

Evaluation Report

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Forster Model 40 Round Bale Mover

A Co-operative Program Between



FORSTER ROUND BALE MOVER

MANUFACTURER AND DISTRIBUTOR:

Harold Forster Industries Ltd.
Box 1049, 143 East Lake Bird
Airdrie, Alberta
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Telephone: (403) 948-3663

RETAIL PRICE:

\$545000 (March 1986, fob Portage la Prairie, Manitoba) excluding optional bale unrollers.

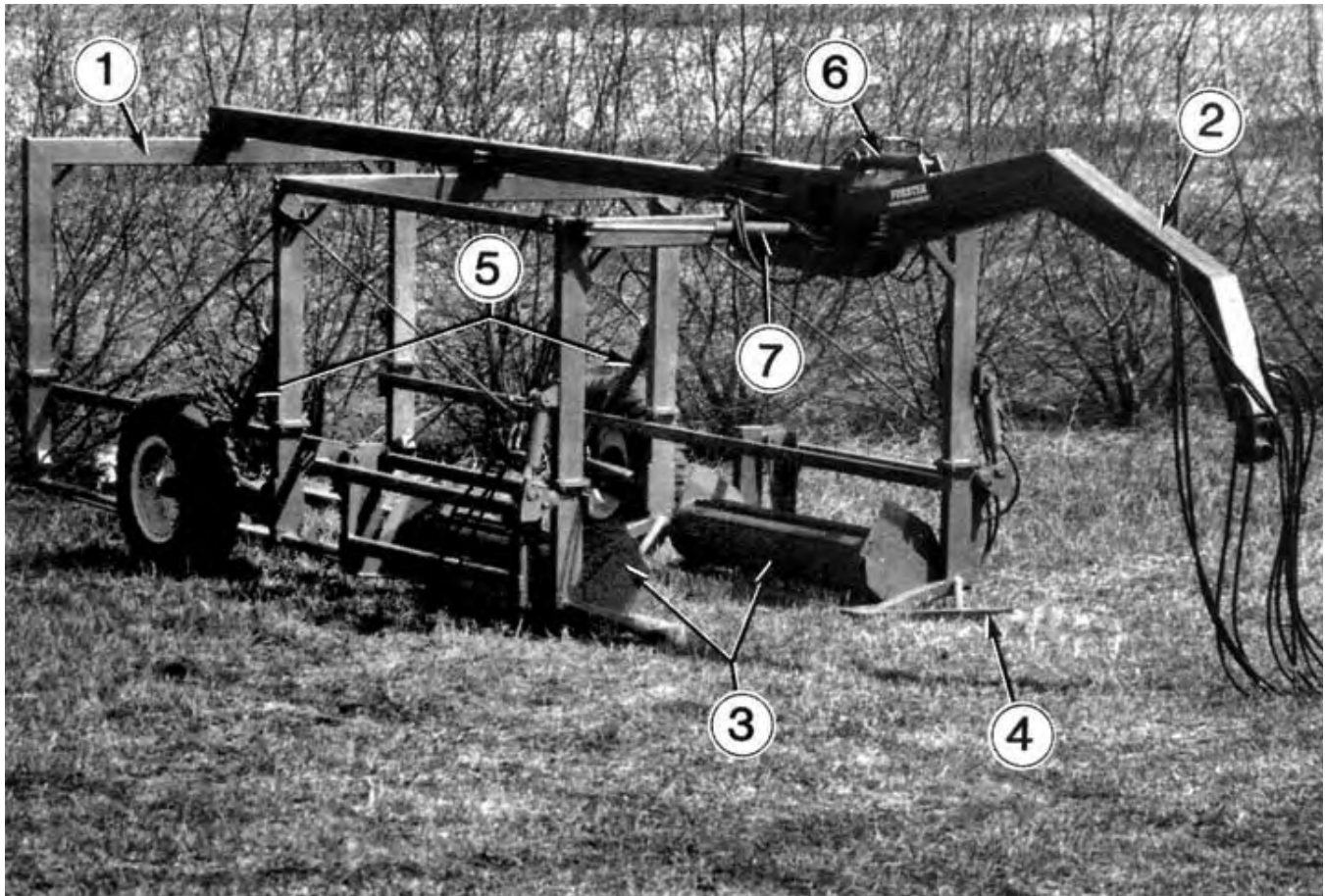


FIGURE 1. Forster Model 40 Bale Mover: (1) Main Frame, (2) Gooseneck Hitch, (3) Optional Bale Unrollers, (4) Pickup and Slide Rails, (5) Wheel Cylinders, (6) Gooseneck Lift Cylinder, (7) Gooseneck Offset Cylinder.

SUMMARY

Quality of Work: The Forster Model 40 picked up, transported and placed round bales with a minimum of damage. Bales that had been sitting in one place and allowed to ovate were sometimes difficult to retrieve without snagging the twine.

Hitching: Hook-up was easily accomplished by one person in about 5 minutes. The self-clutching ball type hitch provided a reliable and safe hook-up.

Bale Retrieval: The Forster Model 40 effectively retrieved bales of various sizes and conditions. Bales that had been in storage and allowed to ovate were sometimes difficult to pickup without snagging the twine.

Transporting: The Forster Model 40 trailed very well, and was stable at highway speeds of 50 mph (80 km/h). Hay loss during transport was insignificant. Maneuvering was very good and typical of most trailers with this type of gooseneck hitch.

Placement: Placement of the bales at the intended storage area was very good and easy to accomplish. Bales were butted tightly together in windrows, and could be unloaded either from the front or the rear of the bale mover.

Power Requirements: The Forster Model 40 is designed to be drawn by either a tractor or light truck. The model tested was set up to be truck drawn. The truck used was a 1982 Ford F 250 4 x 4 and had sufficient power and traction to effectively operate the bale mover. An optional hydraulic power source was added

to the truck and provided ample pressure and flow to operate the various cylinders on the bale mover.

A tractor of 60 hp (45 kW) with a single remote hydraulic circuit would have sufficient power and weight to operate the Forster Model 40.

Operator Safety: The Forster Model 40 was safe to operate if normal safety precautions were followed.

Operator's Manual: No operator's manual was supplied.

Mechanical History: A pin, which holds the hydraulic cylinder to the left wheel fell out and was replaced. Additionally, one of the used military tires blew out and was replaced.

RECOMMENDATIONS

It is recommended that the manufacturer consider

1. Modifications to eliminate interference between bales and the protruding pin at the attachment point of the gooseneck/main frame.
2. Using electrically operated spool valves in place of push pull cables.
3. Supply a permanent slow moving vehicle sign.
4. Supply a complete owners/operators manual.

Senior Engineer: G. M. Omichinski

Project Technologist: R. K. Harris

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A shield has been designed to stop this pin from catching bales.
2. These solenoid valves are now in stock in Airdrie, Alberta.
3. No slow moving sign has been recommended in Alberta when bale handler is pulled behind a pick-up, as they are illegal on vehicles when travelling in excess of 40 mph. Therefore, a permanent slow moving sign will probably not be installed. They should be used, however, when being pulled by a tractor.
4. An operator's manual is being written now and should be ready for the 1986 haying season.

GENERAL DESCRIPTION

The Forster Model 40 round bale mover is a truck or tractor drawn two wheeled trailer designed to retrieve, transport and place round bales. A set of hydraulically operated bale unrollers are offered as optional equipment¹. Additionally, a kit, which provides hydraulic power for a light truck is available from Harold Forster Industries. The Forster Model 40 consists of a main frame and a gooseneck hitch, which is controlled vertically and horizontally by individual hydraulic cylinders. The height of the main frame is controlled by hydraulic cylinders attached to the axles of the wheels. Cable activated spool valves are provided to control the flow of oil to the various cylinders.

Bales are picked up by drawing the main frame over top of the bales and lifting them clear of the ground. The 22.25 ft (6.7 m) slide rails hold 4 or 5 bales, depending on bale width.

FIGURE 1 shows the location of major components. Detailed specifications are found in APPENDIX II.

SCOPE OF TEST

The Forster Model 40 was operated in the crops shown in TABLE 1 for 107 hours, handling approximately 2216 bales. It was evaluated for quality of work, ease of operation and adjustment, rate of work, transportability, operator safety and suitability of the operator's manual. The performance of the optional bale unroller is discussed in Appendix I.

TABLE 1. Operating Conditions

Crop	Hours	Number of Bales
Rye Green Feed	12	180
Alfalfa	39	1036
Brome & Timothy	8	80
Oat Straw	6	70
Barley Straw	27	500
Wheat Straw	15	350
TOTAL	107	2216

RESULTS AND DISCUSSION

Quality of Work: The Forster Model 40 picked up, transported and placed round bales, with a minimum of damage. Bales that had been sitting in one place and allowed to ovate were sometimes difficult to pickup, without snagging the twine. Bales were picked up and relocated in the same orientation to which they were sitting in the field. Bales were placed at the unloading site with the ground-flattened spot down and weathered side up. Bales were not rotated during the pickup stage, as they are with bale movers using hydraulic pickup arms.

Freshly rolled 6 ft (1.8 m) diameter straw bales sometimes snagged twine on the protruding pin of the gooseneck during loading (FIGURE 2). It is recommended that the manufacturer consider modifications to eliminate this problem.

Small diameter bales such as those produced by the Avco New Idea 484 (4 ft/1.2 m diameter) sometimes fell through the loading rails while moving across a rough field. The manufacturer recommended that when handling bales of this size operators use Forster width adjustment sliders (optional).

EASE OF OPERATION AND ADJUSTMENT

Hitching: The Forster was equipped with a self-clutching ball type gooseneck hitch. The Trail King hitch provided a reliable and

safe hook-up. Hook-up was easily accomplished by one person in about 5 minutes. In addition to hooking the bale mover to the truck or tractor, two hydraulic hoses and the three control cables for the spool valves had to be attached.

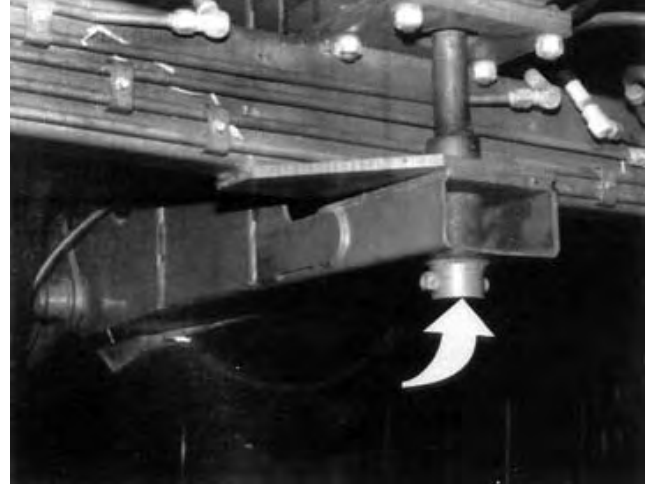


FIGURE 2. Protruding Pin on Gooseneck which Snags Large Bale.

Bale Retrieval: The Forster was prepared for loading by activating the cylinder that controls the offset of the hitch. This forced the main trailer frame to run parallel to the left side of the towing vehicle (FIGURE 3). The front end or pickup of the bale mover was lowered so that the pickup tangs on the slide rails could pass under a bale without snagging the twine. The cylinders that control the height of the wheels were activated and lifted the wheels to allow the slide rails to clear the ground about 6 in (150 mm).

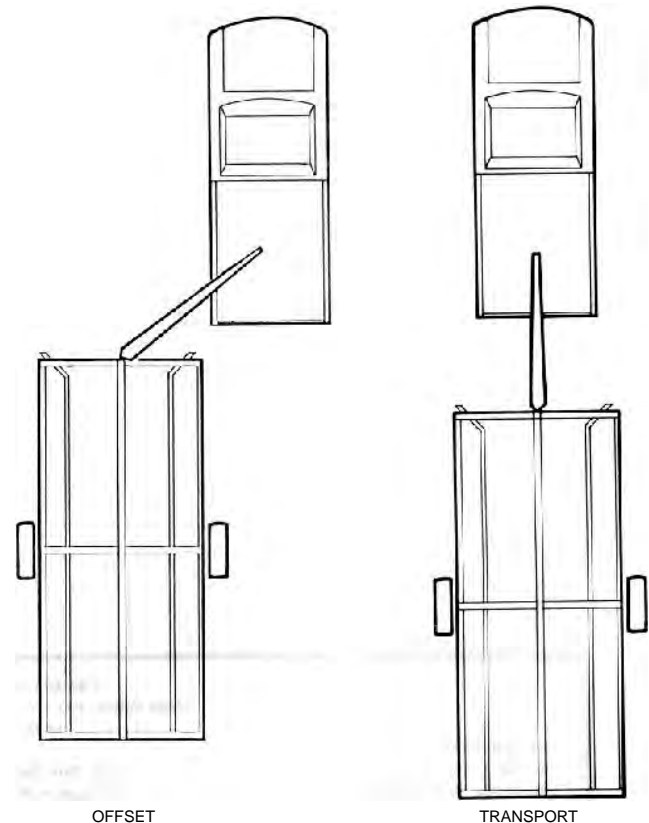


FIGURE 3. Offset and Transport Positions.

The bale was approached with its longitudinal axis being parallel to the towing vehicle and in line with the carriage of the bale mover. The carriage was drawn over the bale until the bale came in contact with the restraining chain at the rear of the bale wagon (FIGURE 4). The wheel cylinders were activated until the bale just cleared the ground. Subsequent bales were loaded until the carriage was full.



FIGURE 4. Bale Restraining Chain.

Bale damage during loading was insignificant for new freshly rolled bales. Sometimes, if the bale was approached with its axis at a slight angle to the pickup tangs, the bale was knocked askew and made a second attempt to pick it up necessary. Operator experience was required before bales could be loaded non-stop.

The Forster Model 40 came with push/pull cables to activate the spool valves that control the flow of oil to the various cylinders. Instructions that came with the bale mover indicated that the placement of these controls was to be beside and below the driver's seat of the truck. When control cables were installed in this location it was found that there was not sufficient room between the truck seat and the door panel and operation of the controls was very difficult.

A system of lever controls was devised and installed in a more convenient location, in front of the truck seat (FIGURE 5). It is recommended that the manufacturer make modifications to the control cables to make them more convenient to operate.

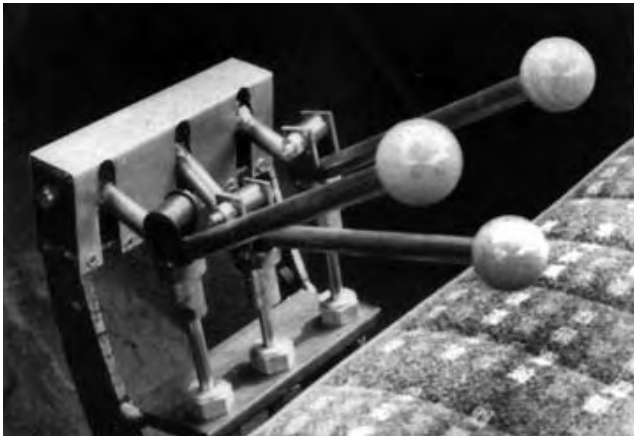


FIGURE 5. Cable Actuating Levers.

Transporting: When the carriage was fully loaded, the cylinder that controls the height of the pickup was activated and raised the pickup well clear of the ground. The cylinders that control the wheel height were also activated until the bale mover was level. The cylinder that controls the offset of the gooseneck was activated and the trailer was brought back in line behind the vehicle. The large 16.00 x 22.5 tires provided good floatation and ride across most fields. The Forster trailed very well and was stable at highway speeds of 50 mph (80 km/h). Hay loss during transport was insignificant. Maneuverability was very good and typical of most trailers with this type of gooseneck hitch.

Placement: The Forster Model 40 could be unloaded from either the front or the rear. To unload from the front, the main frame was first swung to the offset position. The bale load was lowered until the bales contacted the ground. The towing vehicle was backed up until all bales exiting the front of the bale mover were clear. The main frame was then brought back to transport position, directly behind the truck or tractor. To unload from the rear, the restraining chain had to be removed. The main frame was lowered until bales contacted the ground and the vehicle driven ahead until all bales were clear of the bale mover, the restraining chain was then replaced. Most operators preferred the front unloading method,

as they did not have to dismount the cab to remove and replace the restraining chain. Bales were placed in windrows on the ground tightly butted together with approximately 24 in (600 mm) separating their circumferences.

Power Requirements: The truck used in the evaluation of the Forster Model 40 round bale mover was a 1982 Ford F250 4 x 4. Harold Forster Industries supplied a kit which consisted of: 17 gpm (1.29 L/sec) pump, electromagnetic clutch, pump mounting bracket, crank shaft pulley, idler pulley, fan spacer, belts, oil pressure gauge, filter, suction and pressure hoses, reservoir and various hardware (FIGURE 6).

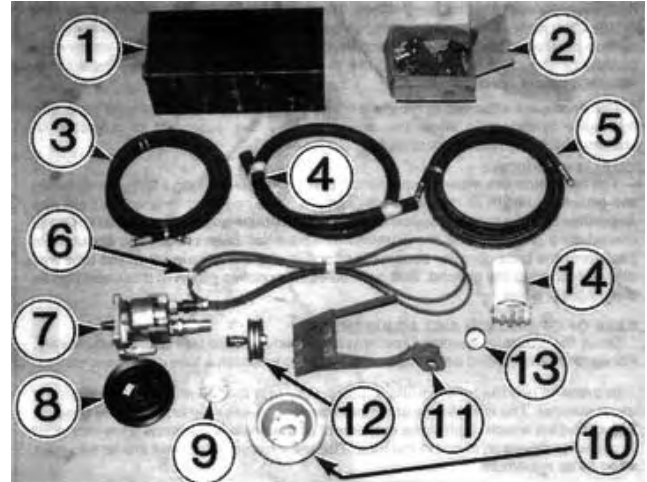


FIGURE 6. Optional Hydraulic Power Source: (1) Reservoir, (2) Assorted Hardware, (3) Pressure Hose, (4) Suction Hose, (5) Return Hose, (6) Drive Belts, (7) Hydraulic Pump, (8) Magnetic Clutch, (9) Fan Spacer, (10) Crankshaft Pulley, (11) Mounting Bracket, (12) Idler, (13) Pressure Gauge, (14) Filter.

Installation of this kit was difficult and time consuming. Pump mounting brackets were not available for the 351 cu. inch engine in the vehicle and modifications and fabrications were necessary. FIGURE 7 shows the general layout of components as they are installed under the hood of the truck.

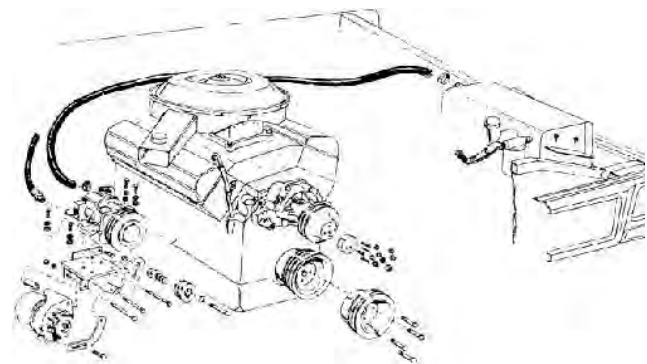


FIGURE 7. Shows General Layout of Components under hood of Truck.

Once installed, the pump gave very good performance and was more than sufficient to operate the various cylinders and motors on the Forster Model 40.

The Ford truck was operated in 4WD while in the field and unloading area and 2WD while on the road. Damp field conditions made 4WD necessary while collecting bales. In dry field conditions, 2WD was adequate. The truck had sufficient power to operate in high gear at highway speeds of 50 mph (80 km/h).

A tractor of 60 hp (45 kW) with a single hydraulic circuit would have sufficient power and weight to operate the Forster Model 40.

Operator Safety: The Forster Model 40 was safe to operate if normal safety precautions were followed. Maintenance should not be carried out with a full or partial load. Visibility to the rear was restricted and the Forster was not supplied with a slow moving vehicle sign. It is recommended that the manufacturer consider supplying a permanently affixed slow moving vehicle sign.

Operator's Manual: The Forster model was not delivered with an operator's manual. However, detailed instructions on the

hydraulic schematics and control cable installation were available upon request. It is recommended that the manufacturer consider supplying a detailed and illustrated operator's manual.

Mechanical History: The intent of the test was evaluation of the functional performance. An extended durability evaluation was not conducted. However, a few mechanical problems occurred during the 107 hrs of operation.

TABLE 2 outlines the mechanical history of the Forster Model 40 during 107 hours of operation.

TABLE 2. Mechanical History

Item	Hours
-Nuts holding tension rods came loose and required frequent tightening at	32, 46, 55, 72, 100
-Pin holding right wheel hydraulic cylinder fell out and was replaced at	51
-Tire blew-out and was replaced at	98

**APPENDIX I
OPTIONAL BALE UNROLLERS**

RETAIL PRICE: \$3600 (March 86 f.o.b. Portage la Prairie, Manitoba.)

GENERAL DESCRIPTION

The bale unrollers available for the Forster model 40 bale mover consist of two hydraulically operated rotating drums. The 6 ft (1.8 m) long drums have a diameter of 12 in (300 mm). The drums are mounted to the main frame directly behind the pickup portion of the slide rails. Each drum is chain driven by a 11.8 cu in/rev (193 cc/rev) orbit motor. The flow of oil to the orbit motors is controlled by a cable actuated detent spool valve.

The drums are attached to the main frame of the bale mover by hinged arms and hydraulic cylinders to allow the drums to be lifted, extended or retracted to accommodate various sizes of bales.

QUALITY OF WORK

The bale unrollers were effective in unrolling bales and laying a fluffy windrow on the ground. Length of the windrows and the time required to unroll a bale was dependent on the forward speed of the towing vehicle and the rotational speed of the rotating drums. Once the diameter of a bale had been reduced to about 12 in (300 mm) the bale unroller became ineffective and the remainder of the bale was allowed to fall to the ground. Soft core bales were not as prone to this condition as were tighter bales.

EASE OF OPERATION AND ADJUSTMENT

Once the operator gained experience, the bales could be unrolled effectively. Forward ground speed determined the distance in which a bale could be unrolled.

In order to use the bale unrollers, bales were first loaded into the Forster in the usual manner. The main frame of the bale mover was lowered to rest on the ground. The cylinders which control the movement of the drum hinge arms were activated to draw the drums in beneath the bale. The main frame of the bale mover was then lifted to its maximum.

The bale twine was cut manually and the orbit motors engaged, while the bale mover moved slowly ahead.

Efficient bale unrolling required practise and experimentation to determine how far apart the drums should be. If the drums were placed too close together, the open area between them was reduced and the hay would bunch up on the side of the bale mover frame (FIGURE 8) rather than fall through the bottom.

Once the operator gained experience the bales could be unrolled effectively.




FIGURE 8. Hay Bunched Up on Frame of Bale Mover.

Operator Safety: The bale unrollers for the Forster Model 40 were safe to use as they were controlled from the cab of the truck or tractor.

MECHANICAL HISTORY

No mechanical problems occurred during the testing.

APPENDIX II SPECIFICATIONS:	
MAKE:	Forster
MODEL:	40
OVERALL DIMENSIONS:	
-- length	33.3 ft (9.4 m)
-- overall width	10.3 ft (3.0 m)
-- length of carriage	20 ft (6.0 m)
-- length of skid rails	22.2 ft (6.7 m)
-- inside vertical clearance	6.1 ft (1.8 m)
-- inside horizontal clearance	6.8 ft (2.0 m)
-- ground clearance	22 in (558 mm)
TIRES:	16.00 x 22.5 - 14 ply
HYDRAULICS:	
-- requirements Minimum	10 gpm, (45 L/m) single circuit
-- controls	Push/Pull cables
-- number of cylinders	4
WEIGHT:	
-- Empty	3400 lb (1545 kg)
-- Gross	15,400 lb (7000 kg)
LOAD CAPACITY:	12,000 lb (5455 kg)
OFFSET ANGLE:	35°
OPTIONS AND ATTACHMENTS:	Bale unrollers, width adjusters, hydraulic power kit

APPENDIX III MACHINE RATINGS	
The following rating scale is used in Machinery Institute Evaluation Reports:	
Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

SUMMARY CHART

FORSTER MODEL 40 ROUND BALE MOVER

RETAIL PRICE	\$5450.00 (March 1986, f.o.b. Portage la Prairie, Man.) Excluding Optional Bale unrollers.
HITCHING	Very Good , took one person 5 minutes
BALE RETRIEVAL	Very Good , dependent on operator experience.
EASE OF OPERATION	Fair , Push/Pull cables were difficult to operate.
RATE OF WORK	Very Good , Bales could be loaded non-stop.
OPERATOR SAFETY	Safe if normal precautions were followed.
OPERATOR'S MANUAL	None supplied.
OPTIONS	Bale unrollers, functional performance was very good. Hydraulic power supply was very good providing ample pressure and flow all applications.



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