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Evaluation Report 18

New Holland Model 850 Round Baler

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

New Holland Model 850 Round Bale

Manufacturer:

Sperry New Holland
A Division of Sperry Rand Corporation
New Holland, Pennsylvania 17557 U.S.A.

Distributors:

Sperry New Holland -- Box 777, Winnipeg, Manitoba
-- Box 1907, Regina, Saskatchewan
-- Box 1616, Calgary, Alberta

Retail Price:

$7,452.00 (May, 1977, f.o.b. Humboldt, with optional electric twine wrapper and bale counter).

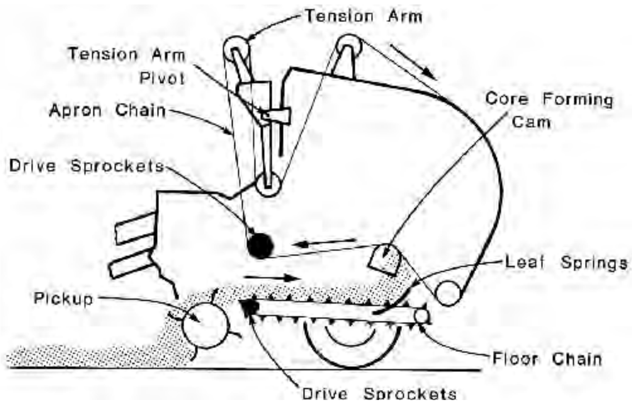

Figure 1. Schematic View of New Holland 850 Round Baler.

Figure 2. Front View of New Holland 850 Round Baler. Identification of Components: (A) Twine Motor, (B) Apron Chain, (C) Tension Arm, (D) Tension Springs, (E) Gate. Cylinder.

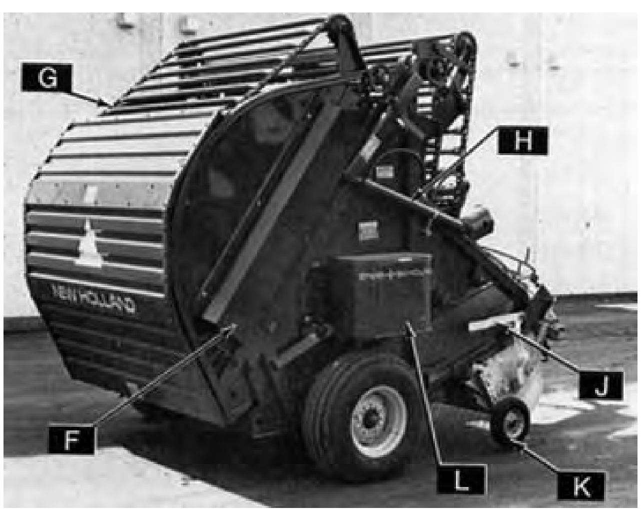

Figure 3. Rear View of New Holland 850 Round Baler. Identification of Components: (F) Tension Springs, (G) Apron Chain, (H) Gate Cylinder, (J) Pickup Transport Lever, (K) Gauge Wheel, (L) Twine Box.

Summary and Conclusions

Overall functional performance of the New Holland 850 round baler was good in most crops. Ease of operation and adjustment both were good. Operation of the twine wrapping mechanism was fair.

Average field speeds varied from 7.5 to 10 km/h (4.6 to 6.2 mph) while average throughputs varied from 5.0 to 12.3 t/h (5.5 to 13.5 ton/h). Ground speed was usually limited by pickup loss and not by baler capacity. Feeding was aggressive in all crops except in very dry straw where back feeding occurred.

Bales were well formed but had a shaggy appearance. The New Holland 850 produced bales with an average length of 1.7 m (68 in) and an average diameter of 1.7 m (68 in). Hay bales weighed from 705 to 865 kg (1530 to 1905 lb) with an average density of 192 kg/m³ (12.0 lb/ft³).

Peak power take-off requirements were about 14 kW (19 hp) in hay and 15 kW (20 hp) in straw.

Leaf loss was comparable to that of other large round balers. In heavy windrows, at optimum moisture content, bale chamber loss was less than 5% while in light, dry alfalfa, average bale chamber loss was 17% and pickup loss was 10%. Heavy windrows, proper conditioning and baling at the maximum permissible moisture and content all were important in reducing bale chamber loss.

The New Holland 850 was safe to operate if the manufacturer's safety recommendations were closely followed.

Recommendations

It is recommended that the manufacturer consider:

1. Modifying the twine tie mechanism to improve its operation.
2. Installing a bale size indicator to improve ease of operation.

Chief Eng[neer -- E. O. Nyborg
Senior Engineer -- L. G. Smith
Project Technologist -- D. H. Kelly

The Manufacturer States That

1. A new twine knife with improved cutting performance is now in production. Twine tension adjustment and the new knife may correct the problem with plastic twine as described on page 6.
2. A bale size indicator is standard equipment on current production.

General Description

The New Holland 850 is a pull-type, power take-off driven baler with a cylindrical baling chamber and a floating drum pickup. The twine wrapping mechanism is manually actuated and an optional electric actuator is available.

Hay is fed directly into the baling chamber by the pickup. The baling chamber consists of eight floor chains on the bottom and one 8640 mm (340 in) long apron chain on the top. The floor chains are fixed while the apron chain is spring loaded to position itself about the bale during formation.

Detailed specifications are given in Appendix I while Figures 1 to 3 show the location of major components.

Scope of Test

The New Holland 850 was operated at 540 rpm with a Case 1070 tractor in the conditions shown in Table 1 for 108 hours while baling about 355 ha (879 ac). It was evaluated for rate of work, quality of work, power consumption, ease of operation, ease of adjustment, operator safety and suitability of the operator's manual.

Results and Discussion

RATE OF WORK

Average throughputs for the New Holland 850 (Table 1) varied from 5.0 t/h (5.5 ton/h) in rye straw to 12.3 t/h (13.5 ton/h) in flax straw that had been cut with a 9100 mm (30 ft) windrower. In heavy, uniform alfalfa, continuous workrates of about 13 t/h (14 ton/h) were possible and a bale could be formed in about three minutes. In addition, it took about one minute to wrap the bale with twine and eject it.

Table 1. Operating Conditions

Crop	Crop Yield Range		Hours	Average Speed		Area Baled		Average Throughput	
	t/ha	ton/ac		km/h	mph	ha	ac	t/h	ton/h
Alfalfa, Bromegrass & Crested Wheatgrass	1.0 - 4.0	0.4 - 1.8	61.0	8.0	5.0	180	446	8.6	9.5
Alfalfa	0.5 - 5.0	1.2 - 2.0	12.0	9.0	5.6	50	123	10.6	11.7
Sweet Clover	3.0 - 4.0	1.3 - 1.7	16.0	7.4	4.6	43	107	9.6	10.6
Wheat Straw	1.0 - 2.0	0.4 - 0.9	17.0	9.0	5.6	70	172	7.2	7.9
Rye Straw	1.5	0.7	1.0	9.0	5.6	3	8	5.0	5.5
Flax Straw	1.3	0.6	1.0	10.0	6.2	9	23	12.3	13.5
Total			108.0			355	879		

In most crops, the maximum workrate was limited by pickup performance and not by bale chamber capacity. Pickup loss usually limited ground speed to a range of 8 to 10 km/h (5 to 6 mph). A heavy windrow was desirable to fully utilize capacity.

Feeding was aggressive in all crops except in extremely dry straw where capacity was reduced by back feeding at the entrance to the bale chamber.

QUALITY OF WORK

Bale Quality: The New Holland 850 produced firm bales (Figure 4) with a shaggy appearance. Bales generally, did not have a uniform diameter throughout their length but had fairly flat ends. Bales averaged 1.7 m (68 in) in length and 1.7 m (68 in) in diameter. Average hay bales weighed from 705 to 865 kg (1530 to 1905 lb) with an average density of 192 kg/m³ (12.0 lb/ft³). Density was uniform throughout the bale.

Figure 4. Typical Bales Formed by the New Holland 850.

Leaf Loss: Total leaf loss for the New Holland 850 varied from less than 5% in ideal windrows to 27% in light dry windrows.

In a field of 4.5 t/ha (2 ton/ac) alfalfa which had been cut with a 5500 mm (18 ft) windrower but which had not been conditioned, bale chamber losses were less than 5%. In this case, the windrow was heavy enough to fully utilize the capacity of the baler.

In another field of 1.2 t/ha (0.5 ton/ac) second cut alfalfa, which has also been cut with a 5500 mm (18 ft) windrower, average pickup loss was 10% while average bale chamber loss was 17%. The hay had not been conditioned and due to drying conditions in late August, the stalks were at a moisture content, which would just permit storage while the leaves were quite dry and brittle.

Bale chamber loss in a round baler depends on how long the bale is in the bale chamber. In the 1.2 t/ha (0.5 ton/ac) alfalfa crop it took about 15 minutes to form a bale while in the 4.5 t/ha (2 ton/ac) crop, a bale could be formed in about three minutes.

Research has shown that to minimize bale chamber losses with a round baler, windrows should be as heavy as possible, the hay should be conditioned to aid stalk curing and moisture content should be at the maximum level which permits safe storage. Feedrate should also be as high as possible to minimize time in the baling chamber. It is often more economical to allow some pickup loss, by driving too fast, as the total loss level will be reduced due to a decreased bale chamber loss. Under ideal conditions, bale chamber loss may be as low as 0.5%. Bale chamber losses in light crops can also be reduced by running the tractor at a lower power take-off speed and in a higher gear to maintain proper ground speed. This results in fewer turns to form a bale. Power take-off speed must however be fast enough for satisfactory pickup performance.

Loss characteristics of small square balers are quite different. For square balers, bale chamber loss varies from about 2 to 5% regardless of windrow size or moisture content. With a large round baler, losses depend on how long a bale stays in the baling chamber since the hay is in constant agitation while the bale is being formed.

POWER CONSUMPTION

Power Take-Off Requirements: Figure 5 shows the power take-off input for the New Holland 850 in alfalfa and in wheat straw. The power input is plotted against bale weight to show the power requirements as a bale is being formed. The power input varied from 3 kW (4 hp) at no load to a maximum of 14 kW (19 hp) in alfalfa and 15 kW (20 hp) in wheat straw.

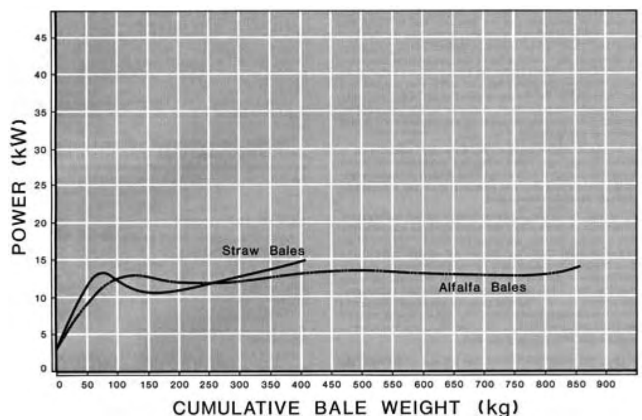

Figure 5. Power Consumption of the New Holland 850 During Bale Formation.

Specific Capacity: Specific capacity is a measure of how efficiently a machine performs a task. A high specific capacity indicates efficient energy use while low specific capacity indicates inefficient operation. The specific capacity of the New Holland 850 was about 0.50 t/kW•h (0.42 ton/hp•h) in alfalfa and 0.39 t/kW•h (0.32 ton/hp•h) in wheat straw. This compares to an average specific capacity of 0.98 to 1.45 t/kW•h (0.8 to 1.2 ton/hp•h) for small square balers in alfalfa. These values represent average operating speeds in average field conditions and not peak outputs.

EASE OF OPERATION

Forming a Bale: Forming a bale with the New Holland 850 was easy with a minimum of operator experience needed. Proper bale formation depended greatly on correct bale core formation. When starting a bale, it was necessary to weave the baler, back and forth, across the windrow so that hay was fed evenly across the width of the baling chamber to form a bale core. Once the bale core was formed, a slight weaving action was needed during bale formation to maintain a uniform diameter.

Bale visibility on the New Holland 850 was very poor and the operator had no indication of bale shape or appearance during formation. This combined with the aggressiveness of the floor and apron chains resulted in a shaggy bale appearance.

Figure 6 shows the position of the apron chairs during bale formation.

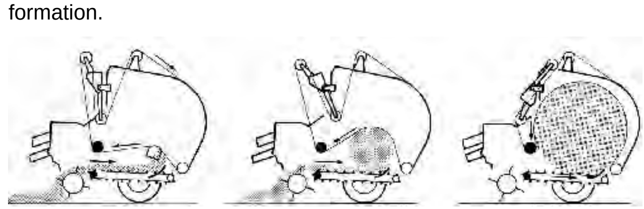

Figure 6. Stages of Bale Formation: (Left) Bale Core, (Centre) Half-Completed Bale, (Right) Completed Bale.

Wrapping the Twine: The New Holland 850 did not have a bale size indicator and the operator had to watch the apron chain tensioning arms to ensure that they did not contact the baler cross member before twine wrapping. Visibility of the tension arms in dusty conditions was poor. If baling was continued after the tension arms contacted the cross member, the power take-off safety pins sheared and the bale had to be ejected without twine, since the baler could not be started with an oversized bale in the chamber. A bale size indicator actuated by the tension arms would eliminate this problem.

Standard equipment on the New Holland 850 is a manually operated twine wrapping mechanism. The test baler was equipped with an optional electric drive for wrapping. The electric drive is operated from the tractor seat through a remote control box.

To start, wrapping, the twine tube is moved to the centre of the bale chamber. Once the twine has been caught by the hay entering the bale chamber, the electric control is actuated to move the twine tube to the extreme right of the bale chamber and the tractor forward movement is stopped but the power take-off is allowed to run. When the twine has made at least a full wrap around the right end of the bale, the control box is activated to move the twine tube across the front of the bale chamber. The control switch must be repetitively turned on and off to get the correct spacing of consecutive wraps around the bale.

Once the twine tube reaches the left end of the bale, the control switch in momentarily released so there is at least one complete twine wrap around the left end. The switch is then actuated to move the twine further to the left to be cut by the twine knife.

It was difficult to start the twine feeding into the bale chamber with plastic twine. This problem was greatly reduced by manually lengthening the amount of free twine exposed at the end of the twine tube. Repositioning the twine cutter so that a greater length of free twine is exposed appears necessary when using slippery synthetic twines. Incorporating an adjustable speed control on the electric drive is also desirable to effectively control the twine spacing.

The twine consumption for the New Holland 850 was about 49 m/t (150 ft/ton). This compares to a twine consumption of about 225 m/t (670 ft/ton) for small square balers.

Discharging a Bale: Once the twine is cut, the power take-off is shut off and the tractor and baler are backed up about 6 m (20 ft). The rear gate is hydraulically opened and the power take-off is engaged, with the tractor at idle, to eject the bale. The tractor and baler are then moved ahead about 4.5 m (15 ft) and the rear gate closed. A slight pressure is required on the gate hydraulic cylinders to ensure that the gate is fully closed. About one minute was needed to wrap and discharge a bale.

Transporting: The New Holland 850 was easy to maneuver and transport. Ground clearance was adequate and there was ample hitch clearance for turning sharp corners. The baler could easily be towed behind a tractor or a small truck.

Hitching: The New Holland 850 was easy to hitch to a tractor. If the optional electric twine drive was used, the control box also had to be mounted and connected to the tractor battery. The electric drive could be used on any positive or negative ground 12 volt electrical system.

Feeding: Feeding was positive and aggressive in nearly all crops with only infrequent plugging. Back feeding problems occurred in extremely dry straw. Instead of forming a bale core, very dry, brittle straw sometimes fed back out the front of the bale chamber and built up until the apron chain stopped. The rear gate had to be opened and the straw pulled out of the baler by hand to resume baling. This problem occurred infrequently during the test and only in extremely dry, brittle straw.

Twine Threading: Twine threading was quite easy. Twine could be threaded without the use of a wire or additional aids.

The twine cutter performed well but repositioning the cutter, so that a longer length of free twine is left exposed after cutting, is desirable. No adjustment was needed during the test.

EASE OF ADJUSTMENT

Apron Chain: Apron chain tension was provided by a set of adjustable springs on each side of the baler. Chain tension during bale core information was maintained with an adjustable breakaway latch. No adjustment to the apron tension springs was needed during the test however the breakaway latches had to be adjusted once.

The apron chain drive sprocket shaft was belt driven. The drive belt had a spring loaded tightener which needed no adjustment.

Floor Chains: Each of the eight floor chains had an independent tightener, which needed occasional adjustment during the test period. The floor chain drive needed no adjustment during the test.

Pickup: Pickup flotation was provided by a pickup gauge wheel, which was assisted by an adjustable flotation spring. The gauge wheel was adjusted to give about 25 mm (1 in) clearance between the ground and the pickup teeth while the flotation spring was adjusted to carry as much weight as possible without excessive pickup bounce. The maximum pickup drop was adjusted by a chain, which limited flotation spring movement. Once proper settings were determined no further adjustments were needed.

The height of the pickup compression bars above the pickup was adjustable, as well as the maximum flotation limit. Once proper settings were determined no adjustments were needed.

The pickup tine pattern was circular and no adjustment of tine pattern was possible.

Servicing: The New Holland had 11 chains, 31 grease fittings and one gearbox. The operator's manual recommended chain oiling every five hours, lubrication of most grease fittings every 10 hours and checking gear box oil and repacking the wheel bearings every season. About 15 minutes were needed to service the New Holland 850.

OPERATOR SAFETY

The New Holland 850 was safe to operate and service as long as common sense was used and the manufacturer's safety recommendations were followed. Rotating parts were well shielded.

The New Holland 850 had rear gate cylinder locks to permit safe servicing while the rear gate was open.

GENERAL SAFETY COMMENT

The operator is cautioned that a round baler is potentially very dangerous. The operator must disengage the power take-off and stop the tractor engine to clear blockages or to make adjustments. Many serious and fatal accidents have occurred with round balers. Most of these are caused by operators dismounting from the tractor while leaving the baler running. The manufacturer can only go to certain limits in providing shielding and safety devices and must rely on the operator's common sense in following established safety procedures.

OPERATOR'S MANUAL

The operator's manual was clear, well written and contained much useful information on operation, servicing, adjustments and safety procedures.

Durability Results

Table 2 outlines the mechanical history of the New Holland 850 during 108 hours of field operation while baling about 355 ha (879 ac). The intent of the test was functional evaluation. The following failures represent only those, which occurred during functional testing. An extended durability evaluation was not conducted.

Table 2. Mechanical History

Item	Hours
-The apron chain broke and was repaired at	14 and 28
-The floor chain drive sprocket broke and was replaced at	74

Discussion of Mechanical Problems

Apron Chain: The apron chain broke twice during the test. On both occasions failure occurred when rocks were fed into the baling chamber by the pickup. The operator's manual provided the necessary information for proper chain repair.

Floor Chain Drive Sprocket: The floor chain main drive sprocket broke after 74 hours. No cause was determined for the failure.

APPENDIX I
SPECIFICATIONS

Make:	New Holland Model 850 Round Baler
Serial Number:	390420
Overall Dimensions:	
-- Ground clearance	200 mm (7.9 in)
-- Width	2600 mm (102.4 in)
-- Height	2410 mm (94.9 in)
-- Length	3960 mm (155.9 in)
Tires:	2, 11L x 14 Farm Service
Weight (with drawbar in field position and two balls of twine):	
-- Left wheel	754 kg (1662 lb)
-- Right wheel	702 kg (1548 lb)
-- Hitch point	272 kg (600 lb)
Total weight	1728 kg (3810 lb)
Bale Chamber:	
-- Width	1690 mm (66.5 in)
-- Maximum diameter	1950 mm (76.8 in)
-- Floor chains	
-number of chains	8
-type of chain	Roller chain No. CA550 with No. RC53 links
-chain speed	2.1 m/s (83 in/s)
-- Apron chain	
-type of chain	Roller chain No. CA550 with No. CA555 bars
-chain length	8460 mm (340 in)
-chain speed	1.98 m/s (78 in/s)
-- Bale chamber tension method	Spring
-- Bale size indicator	None
Pickup:	
-- Type	Fully floating, cylindrical drum with gauge wheel and spring teeth
-- Height adjustment	Gauge wheel bracket
-- Width	1.83 m (72 in)
-- Number of tooth bars	4
-- Tooth spacing	77 mm (2.8 in)
-- Speed	100 rpm
-- Tooth pattern	Circular
Twine System:	
-- Capacity	2 balls
-- Recommended twine thickness	None
-- Twine feed and cutter	Standard equipment - manual Optional equipment - electric
Safety Devices:	Power take-off shear pins, rear gate locks, hydraulic relief valve on rear gate
Servicing:	
-- Grease fittings	31, every 10 hours
-- Gear box	1, seasonal
-- Chains	11, every 5 hours
-- Wheel bearings	2, yearly
Optional Equipment:	bale counter electric twine tie

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

(a) excellent	(b) very good
(c) good	(d) fair
(e) poor	(f) unsatisfactory.

APPENDIX III
METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversion may be used:

1 hectare (ha)	= 2.47 acres (ac)
1 kilometre/hour (km/h)	= 0.62 miles/hour (mph)
1 tonne (t) = 2204.6 pounds (lb)	= 1.10 ton (ton)
1 tonne/hour (t/h)	= 1.10 ton/hour (ton/h)
1 tonne/hectare (t/ha)	= 0.45 ton/acre (ton/ac)
1000 millimetres (mm) = 1 metre (m)	= 39.37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.20 pounds (lb)
1 tonne/kilowatt hour (t/kW•h)	= 0.82 tons/horsepower hour (ton/hp•h)

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