylon) and materials cost $29.50 per mattress and also required approximately 1.3 man-hours per stall to construct. These mattresses lasted 4 to 10 months. Approximately 300 pounds of shredded rubber were used at a cost of $15.00/mattress.

The total amount of wood shavings required to bed all cows was greatly reduced. Prior to mattress installation, 20 bales of wood shavings (at $4.40/bale) were used per day for a total cost of $88.00/day to bed 84 cattle. After mattress installation, 3 bales/day of wood shavings were used at a cost of $13.20/day. Thus, mattress installation resulted in a savings of $74.80/day for wood shavings.

The incidence of foot and leg lesions attributable

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Table 1. Mattress type, fabric type, cost, and duration of use.

Mattress Type	Fabric Type	Cost of Materials*	Labor (Man-hours)	Duration
1	9 oz polypropylene	$33.50	0.5 hrs	1-4 mo
2	14.4 oz polypropylene	$34.50	1.3 hrs	3-6 mo
3	20 oz polyester/nylon	$29.50	1.3 hrs	4-10 mo

•Note: Prices do not include cost of lumber (approximately $5-8.00/ stall).

to stall construction declined from 8 cases in the 7 month period before installation to one new case within 6 months after installation and no new cases in the following 6 months. Subjectively, more cows appeared to lay down when not eating (Fig. 6).

Figure 6. Cow comfort greatly increased as evidenced by the number of cows preferring to lie down when not eating or milking.

Discussion and Conclusion

To reduce foot/leg injury and improve cow comfort in 84 dairy cattle housed in tie stalls for 20 hours per day, woven fiber mattresses were constructed for each tie stall using shredded (1 inch diameter) tire rubber (nonsteel-belted) and a heavy weight industrial fabric. Three different fabric materials were examined. Total cost of materials for each mattress depended on the type of materials and method of construction (Table 1). Of the 3 fabric types, the heavier 20 oz polyester/nylon fabric had a longer duration and cost less.

Mattress installation was simple and was not overly time consuming (Table 2). The chopped rubber filling proved to be resilient, soft and clean. The shredded rubber did not cause packing, hollowing or contamination problems commonly found with organic (sawdust, straw) filling. Furthermore, the rubber could be reused. Some bunching of material did occur, but this problem may be resolved by sectioning the material. Although all mattresses required a wood shaving cover to reduce friction and absorb moisture, the total amount of bedding used was substantially reduced (approximately 85% less for a savings of $74.80 per day). Mattress surfaces stayed dry and could be easily cleaned.

Table 2. Advantages and disadvantages of cow mattresses.

ADVANTAGES	DISADVANTAGES
1. Increased cow comfort	1. Cost
2. Decreased injury	2. Time to construct
3. Cleaner udders	3. Cleaning more difficult
4. Reduced bedding usage	4. Mattress repairs/replacement
5. Easy installation	

Cow comfort in dairy cattle housed in tie stalls appeared to increase as a result of using mattresses constructed of a heavy woven fiber fabric and shredded tire rubber. Although cow comfort is difficult to quantify, cows appeared to spend more time lying down when not eating.

Cow health also appeared to improve after installing the mattresses. Existing hock lesions did not worsen when mattresses were installed, and new cases of foot/ leg and udder injury greatly decreased. Since mattresses were easily cleaned and maintained, use of mattresses promoted cleaner udders. It was concluded that the shredded rubber filled mattresses improve cow comfort and health in cattle housed in tie stalls and that the heavier-duty polyester woven fiber materials appear more suitable for heavy use.