

Evaluation Report

626



Vermeer Bale Wrapper

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

VERMEER BALE WRAPPER

MANUFACTURER:

Vermeer Manufacturing Company
P.O. Box 200
Pella, Iowa
50219 USA
Phone: (515) 628-3141

DISTRIBUTOR:

Central Alberta Hay Centre
6874-52nd Avenue
Red Deer, Alberta
T4N 4L1
Phone: (403) 340-1000

RETAIL PRICE: \$4575.00 (March 1990, f.o.b. Portage la Prairie, Manitoba). Plastic wrap 5000 ft (1520 m) \$300 March 1990, f.o.b. Portage la Prairie, Manitoba).

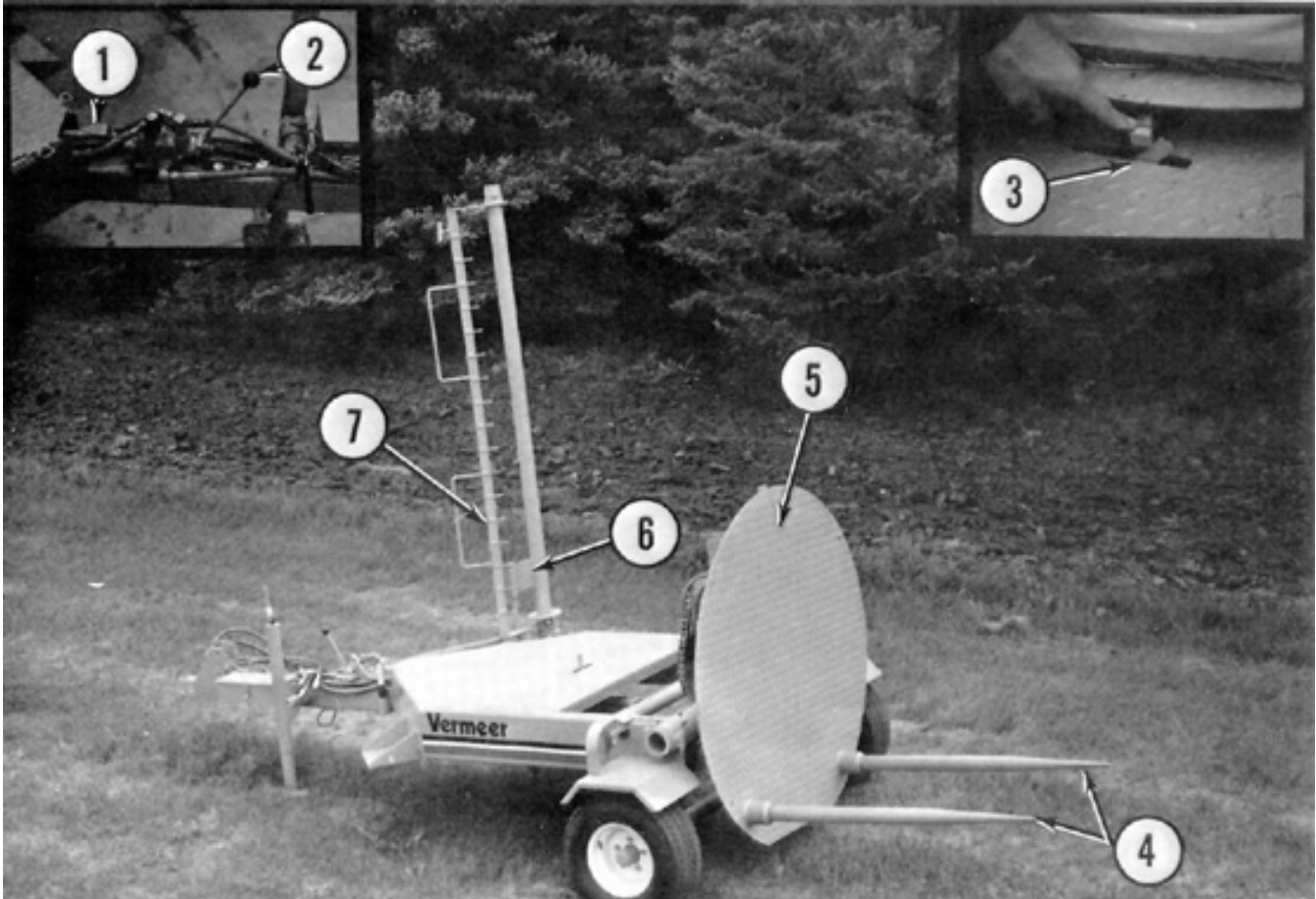


FIGURE 1. Vermeer Bale Wrapper: (1) Bale Position Indicator, (2) Hydraulic Lever, (3) Table Position Trigger, (4) Forks, (5) Table, (6) Brake, (7) Knife.

SUMMARY

Rate of Work: For bales within 100 ft (30 m) of the storage site, work rates of 15 to 18 wrapped bales/hour were realized. Two operators were able to improve this to 20 to 24 bales/hour.

Quality of Work: Quality of work was very good. Performance of the Vermeer depended on how well the bales were formed. Barrel shaped or cone shaped bales caused the plastic to wrap loosely on parts of the bale. The plastic wrap was durable when applied as recommended with two wraps around the bale.

Storability of the bales wrapped by the Vermeer was very good. Bales wrapped at moisture contents below 18% and arranged with a 4 to 6 in (100 to 150 mm) gap between the exposed ends of adjacent bales showed no evidence of hay spoilage.

Ease of Operation: Ease of hitching, plastic wrap installation, wrapping, knife operation, removal of plastic and lubrication was very good. Ease of loading and unloading was good. Ease of adjusting the plastic wrap tension and maneuverability was fair.

Installing the plastic wrap roll was easily done by one person

from the floor of a pickup truck box. Plastic wrap tension was generally controlled by applying pressure with a gloved hand against the plastic roll. A brake that was provided to apply pressure to the roll, proved to be inadequate. Backing into a bale or attempting to align the bales when unloading was difficult due to the trailer wanting to steer itself. Operator experience assisted with this.

No adjustments were required throughout the duration of the test. Daily servicing took one person about 5 minutes.

Power Requirements: A 40 hp (30 kW) tractor equipped with 5 gpm (22.7 L/min) hydraulic capacity and two remote hydraulic outlets was ideally suited to the Vermeer.

Operator Safety: The Vermeer was safe to operate if normal safety precautions were followed.

Operator's Manual: The operator's manual was very good. It contained some useful information on operation and was well written and clearly illustrated.

Mechanical History: No mechanical problems occurred during the test.

RECOMMENDATIONS

It is recommended that the manufacturer consider modifying the brake to improve its ease of operation and performance.

Station Manager: B.H. Allen

Project Engineer: R.R. Hochstein

THE MANUFACTURER STATES THAT

With regard to the recommendation:

At the time the bale wrapper was designed, it seemed logical for us to incorporate the brake and knife into a mechanism that could be actuated by one hand while the other hand was used to meter the wrap speed. The knife action operation is quite clear and leaves little room for operator error. The brake mechanism is somewhat operator sensitive and therefore could possibly be improved to take away some of the guess work. We will investigate this area of the bale wrapper to determine if there is a cost effective method of improving the brake. If a reasonable improvement is feasible, we will implement that new design into the next production run. At the same time, we will try to design an improvement that could be retrofitted into older machines if the customer so desires.

GENERAL DESCRIPTION

The Vermeer Bale Wrapper (FIGURE 1) is a hydraulically driven round bale wrapping system mounted on a two wheel trailer. Two, 3.75 ft (1.14 m) long forks pierce and pick up the bale. The pierced bale is tilted back onto the rotating table. The plastic wrap end is then pulled off the roll and tucked under one or two of the strings. A hydraulic lever at the centre front of the trailer, controls the rotation of the table. The brake is applied to the plastic roll to provide tension on the wrap while the bale is being rotated. The bale is rotated twice to ensure that two layers of plastic surround the circumference of the bale.

The knife, which consists of a row of sharpened steel rods, is pivoted towards the roll to cut the plastic.

The 5.4 ft (1.65 m) wide 0.9 mil plastic contains both a clinging agent and an ultraviolet inhibitor. One 5000 ft (1520 m) roll will wrap about 130 bales. A 4.2 ft (1.27 m) wide plastic wrap is available to wrap smaller bales. Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Vermeer Bale Wrapper was operated for approximately 25 hours while wrapping 350 bales of alfalfa and mixed hay. It was evaluated for rate of work, tractor requirements, quality of work, ease of operation, operator safety and suitability of the operator's manual. Although extended durability testing was not conducted, the mechanical failures which occurred during the test were recorded.

RESULTS AND DISCUSSION

RATE OF WORK

Rate of work was highly dependent upon the proximity of the hay to the storage site. The Vermeer was best suited for wrapping bales which were baled and stored in the same field. Peak work rates of 20 to 24 bales/hour were realized with two operators; one on the tractor and the other operating the wrapper. Work rates realized for one person were only about 15 to 18 bales/hour.

QUALITY OF WORK

Plastic Wrap: The quality of work on the Vermeer was very good. Five foot (1.5 m) wide bales were wrapped with two layers of the 0.9 mil plastic to provide a durable cover. It was necessary to provide pressure to the roll with the brake or with a gloved hand as the bales were wrapped to ensure the plastic fit tightly around the bale. Bale shape variations, such as barrel shaped or cone shaped bales, resulted in a poor fit of the plastic around the bale.

The plastic contained a clinging agent to hold the two layers together. However, it was still necessary to set the bale on the ground such that the end of the wrap was held in place beneath the bale. Otherwise, the plastic eventually separated. The ultraviolet inhibitor provided good weatherability for one year. The manufacturer claimed

that a two year life is probable.

Storability: Storability of the bales wrapped by the Vermeer was very good. However, determination of the hay moisture content of the bale was critical. It was found that wrapping bales below 18% MC provided the best storage. It was best to wait about 5 to 7 days, weather permitting, before wrapping to allow the bales to dissipate any excess moisture. Alternately, the operator may bale at a lower moisture content (15% MC) and wrap the following day. Bales which were wrapped following these moisture content guidelines kept well. Storing the bales by butting them tightly against each other did not allow air to circulate between the bales and some spoilage from moisture accumulation between the bales occurred. Bales were best kept apart about 4 to 6 inches (100 to 150 mm) (FIGURE 2).



FIGURE 2. Round Bales Wrapped with Plastic and Stored in Field.

EASE OF OPERATION

Hitching: Ease of hitching the Vermeer bale wrapper was very good. The hitch jack was helpful to adjust for the height of the tractor drawbar. The hitch jack could be rotated to store horizontally alongside the hitch frame. The hitch clevis accommodated a 0.88 in (22 mm) diameter pin and could be adjusted to suit the tractor drawbar height. This adjustable hitch permitted level bale table operation for tractor drawbar heights from 19 to 31 in (480 to 790 mm).

Plastic Wrap Installation: Ease of installation of the plastic was very good. One man could easily install the plastic in about 5 minutes. The roll was best installed from the floor of a pickup truck box. The roll retainer tube pivoted down to within 12 in (300 mm) of the pickup box floor. The 5.4 ft (1.65 m) plastic roll was then lifted onto the end of the tube by the operator straddling the 121 lb (55 kg) roll and lifting it at the one end. The opposite end was then easily lifted and guided onto the retainer tube. The plastic roll could also be lifted from the ground. However, due to the cumbersome weight of the plastic roll, this had to be done by two people. The 4.2 ft (1.27 m) plastic roll weighed about 95 lb (43 kg).

Wrapping: Ease of wrapping the bales was very good. The Vermeer Bale Wrapper was easy to operate throughout the wrapping cycle. After the bale was picked up, it was rotated such that the side of the bale that had been in contact with the ground was towards the front of the Vermeer. The direction of rotation of the bale depended on which side of the Vermeer the roll of plastic wrap was located. The plastic wrap was then pulled off the roll and tied around the strings of the bale (FIGURE 3). The best results were attained by tucking the upper and lower corners of the end of the plastic wrap under the strings. The remote hydraulic lever was used to rotate the bale in the desired direction. The operator watched for the bottom of the bale to come around a second time at the end of the wrap cycle. The point at which the wrap had been tied at the bottom of the bale provided a good indicator of where to cut the plastic. The bale was then rotated on the table such that the bottom of the bale faced the rear. This provided the greatest thickness of plastic on the ground and secured the plastic so it would not peel off. The position indicator guided this procedure. It was located near the remote hydraulic lever used to operate the bale rotation. One person could complete this entire operation.

Bales transported to the storage site using a bale wagon sometimes resulted in the occasional cut string. In this case, it was difficult to

securely tie the plastic to the bale. A second person was required to hold the wrap against the bale until the second wrap had started. Full tension could then be applied to the wrap with the brake to ensure pressure against the plastic roll.



FIGURE 3. Tying the Plastic End to the Bale Strings.

Plastic Wrap Tension: Ease of applying tension was fair. A metal brake (FIGURE 4) was designed to apply tension to the plastic wrap while it was pulled around the rotating bale. The metal surface of the brake did not provide sufficient resistance against the plastic roll. The operator often resorted to holding a gloved hand against the roll to apply additional tension (FIGURE 4).



FIGURE 4. Applying Tension to Plastic Roll.

The brake was engaged by pulling back on the pivoting knife assembly. When the knife assembly was pulled back away from the plastic it bore against the brake to provide the braking resistance. The operator had to hold the brake in place with one hand until the knife assembly came into contact to insure proper brake orientation, otherwise the brake would occasionally turn around and wedge against the roll. The plastic roll would then stall and rip at the bale. It is recommended

that the manufacturer consider modifying the brake to improve its ease of operation and performance.

Knife: Ease of operation of the knife was very good. The knife performed well throughout the test. The knife consisted of a row of 16 sharp teeth mounted to a pivoting bar. Upon completion of the wrap cycle, the pivoting knife was moved towards the wrapped bale and into the plastic with the one hand, while the opposite hand operated the lever. It was important to keep the bale rotating to ensure a clean cut on the plastic.

Loading and Unloading: Ease of loading and unloading was good. Loading of the bales was done by backing the forks into the bale such that the bale was pierced about 8 to 12 in (200 to 300 mm) above the ground. The bale was then tilted upward to rest its end upon the table. The bale was unloaded by tilting the platform back to set the bale onto the ground and then pulling away from the bale.

Maneuverability: Ease of maneuvering the wrapper to load and unload the bales was fair. When aligning the forks to pierce the bale, and when positioning the bale for storage, the wrapper had to be backed into the bale or towards the storage site. The Vermeer tended to steer itself. With time, the operator became more skilled when maneuvering the wrapper. A front-end loader with forks helped to align the bales into a neat and orderly fashion after the bales were wrapped. Alternatively, the loaded bale could be tilted back such that the previously unloaded bale was visible beyond the loaded bale. The operator could then back into the bale, drive ahead about 4-6 in (100-150 mm), and set the bale down. It was found that the bales stored best when spaced apart to prevent moisture from accumulating between the ends of the bales and causing spoilage.

Removal of Plastic: The ease of removing the plastic from the bale was very good. The operator used a knife to cut the plastic along one side of the bale. The plastic came off in one sheet and was folded together prior to disposal. Removal of the plastic was not tested under snow and ice conditions. There has been concern regarding the safe environmental disposal of plastic products. The used plastic might be suitable for disposal at a recycling depot.

Lubrication: Ease of lubrication was very good. The operator was required to lubricate the Vermeer regularly. Seven grease fittings required grease every 8 hours, while the chain and jack required oiling every 40 hours. Daily servicing took one person about 15 minutes.

Adjustments: The chain drive tightener was the only adjustment found on the Vermeer. The tightener was easily accessible by the operator but adjustment was not required during the test.

POWER REQUIREMENTS

The manufacturer recommended operating the Vermeer with at least a 40 hp (30 kW) tractor equipped with a 5 gpm (22.7 L/min) capacity hydraulic system and remote hydraulic outlets. The Vermeer was operated with several tractors over the test duration.

It was determined that tractors between 40 and 50 hp (30 and 37 kW) were ideally suited to the Vermeer.

OPERATOR SAFETY

The Vermeer was safe to operate when normal safety precautions were practised by the operator. Safety warnings were provided throughout the operator's manual as well as at hazardous locations on the machine. A permanently affixed slow moving vehicle sign was provided.

OPERATOR'S MANUAL

The operator's manual was very good. It was well illustrated, clearly written and contained useful information on operation, maintenance and safety.

MECHANICAL HISTORY

The Vermeer Bale Wrapper was operated for about 25 hours, while wrapping about 350 bales. The intent of the test was an evaluation of functional performance. An extended durability test was not conducted. No durability problems were encountered during the test.

APPENDIX I

SPECIFICATIONS

MAKE: Vermeer

MODEL: Bale Wrap-M

SERIAL NUMBER: 1VRA12157H1000221

Overall Dimension:

- length 11.5 ft (3.50 m)
 - width 6.1 ft (1.86 m)
 - height 8.6 ft (2.62 m)
 - storage height, (forks & plastic holder removed) 3.0 ft (0.91 m)

Weight:

- wheels 1210 lb (550 kg)
 - hitch 230 lb (104 kg)
 Total: 1440 lb (654 kg)

Table Diameter:

4.5 ft (1.37 m)

Forks:

- number Two
 - length 3.7 ft (1.14 m)
 - distance apart 2.5 ft (0.76 m)

Plastic Roll Retainer:

- pin length 5.8 ft (1.78 m)
 - diameter 2.6 in (67 mm)

Hitch:

- pin diameter 0.88 in (22 mm)
 - height (table level) 19 to 31 in (480 to 790 mm)

Position of Remote Hydraulic Lever:

located at front centre,
 35 in (890 mm) from ground

Tires:

Two, 20.5 x 8.0 - 10, 6 ply

Hydraulic Cylinder:

One, dual acting

Hydraulic Motor:

One

Lubrication:

- grease Seven, every 8 hours
 - oil Two, every 40 hours

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

SUMMARY CHART

VERMEER BALE WRAPPER

RETAIL PRICE

\$4575.00 (March 1990, f.o.b. Portage la Prairie, MB)
 Cost of plastic: \$300/5,000 ft (1520 m) roll, sufficient to wrap about 130 bales

RATE OR WORK

20 to 24 bales/hour for two operators

QUALITY OF WORK

Plastic Wrap **Very Good**; generally depended on bale form
 Storability **Very Good**; No spoilage when bales kept apart and wrapped sufficiently

EASE OF OPERATION

Hitching **Very Good**; several hitch positions to suit tractor drawbar height
 Plastic Wrap Installation **Very Good**; easily installed by one person
 Wrapping **Very Good**; depended on bale condition
 Plastic Wrap Tension **Fair**; the brake was difficult to operate, however the operator could alternatively use his hand
 Knife Loading and Unloading **Very Good**; easy to operate
 Good; the wrapper was difficult to maneuver
 Maneuverability **Fair**; wrapper was difficult to align
 Removal of Plastic **Very Good**; cut along one side of bale and plastic can be removed in one sheet
 Lubrication **Very Good**; Seven grease fittings required lubrication every 8 hours
 Adjustments No adjustments were necessary

POWER REQUIREMENTS

Tractor Size 40 hp (30 kW) was sufficient

OPERATOR SAFETY

Safe to operate if normal precautions were observed.

OPERATOR'S MANUAL

Very Good; was clear and concise

MECHANICAL HISTORY

No mechanical problems during test



ALBERTA FARM MACHINERY RESEARCH CENTRE

3000 College Drive South
 Lethbridge, Alberta, Canada T1K 1L6
 Telephone: (403) 329-1212
 FAX: (403) 329-5562
<http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html>

Prairie Agricultural Machinery Institute

Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
 Telephone: (306) 682-2555

Test Stations:
 P.O. Box 1060
 Portage la Prairie, Manitoba, Canada R1N 3C5
 Telephone: (204) 239-5445
 Fax: (204) 239-7124

P.O. Box 1150
 Humboldt, Saskatchewan, Canada S0K 2A0
 Telephone: (306) 682-5033
 Fax: (306) 682-5080