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Evaluation Report 554

New Idea 486 Round Baler

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

NEW IDEA 486 ROUND BALER

MANUFACTURER:

White-New Idea Farm Equipment Co.
123 West Sycamore St.
Coldwater, Ohio
45828

DISTRIBUTOR:

White-New Idea Farm Equipment Co.
Box 677
2201 1st Ave,
Regina, Sask.
S4P 3A3
(306) 352-2613

RETAIL PRICE: $17,779.00 (March, 1988, f.o.b. Portage la Prairie, Manitoba) with electric tie and optional trip gate and crop retainer.

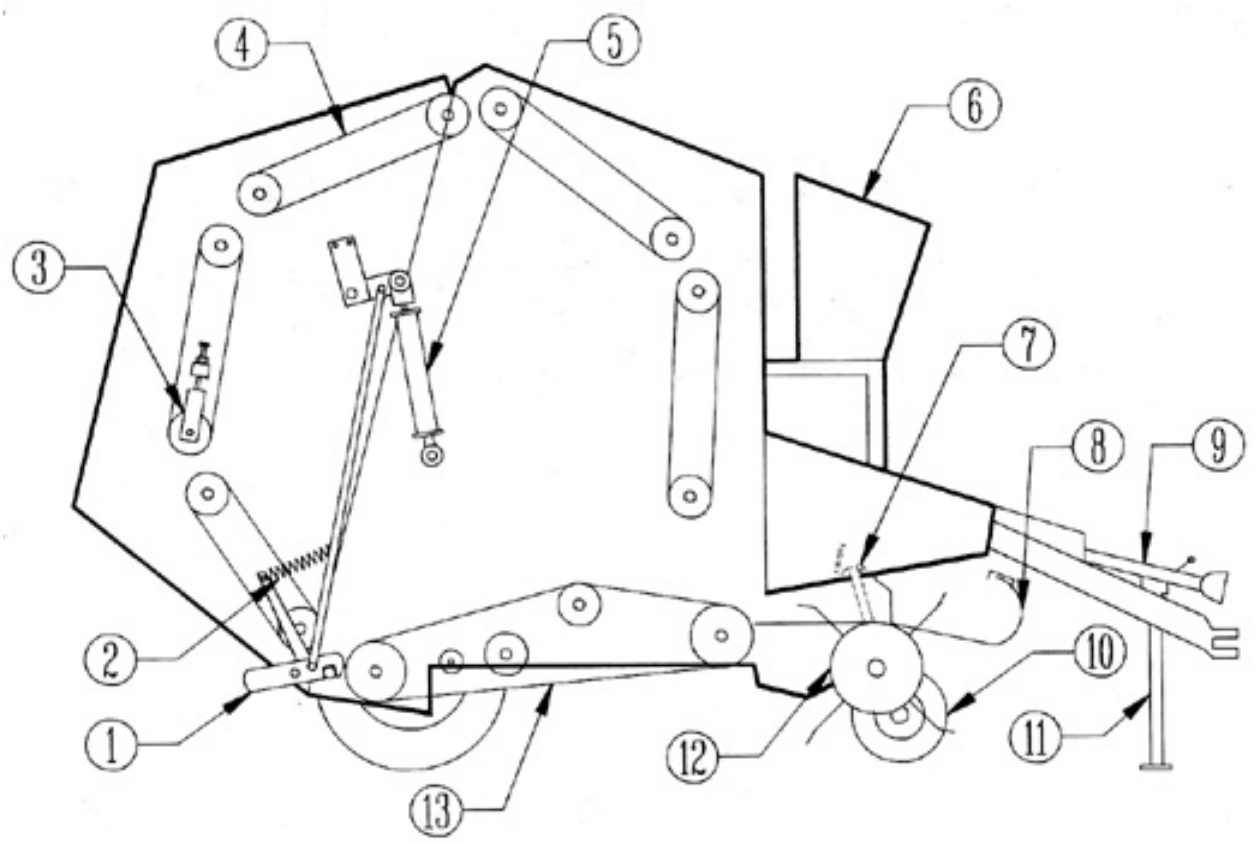

FIGURE 1. New Idea 486 Round Baler: (1) Tailgate Latch, (2) Bale Density Spring, (3) Belt Tension Adjusting Block, (4) Forming Belt, (5) Hydraulic Gate Cylinder, (6) Twine Box, (7) Pickup Transport Arm, (8) Windguard, (9) PTO Drive Shaft, (10) Gauge Wheel, (11) Jack, (12) Pickup, (13) Platform Belt.

SUMMARY

Rate of Work: Typical throughput of the New Idea 486 was 4.5 ton/h (4.1 t/h) in wheat straw and 8.6 ton/h (7.8 t/h) in alfalfa. Throughput was limited by pickup and feeding performance rather than by bale chamber capacity.

Bale Quality: Bale quality was very good, with well formed and durable bales in most crops. Bale quality in very short straw was fair due to poor bale durability. Hay bales weighed from 1200 to 1500 lb (550 to 680 kg) and straw bales from 800 to 1000 lb (360 to 450 kg).

Resistance to moisture penetration and spoilage was very good after 100 days of weathering. Total leaf and stem loss was 3.2% in alfalfa at a moisture content of 13%. This was considered very good.

Ease of Operation: Bale forming, bale wrapping, bale discharging, transporting, twine threading, and hitching were all rated very good. Feeding was rated as good. Starting and forming a bale was very easy in most crops. Reduced ground speed in heavy, damp hay was required to prevent occasional plugging of the pickup.

The electric twine wrapping system required little operator experience to tie a good bale. The control box in the tractor cab alerted the operator when to begin the wrapping procedure. The optional trip gate made backing unnecessary to clear the bate from under the gate. A bale could be wrapped and discharged in about 40 to 50 seconds.

Feeding was positive and aggressive in most crops, but plugging occurred occasionally in damp or tough hay and straw. Overloading the bale chamber caused the driveline shear pin to break, while overloading the pickup caused the drive belt to slip.

The New Idea 486 was easy to maneuver and transport. Visibility to the rear was restricted.

Ease of Adjustment: Ease of adjusting the wrap setting was excellent. Ease of adjusting the drive chain and forming belt tension was very good, and ease of lubricating was good.

Power Requirements: Peak power requirements were about 74 hp (55 kW) in hay and straw in level fields. A 90 hp (67 kW) tractor was needed to fully utilize baler capacity on soft and hilly land.

Operator Safety: Operator safety on the New Idea 486 was very good if normal safety precautions were observed.

Operator's Manual: The operator's manual was very good. It was well written and clearly illustrated.

Mechanical Problems: Several shear pins broke and were eventually replaced with a higher grade bolt early in testing. The twine cut-off mechanisms malfunctioned from the start of testing and were replaced after 66 hours. Two forming belts turned inside out and the full bale switch malfunctioned and was replaced.

RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Strengthening the driveline shear bolt to reduce failure under normal baling conditions.
2. Modifying the door fasteners on the safety shields to improve their convenience.

Station Manager: G.M. Omichinski

Project Engineer: D.J. May

THE MANUFACTURER STATES THAT:

With regard to recommendations (1 & 2)

1. Shearing of the Grade 5 driveline shearbolt is acknowledged. The recommended use of Grade 8 shearbolt will be considered.
2. The inconvenience in turning the safety shield fasteners is recognized. Modifications for future production is under review.

GENERAL DESCRIPTION

The New Idea 486 is a pull-type, PTO driven baler with a cylindrical baling chamber and a floating drum pickup. The twine wrapping mechanism is electrically actuated.

Material is fed into the 5.0 ft (1.5 m) wide, 6.0 ft (1.8 m) diameter baling chamber by the pickup. The baling chamber is a fixed chamber type with five, 11 in (280 mm) wide platform belts and five sets of forming belts making up the circumference of the baler. Each set of belts is made up of five, 11 in (280 mm) wide belts. All belts rotate in a fixed location.

The New Idea 486 is an improved design of the Avco New Idea 486 tested by PAMI in 1982 (Report No. 299). Following is a list provided by the manufacturer of changes made to the baler since 1982:

-- wider, rougher textured, endless forming belts.

-- belt take-up range is extended for the platform belt set.

-- belt dividers are larger and are hardened.

-- a double twining system replaces the single twine wrap.

-- electric tie and hydraulic tie are factory installed options.

-- adjustable twine stops control the twine placement on the ends of the bale.

-- full bale switch and twine tensioning parts are modified.

-- pickup is redesigned to improve reliability.

-- two pickup gauge wheels are modified and are standard equipment.

-- windguard assembly is modified to improve feeding.

-- constant velocity driveline eliminates need for an equal angle hitch extension.

-- hex idler bearings are used to improve bearing mounting and reliability.

-- roller drive shafts were increased from 1.75 to 2 in (44 to 51 mm) diameter and the spline fits are now tighter.

-- wheel spindles are now heat treated.

-- floatation tires are available as an option.

-- an optional trip gate bundle eliminates the need for backing up the baler before ejecting the bale.

-- a crop retainer assembly is available as an option to prevent material backfeeding into the pickup area in finely chopped straw.

-- a mechanical bale counter is standard equipment.

The test baler was provided with optional floatation tires, trip gate, and crop retainer. Detailed specifications are given in APPENDIX I, while FIGURE 1 shows the locations of major components.

SCOPE OF TEST

The New Idea 486 round baler was operated in a variety of crops (TABLE 1) for 171 hours while producing 2122 bales. It was evaluated for rate of work, quality of work, power requirements, ease of operation, ease of adjustment, operator safety, and suitability of the operator's manual. In addition, the baler was monitored for mechanical problems throughout the evaluation.

TABLE 1. Operating Conditions

CROP	OPERATING HOURS	NUMBER OF BALES	EQUIVALENT FIELD AREA ac	(ha)
Alfalfa	103	1349	515	(208)
Alfalfa-Bromegrass	6	60	45	(18)
Alfalfa-Timothy	6	71	17	(7)
Mixed Grass	18	216	170	(69)
Wheat Straw	25	285	125	(51)
Barley Straw	4	45	30	(12)
Mixed Grain Straw	9	96	55	(22)
TOTAL:	171	2122	957	(387)

RESULTS AND DISCUSSION

RATE OF WORK

Throughput depended on windrow size, uniformity and crop conditions, field surface, available tractor speeds and operator skill. Typical throughput for the New Idea 486 (TABLE 2) was 4.5 ton/h (4.1 t/h) in wheat straw and 8.6 ton/h (7.8 t/h) in alfalfa. The values in Table 2 are all based on average workrates for daily field operation. Peak workrates during any one day were generally 10 to 20% higher.

In most crops, the feedrate was primarily limited by windrow size and pickup/feeding performance. In lighter crops, the ground speed was normally limited to about 8 mph (13 km/h) due to bouncing on rough ground and pickup performance. Heavy windrows were desirable to fully utilize baler capacity.

TABLE 2. Typical Throughputs

CROP	CROP YIELD ton/ac	(t/ha)	DAILY AVERAGE THROUGHPUT ton/h	(t/h)
Alfalfa	1.8	(4.0)	8.6	(7.8)
Alfalfa-Timothy	2.9	(6.5)	9.0	(8.2)
Mixed Grass	0.9	(2.0)	7.8	(7.1)
Wheat Straw	1.1	(2.5)	4.5	(4.1)
Mixed Grain Straw	0.8	(1.8)	4.8	(4.4)

QUALITY OF WORK

Bale Quality: The New Idea 486 produced firm, durable bales with flat ends and uniform diameter in all hay crops (FIGURE 2). Handling the bales when transporting did not present a problem. The overall bale quality depended greatly on the operator's experience. Failure of the operator to evenly feed both sides of the baler in light windrows resulted in barrel or cone-shaped bales.

Similar to most round balers, it was difficult to consistently produce uniform durable bales in dry, short, chopped-up straw similar to that combined with rotary combines. In short straw condihons, bale quality was greatly improved if the straw was baled when slightly tough.

A typical hay bale averaged 5.0 ft (1.5 m) in width and 6.0 ft (1.8 m) in diameter. Bales usually settled to about 92% of their original height after 100 days. Average hay bales weighed from 1200 to 1500 lb (550 to 680 kg) with average densities ranging from 85 to 10.3 lb/ft^3 (138 to 167 kg/m^3). Average straw bales weighed from 800 to 1000 lb (360 to 450 kg) with average densities ranging from 5,7 to 7.1 lb/ft^3 (92 to 115 kg/m^3)

FIGURE 2. Typical Hay Bale.

Bale Weathering: During a period of 100 days, over which a total rainfall was measured at 10.7 in (270 mm), moisture had penetrated to a maximum of 2 in (50 mm) in the area where the bale touched the ground. Spoilage occurred to a depth of 1.0 in (25 mm) on topof the bale which was considered very good.

Leaf Loss: The New Idea 486 was tested for leaf and stem loss in a heavy crop of alfalfa, which had been cut with an 18 ft (5.5 m) swather. Average crop yield was about 2.9 tons/ac (6.5 t/ha). Total leaf and stem loss was 3.2% at 13% moisture content which was considered very good.

The importance of baling at a high moisture content on losses can be noted in FIGURE 3. This figure represents an accumulation of previous data for several round balers showing the total measured leaf and stem loss over a range of moisture contents, in fields of mixed alfalfa -- crested wheatgrass and bromegrass. Although the New Idea 486 was tested in a different crop, its performance was better than that presented in the figure, i.e. losses were lower.

FIGURE 3 does not include relative effects of baling unconditioned or light windrows. Heavy, conditioned windrows were important to minimizing losses.

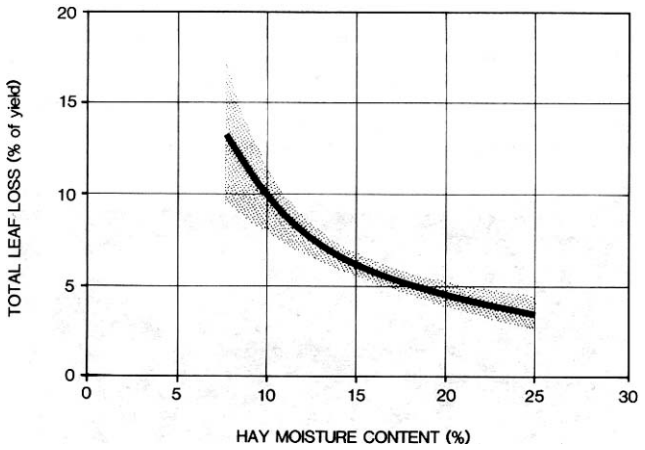

FIGURE 3. Typical Round Baler Leaf Loss in Mixed Alfalfa, Crested Wheatgrass and Bromegrass.

EASE OF OPERATION

Bale Forming: Ease of bale forming was very good in most crops encountered. Feeding hay across the entire width of the bale chamber by weaving during bale core formations was not critical as the hay tumbled within the bale chamber, distributing itself quite evenly across the chamber. Some weaving during core formation did help the hay distribute across the chamber more easily.

Alternate side to side feeding to a count of at least 10 at each side was required during the later stages of the bale formation to produce bales of uniform diameter. Lack of visibility inside the bale chamber made it difficult for the operator to judge whether he was overfeeding one side or the other. This could result in barrel or cone-shaped bales.

Bale density was controlled by a spring loaded mechanical latch on either side of the tailgate. The springs could be tightened for greater bale density or loosened for lower density.

The best outside bale wrap was achieved by gearing down the tractor when the bale chamber was nearly full. The hay was thus fed in more slowly, allowing more time for the hay to be compressed before eventual tying of the bale. This resulted in a higher density wrapped bale to better resist weathering elements. There was no indicator to tell the operator when the bale chamber was nearly full and to begin gearing down. However, on most tractors the engine could be heard loading down as the outer edge of the bale was being formed. At this point, gearing down provided optimum bale wrap.

Bale Wrapping: Ease of bale wrapping on the New Idea 486 was very good. A red light flashed and a horn sounded on the control box in the cab of the tractor when the bale was completed and ready for twine wrapping. In heavy baling conditions, feeding generally had to be stopped within 15 to 20 seconds after the horn sounded to prevent overfilling and failure of the main drive shear bolt.

The drive line shear pins supplied by the manufacturer frequently broke just before or just as the horn sounded when the density control spring was adjusted according to the manufacturer's specifications. After a large number of shear pins were broken, the next highest grade of bolt was installed. These bolts broke only in extreme conditions. It is recommended that the manufacturer consider strengthening the driveline shear pin to reduce failure under normal baling conditions.

The test baler was equipped with the standard electric actuator and control box. To start wrapping, the twine tubes were moved to the centre of the bale chamber. Once the twine had been caught by the rolling bale, the forward motion of the tractor was stopped. After a sufficient number of wraps had been placed on the centre of the bale the toggle switch on the control box was moved to the "out" position and held. This intermittently moved the twine tubes towards the outside of the bale. Generally about three to four wraps of twine were left at the outer edges of the bale. A thumbscrew on the control box controlled the rate of movement of the twine tubes toward the outside of the baler. When the twine tubes reached the extreme outside of the bale chamber the twine was pinched and cut off.

The original twine cut-off mechanisms supplied with the baler failed to adequately pinch and hold the twine as it was cut off. Then upon tying the next bale there was insufficient twine left to be pulled into the bale chamber by the incoming hay. It was then necessary to stop the baler and manually thread the twine tube and pull out a sufficient length of twine to be fed into the bale chamber.

After 737 bales were produced the twine cut-off mechanisms were replaced with new ones supplied by the manufacturer. This resulted in much better tying by the test baler. After this repair, a mis-tie would only occur approximately once every 50 bales for various reasons.

Twine consumption ranged from about 330 to 1140 ft/ton (100 to 330 m/t). Most operators preferred a wrap cycle which consumed about 570 ft/ton (191 m/t). Typical twine consumption for small balers is about 670 ft/ton (225 m/t). In short straw more twine was required to provide bales of adequate durability. Also if the wraps of twine on the ends of the straw bale were less than about 8 in (200 mm) from the end, the twine would usually slip off the ends during wrapping or when the bale was discharged.

Twine requirements varied with the type of crop, conditions of crop, type of twine and the desired durability.

Bale Discharging: Ease of bale discharging was very good. Once the twine was cut, the PTO was allowed to turn and the gate was hydraulically opened, ejecting the bale. The test baler was equipped with the optional trip gate to allow the operator to stop and eject the bale without backing up. When the tailgate opened, the gate fingers (FIGURE 5) protruded up between the floor belts to prevent crop material entry into the open bale chamber. The tractor was then driven forward enough for the tailgate to clear the discharged bale upon closing and a new bale was started. The red light and the horn stayed off when the gate was fully closed. A minimum of about 40 seconds were needed to wrap and discharge a bale.

Transporting: Ease of transporting and maneuvering was very good. Ground clearance was adequate and there was ample hitch clearance for turning sharp corners. The operator had to remember to place the jack into its storage position to prevent damage on

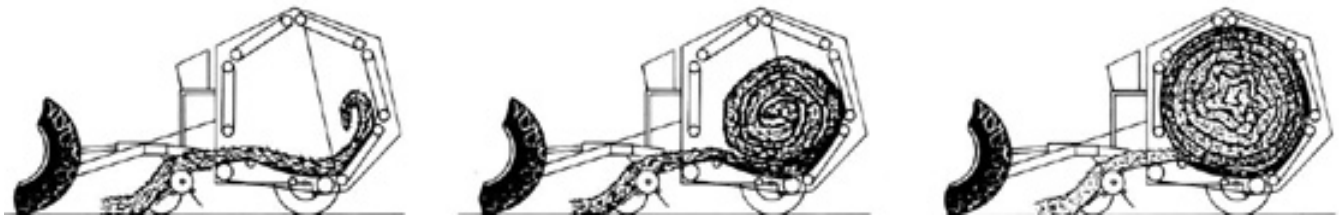

FIGURE 4. Stages of Bale Formation: (Left) Starting Bale, (Centre) Partially Completed Bale, (Right) Completed Bale.

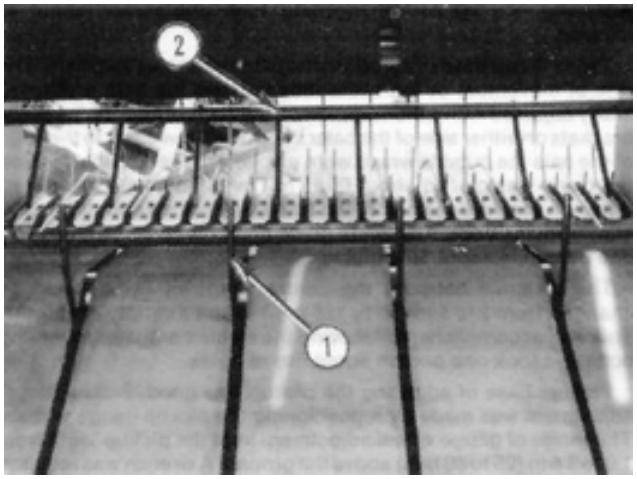

FIGURE 5. (1) Gate Fingers, (2) Crop Retainer.

turns. Care was necessary when backing up or transporting on roadways due to obstructed visibility to the rear. The baler could be easily towed behind a tractor or suitably sized truck. A safety chain was available as optional equipment. The load on the baler tires with a full bale chamber did not exceed the Tire and Rim Association maximum load ratings at transport speeds of 25 mph (40 km/h). Dismounting the tractor was required to lift the pickup. Placing the pickup in transport required an upward lift of about 50 lb (220 N).

Hitching: Ease of hitching the New Idea 486 was very good. The hitchjack could be removed and placed into its storage position as soon as the base was clear of the ground. Full retraction of the jack was not required. The location of the jack near the hitch point, sometimes limited operation of the jack crank. The constant velocity joint on the PTO driveline eliminated driveline chatter and the need for an equal angle hitch extension.

Feeding: Pickup performance of the New Idea 486 was good. It was positive and aggressive in most crops. Plugging occurred occasionally in damp hay. When plugging occurred damp material would usually get caught on the edges of the pickup between the windguard and pickup drum. Raising the windguard may have reduced this plugging. Very dry and short straw would backfeed into the pickup area when the bale was nearing completion. The optional crop retainer helped prevent material from backfeeding into the pickup. In extreme conditions backfeeding caused plugging or shear bolt failure when the accumulated straw fed back into the bale chamber. Baling short straw when it was slightly tough eliminated this problem.

Twine Threading: Ease of twine threading was very good. A stiff piece of wire supplied by the manufacturer simplified threading the wire through the twine tubes.

EASE OF ADJUSTMENT

Drive Chains: Ease of adjusting the drive chains was very good. The seven drive chains all had adjustable slides to adjust the tension on them. As well, the main drive chain and the lower roll chain had spring loaded idler sprockets. The drive chains required frequent checking and occasional tension adjustment. Adjusting each drive chain took one person about five minutes to complete.

Flat Belts: Ease of adjusting the flat belts was very good. Belt tension was adjusted with six adjusting rollers; five rollers for the five sets of forming belts and one roller for the platform belts. Adjusting blocks located on both sides of the baler, were used to reposition rollers to achieve the required belt tension. Upper belts had correct tension when there was a 2.5 in (64 mm) clearance when pressing down on the belts halfway between the rollers. Proper tension on the platform belts (FIGURE 1) was achieved when the belts could be depressed to within 1 in (25 mm) of the rear idler. Adjusting belt tension was not difficult but the operator had to be careful to adjust each set of adjusting blocks exactly the same amount on either end of the roller. A measuring tape aided in adjusting each end of the roller the same amount. If this was not done the belts would not turn evenly and excessive wear on the belts would result. Belt tension was adjusted once near the beginning of the test. Roller scrapers used to keep the rollers clear of buildup, moved with the rollers when belt tension was adjusted. Adjusting one set of forming belts took one person about 15 minutes.

Twine Wrap: Ease of adjusting the twine wrap was excellent. The rate of movement of the twine tubes across the bale width was easily adjusted with a thumbscrew on the control box. Twine guide brackets on either side of the baler controlled how close to the edge of the bale the outside wraps were placed. On the outside position the twine was placed about 6 in (150 mm) from the bale edges. While on the inside position, the twine was placed about 8 in (200 mm) from the edge. The twine guide brackets could be moved by one person in about 10 minutes.

The distance between the centre wraps of twine could be changed from 2 to 5 in (50 to 125 mm) to suit a variety of lengths. This was accomplished by moving the electric actuator mounting bolts and took one person about five minutes.

Pickup: Ease of adjusting the pickup was good. Pickup height adjustment was made by repositioning the pickup gauge wheels. The range of gauge wheel adjustment kept the pickup teeth from 1.0 to 3.5 in (25 to 89 mm) above the ground. A wrench was required to make this adjustment. The adjustment range was sufficient for all conditions encountered during the test. The pickup could easily be latched into transport position. The recommended pickup floatation adjustment was adequate.

The pickup windguard could easily be removed by hand to make it easier to unplug the pickup area. The windguard could be adjusted from 3 to 6 in (75 to 150 mm) away from the pickup and was effective in all crops.

The pickup drive belt tension was maintained with a spring loaded idler. The belt would slip if there was an overload on the pickup.

Pickup floatation was provided by an adjustable floatation spring, which required no further adjustment after the initial setting. The recommended pickup floatation adjustment was adequate in most field conditions.

Bale Density Springs: Ease of adjusting bale density was very good. The spring tension on the gate latches, controlled the bale density at which the red light on the control box would come on. The recommended spring tension was adequate for all conditions encountered during the test. The 2 in (50 mm) range of adjustment in the adjusting bolt was sufficient in all crop types and required one person about five minutes to adjust.

Lubricating: Ease of lubricating was good. The New Idea 486 had seven drive chains, 23 grease fittings and one gear box. The operator's manual recommended daily oiling of the drive chains, lubrication of eight PTO driveshaft grease fittings every eight hours, the pickup drive hub and pickup gauge wheels every 10 hours, PTO couplings and sliding shafts every 20 hours, and all other grease fittings every 50 hours. Also recommended was that the gearbox be checked every 50 hours with oil changed and wheel bearings repacked annually. Complete daily servicing took one person about 15 minutes,

Opening and closing the hinged shield was inconvenient due to the type of fasteners used. One fastener fell off and others were bent and became difficult to twist when locking the shields shut. It is recommended that the manufacturer consider modifying the door fastener on the safety shields to improve their convenience.

POWER CONSUMPTION

Power Requirements: FIGURE 6 shows the PTO and drawbar requirements for the New Idea 486. The power input is plotted against bale weight to show the power requirements while a bale is formed. The PTO requirements varied from 4.0 hp (3.0 kW) at no load to a maximum of 70 hp (52 kW) in alfalfa. Drawbar requirements at 6.6 mph (10.7 km/h) on flat firm fields were about 4.0 hp (3.0 kW) when the bale reached maximum size. Although maximum horsepower requirements did not exceed 74 hp (55 kW) additional power was needed to suit field conditions especially in soft hilly fields. The manufacturer suggested a tractor of at least 70 hp (52 kW). To fully utilize baler capacity, PAMI recommends a tractor of at least 90 hp (67 kW) in order to have sufficient power reserve in all field conditions.

Specific Capacity: Specific capacity is a measure of how efficiently a machine performs a task. A high specific capacity indicates efficient energy use. The specific capacity of the New Idea 486 was measured at 0.28 ton/hp-h (0.34 t/kW-h) in alfalfa at a workrate of 7.1 ton/h (6.4 t/h). This specific capacity was greatly influenced by the workrate. At a maximum workrate of 12 ton/h

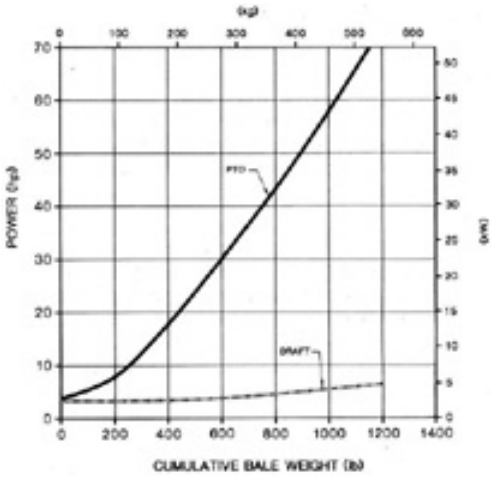

FIGURE 6. Power Consumption During Bale Formation in Alfalfa.

(10.9 t/h) a specific capacity of 0.47 ton/hp-h (0.57 t/kW-h) could be expected. The typical range of specific capacities for small square bales in alfalfa is 0.6 to 1.2 ton/hp-h (0.7 to 1.4 t/kW-h).

OPERATOR SAFETY:

Overall operator safety on the New Idea 486 was very good.

The operator is cautioned that a round baler is potentially a very dangerous farm implement. The operator must disengage the PTO 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.

The New Idea 486 conformed to ASAE safety standards. It 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 pickup and feeding areas were well guarded to discourage operators from attempting to clear blockages with the baler in operation. The safety shields were conveniently hinged so they did not have to be completely removed.

The New Idea 486 had rear gate cylinder locks to permit safe servicing with the rear gate open.

A slow-moving-vehicle sign was permanently fastened at the rear of the baler.

OPERATOR'S MANUAL

The operator's manual was very good. It was well written and clearly illustrated and contained much useful information on operation, servicing, adjustments, assembly, optional equipment and safety procedures.

MECHANICAL HISTORY

The New Idea 486 was operated for 171 hours while baling 2122 bales. The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted. TABLE 3 outlines those problems which occurred during functional testing.

TABLE 3. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac	(ha)
Several shear pins broke and were replaced at:	2-10	8-40	(3-16)
Twine cut-off mechanisms malfunctioned and were replaced at:	66	210	(85)
Two forming belts turned inside out and were turned back at:	90	350	(142)
Full bale switch malfunctioned and was replaced at:	156	870	(352)
Optional crop retainer bent and was repaired at:	165	920	(372)

DISCUSSION OF MECHANICAL PROBLEMS

Shear Pins: Several drive line shear pins broke early in testing under normal circumstances. Originally they were replaced with the shear pins supplied by the manufacturer. The problem persisted and the shear pin was eventually replaced with a grade 8 bolt. This grade 8 bolt still broke occasionally but only under extreme conditions.

Twine Cut-off Mechanisms: The two twine cut-off mechanisms gave frequent problems for the first 66 hours of testing. They did not adequately pinch the twine for proper cut-off or for drawing a length of twine for the next bale to start tying. The mechanisms were replaced with new ones to the account of the manufacturer and no further problems were encountered. Replacement took one person about 30 minutes.

Forming Belts: Two of the inside forming belts at the top rear of the baler turned inside out (FIGURE 7) due to improper tension. The idler roller was removed, the belts returned to their proper position and were properly tensioned. No further problems occurred. Baling did not have to be halted when the belts started to turn inside out. Turning the belts took two people about one hour.

Crop Retainer: Shortly after being installed, the crop retainer (FIGURE 5) bent due to overfeeding the bale chamber with short straw. There was insufficient pressure within the bale chamber to trigger the flashing light on the control box even though maximum bale diameter had already been reached. Loosening the bale density springs may have prevented this. The crop retainer was removed and not replaced for the remainder of the test.

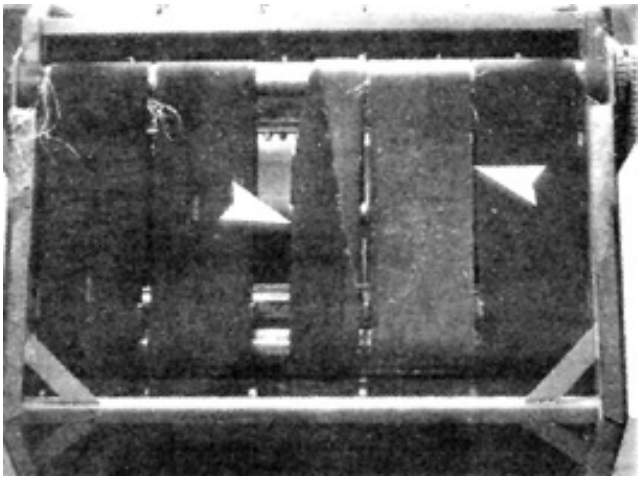

FIGURE 7. Forming Belts Turned Inside Out.

APPENDIX I

SPECIFICATIONS

MAKE:	New Idea	
MODEL:	486	
SERIAL NUMBER:	07336	
MANUFACTURER:	New Idea Coldwater, Ohio U.S.A.	
DIMENSIONS:		
- width	8.3 ft	(2.5 m)
- height	7.9 ft	(2.4 m)
- length	14.2 ft	(4.3 m)
- ground clearance	12 in	(300 mm)
TIRES:		
- undercarriage	Two, 31 x 13.50-15 NHS, 6-ply tubeless	
- pickup gauge	Two, 480-8NHS, 4-ply.	
WEIGHT:		
- left wheel	1733 lb	(786 kg)
- right wheel	1852 lb	(840 kg)
- hitch point	758 lb	(344 kg)
Total:	4343 lb	(1970 kg)
BALE CHAMBER:		
- width	4.9 ft	(1.5 m)
- maximum diameter (fixed)	6.0 ft	(1.8 m)

- tension method	spring and latch	
- bale peripheral speed (at 540 rpm)	3.9 mph	(6.3 km/h)

BALE CHAMBER PLATFORMS

- number of belts	5	
- belt width	11.0 in	(280 mm)
- thickness	0.18 in	(4.6 mm)
- spacing (centre to centre)	11.85 in	(298 mm)
- belt speed (at 540 rpm)	5.7 ft/s	(1.74 m/s)
- number of rollers	4, tubular steel	
- roller length	58.8 in (1490 mm)	
- roller diameter	two, 7.6 in (190 mm) two, 4.5 in (113 mm)	
- roller surface	smooth	
- roller speed (drive)	169 rpm	

FORMING SECTIONS:

- number of sections	5	
- number of belts per section	5	
- belt width	11.0 in	(280 mm)
- thickness	0.18 in	(4.6 mm)
- spacing (centre to centre)	11.8 in	(298 mm)
- belt speed (at 540 rpm)	5.7 ft/s	(1.74 m/s)
- number of rollers per section	2	
- roller diameter	4.57 in	(113 mm)
- roller speed (at 540 rpm)	285 rpm	

BALE SIZE INDICATOR:	gate latch switch with red light and horn on central box

PICKUP:

- type	floating cam actuated drum with spring teeth	
- height adjustment	gauge wheels, 4 positions, transport latch	
- width	69.3 in	(1760 mm)
- diameter	14.0 in	(360 mm)
- number of tooth bars	4	
- tooth spacing	2.76 in	(70 mm)
- speed (at 540 rpm)	101 rpm	
- tooth tip speed (at 540 rpm)	7.3 mph	(11.8 km/h)

TWINE SYSTEM:

- capacity	6 balls
- recommended twine-size	none
- twine feed	electric actuator controller dual wrap
- twine cutter	stationary knife with jam plate

DRIVES:

- number of belt drives
- number of chain drives
- number of gear drives
- number of universal joints

SAFETY DEVICES:

- main drive shear bolt
- rear gate cylinder locks
- hinged safety shields

LUBRICATING:

	8 hr	10 hr	20 hr	50 hr	Yearly
- grease points	8	3	2	10	2
- oil points	--	7	--	1	1

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

SUMMARY CHART

NEW IDEA 486 ROUND BALER

RETAIL PRICE:	$17,779 (March 1988, f.o.b. Portage la Prairie, MB)
RATE OF WORK:	4.5 ton/h (4.1 t/h) in wheat straw 8.6 ton/h (7.8 t/h) in alfalfa
QUALITY OF WORK:	
Bale Quality	**Very Good;** soft core, tight outside wrap
Weatherability	**Very Good;** about 1 in (25 mm) spoilage
Leaf & Stem Loss	**Very Good;** 3.2% in alfalfa hay at 13% moisture
EASE OF OPERATION:	
Bale Forming	**Very Good;** limited visibility into the chamber for uniform bale formation.
Bale Wrapping	**Very Good;** dual twine tubes
Bale Discharging	**Very Good;** trip gate optional
Transporting	**Very Good;** limited visibility
Hitching	**Very Good;** jack was obstructed in some cases
Feeding	**Good;** plugged occasionally in damp crops
EASE OF ADJUSTMENT:	
Drive chains	**Very Good;** adjustable slides
Flat belts	**Very Good**; time required to match both sides of adjusting rollers
Twine Wrap	**Excellent;** thumbscrew on control box
Pickup	**Good;** adjusted at beginning of test
Bale Density Springs	**Very Good;** adequate adjustment for all crop types
Lubricating	**Good;** 15 min. for daily service; fasteners were difficult to open and close
POWER REQUIREMENTS:	
Tractor size	90 hp (67 kW) tractor has sufficient reserve for most field conditions
Specific capacity	0.47 ton/hp-h) (0.57 t/kW-h) at a work rate of 12 ton/h (10.9 t/h)
OPERATOR SAFETY:	**Very Good;** well shielded
OPERATOR'S MANUAL:	**Very Good;** well written and clearly illustrated.
MECHANICAL HISTORY:	Several shear pins broke, twine cutoff mechanisms and full bale switch malfunctioned.

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