

Evaluation Report 417



Bergen 50 SD Swing-Away Auger

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
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CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

BERGEN 50 SD SWING-AWAY AUGER

MANUFACTURER AND DISTRIBUTOR:

Bergen Manufacturing Ltd.
Box 133
Drake, Saskatchewan
S0K 1H0

RETAIL PRICE: \$5,300 (October 1985, f.o.b.
Portage la Prairie, Manitoba) 10.8 in
x 50 ft (270 mm x 15.2 m) Swing-Away Auger

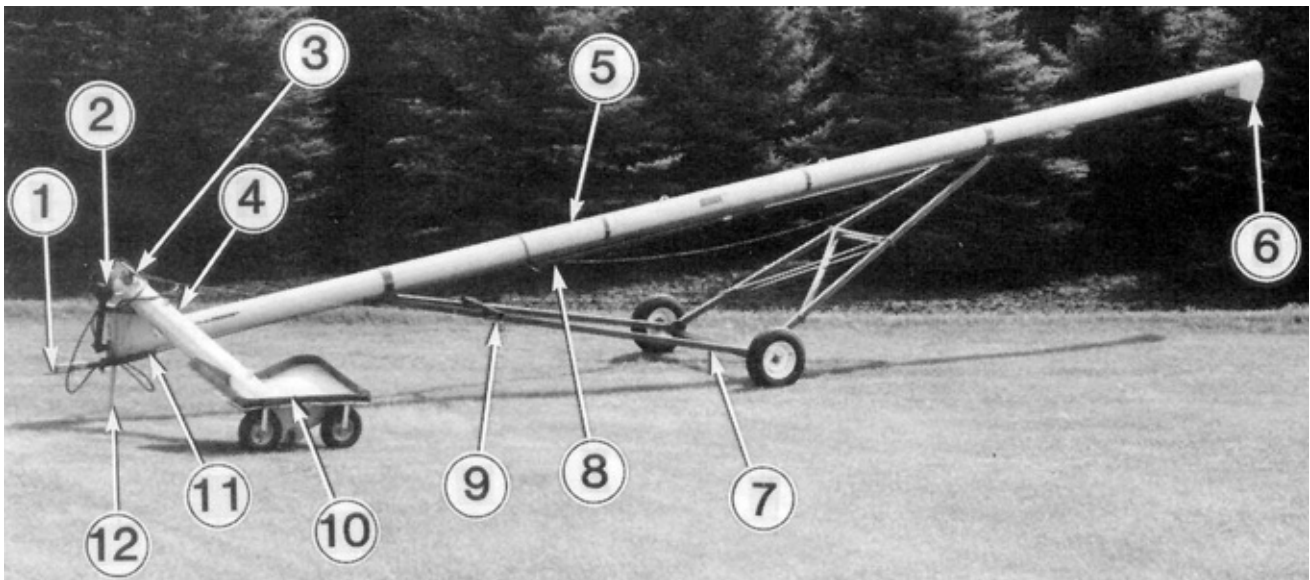


FIGURE 1. Bergen 50 SD Swing-Away Auger: (1) Tow Hitch, (2) Power Take-Off Driveline, (3) Swing Auger Winch, (4) Swing Auger, (5) Main Auger Tube, (6) Discharge Spout, (7) Undercarriage, (8) Hydraulic Cylinder, (9) Swing Auger Lift Boom, (10) Intake Hopper, (11) Auger Boot, (12) Jack.

SUMMARY

Ease of Operation: The Bergen 50 SD was very easy to position and operate since raising the main tube and engaging the flighting was performed from the tractor seat. Maneuverability was good and transportability was very good.

Rate of Work: At the 30° elevation angle, corresponding to a discharge height of 27.2 ft (8.1 m), maximum capacities were 4800, 3500, 4200 and 4200 bu/h (127, 59, 109 and 96 t/h) in wheat, oats, corn and rapeseed respectively. Maximum capacities were usually obtained at flighting speeds between 300 and 450 rpm.

Power Requirements: Combined power requirements for the main auger and the swing auger ranged from 8.1 to 40 hp (6.0 to 30 kW) in dry grain.

Quality of Work: In dry wheat, damage was less than 0.2% for each pass through the auger.

Safety: All nip points, rotating drive shafts, and inlet flighting were guarded in accordance with safety standards.¹

Operator's Manual: The manual lacked detailed instruction and illustrations on operation, assembly and safety.

Mechanical History: No mechanical problems occurred during testing.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modification to the auger boot to allow for more thorough cleaning and inspection of the flighting.
2. Providing an operator's manual with more detailed information and illustrations on operation, assembly and safety.

Senior Engineer -- G.M. Omichinski

Project Engineer -- D.J. May

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. To allow for more thorough cleaning and inspection of the flighting, we will be manufacturing the auger with a larger opening at the boot and hopper.
2. We also will be revising our operator's manual to include more detailed information in the areas mentioned above.

¹American Society of Agricultural Engineers Tentative Standard ASAE S361.2T, "Safety for Agricultural Auger Conveying Equipment," December 1985.

GENERAL DESCRIPTION

The Bergen 50 SD Grain Auger (FIGURE 1) is a 10.8 in (270 mm) diameter, 50 ft (15.2 m) long portable screw conveyor with a hopper section at the bottom which swings to either side of the main auger.

The main auger tube is mounted on a tubular steel undercarriage and is raised or lowered hydraulically. The swing auger is raised or lowered with a hand-operated cable winch.

The test machine utilized a direct drive 540 rpm, PTO drive shaft to the main auger and a hydraulic motor drive to the swing auger.

Detailed specifications are given in Appendix I.

SCOPE OF TEST

The Bergen 50 SD was operated for about 30 hours while conveying a total of 1000 tons (910 t) of dry wheat, oats, barley, corn and rapeseed. A standard test material (Appendix II) was also used. The machine was transported over gravel and paved highways for a distance of 500 miles (800 km). It was evaluated for ease of operation and adjustment, rate of work, power requirements, quality of work, operator safety and suitability of the operator's manual.

RESULTS AND DISCUSSION

EASE OF OPERATION AND ADJUSTMENT

Discharge Height: The discharge height (FIGURE 2) could be varied from 9.8 to 26.6 ft (3.0 to 8.1 m) with the hydraulic lift mechanism. Corresponding elevation angles varied from 10° to 30°. See TABLE 1.

The auger discharge height could be easily adjusted from the tractor seat. A chain was provided to lock the auger at the desired discharge height.

Auger Reach: The bin eave clearance and horizontal reach (FIGURE 2) of the Bergen 50 SD are shown in TABLE 1. Bin eave clearance, measured from the ground to the auger tube at the foremost part of the undercarriage, varied from 8.2 ft (2.5 m) at 10° to 19.7 ft. (6.0 m) at 30° elevation. The reach, measured from the foremost part of the undercarriage to the centre of the discharge, varied from 13.1 ft (4.0 m) at 10° to 9.5 ft (2.9 m) at 30°.

TABLE 1. Reach, Clearance and Discharge Height at Various Elevations.

ELEVATION ANGLE Degrees	A HORIZONTAL REACH		B BIN EAVE CLEARANCE		C DISCHARGE HEIGHT	
	ft	(m)	ft	(m)	ft	(m)
10° (min)	13.1	(4.0)	8.2	(2.5)	9.8	(3.0)
20°	11.2	(3.4)	15.4	(4.7)	21.0	(6.4)
30° (max)	9.5	(2.9)	19.7	(6.0)	26.6	(8.1)

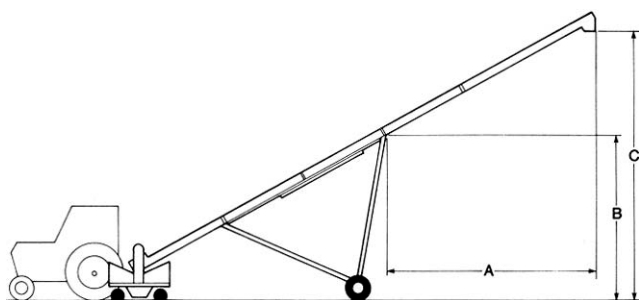


FIGURE 2. Dimensions: (A) Horizontal Reach, (B) Bin Eave Clearance, (C) Discharge Height.

Maneuverability: The Bergen 50 SD was designed as a tractor implement. It could be transported, raised, positioned, and operated from the tractor seat. The large hitch weight of 360 lb (162 kg) made moving the auger by hand impractical. Despite the considerable length of the auger and the added length with a tractor, the maneuverability was good. However, it was difficult to judge the distances between the auger outlet and obstructions.

The auger transported well and was stable at speeds up to 50 mph (80 km/h) on paved highways and up to 30 mph (50 km/h) on gravel roads, although the auger was only equipped with 25 mph (40 km/h) rated tires.

The auger was supplied with a rigid stable hitch. The operator should use a suitable hitch pin and safety chain to prevent accidental unhitching when transporting on public roads. Clearance under power lines was ample when fully lowered. The transport height was 11.8 ft (3.6 m). See cover photo.

Swing Auger: The swing auger was easily moved to and from the transport position. It was easily positioned and operated very well with most grain trucks. The swing auger lift boom could be moved from one side to the other in ten minutes for transport on either side. The fighting speed of the swing auger varied with the engine and hydraulic pump speed of the tractor. It did not have a flow control valve to vary the fighting speed in relation to the fighting of the main auger.

There were cleanout holes at the bottom of the hopper and auger boot. The hopper inlet guard could also be removed to facilitate cleaning. A small cleanout hole made the auger boot more difficult to clean. It is recommended that the manufacturer consider modifications to the auger boot to allow for more thorough cleaning and inspection of the fighting.

RATE OF WORK

Capacity: FIGURE 3 shows the capacities of the Bergen 50 SD in various dry grains at 30° elevation angle. Maximum capacities at this angle were 4800, 3500, 4200 and 4200 bu/h (127, 59, 109 and 96 t/h) in dry wheat, oats, corn and rapeseed respectively. As fighting

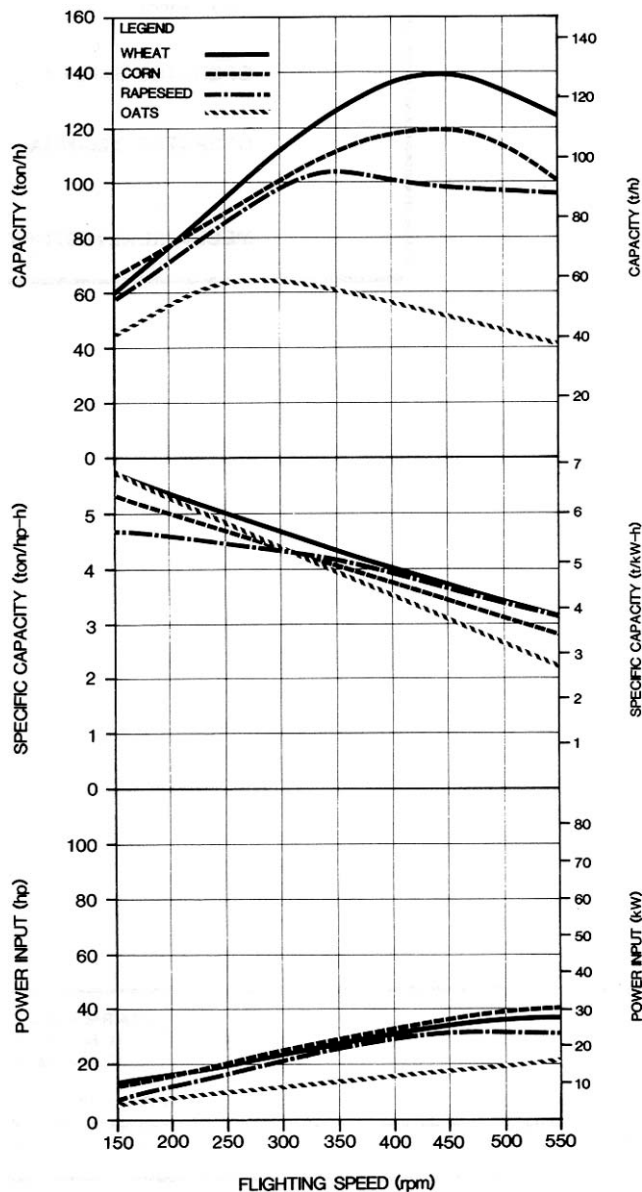


FIGURE 3. Capacity, Specific Capacity and Power Requirements for Various Speeds at 30° Elevation Angle (Dry Grain).

speeds are increased, the capacity of screw conveyors increases to a peak, then levels off or decreases. Maximum or peak capacities for the Bergen 50 SD occurred at flighting speeds (PTO speeds) varying from 300 to 450 rpm.

The effect of elevation angle on capacity is illustrated in TABLE 2. Peak capacities in wheat dropped 3% from 4900 bu/h (130 t/h) at 20° elevation to 4800 bu/h (127 t/h) at the maximum 30° elevation.

TABLE 2. Peak Capacity, Specific Capacity and Power Requirements vs Elevation Angle (Dry Wheat).

ELEV. ANGLE Degrees	DISCHARGE HEIGHT		PEAK CAPACITY		SPECIFIC CAPACITY		POWER INPUT	
	ft	(m)	bu/h	(t/h)	ton hp-h	(t) (kW-h)	hp	(kW)
20	21.0	(6.4)	4900	(130)	4.9	(6.0)	29	(22)
30	26.6	(8.1)	4800	(127)	3.9	(4.7)	36	(27)

Specific Capacity: Specific capacity is the amount of grain moved per unit of power in a specific time. A high specific capacity indicates efficient use of energy. In general, specific capacity decreases (less grain is moved per horsepower-hour) with increasing flighting speed and elevation angle. Specific capacity at 30° ranged from 6.8 to 2.6 ton/hp-h (8.3 to 3.2 t/kW-h) in dry wheat, oats, corn and rapeseed. TABLE 2 indicates the effect of elevation angle on peak and specific capacities for the Bergen 50 SD.

Critical Speeds: At certain critical flighting speeds auger vibration may become excessive. This phenomenon, known as resonance, is common to all augers (although the critical speed may be outside of the operating range of any particular auger) and varies with grain type and operating conditions. Care should be taken not to operate at these critical speeds. On the Bergen 50 SD a drop in capacity due to resonance was occasionally noted at a PTO speed of about 520 rpm.

Damp Grain: No specific tests in damp grain were carried out for the Bergen 50 SD. However, tests with similar augers of this size, generally show that power requirements increase and capacities decrease as moisture content rises. These test results are summarized in TABLE 3.

TABLE 3. Capacity and Power Requirements in Damp Grain for Grain Augers with Side Delivery (30° Elevation).

Grain (Moisture Content)	Peak Capacity as % of Capacity in Dry Grain	Power Requirements as % of Power Required in Dry Grain
Wheat (20% MC)	65	142
Corn (30% MC)	70	149
Rapeseed (15% MC)	90	100

If augers are used to move damp grain the power source should be sized accordingly. The power requirement for augers without side delivery will increase by approximately 5%, 33% and 50% when moving damp rapeseed, corn and wheat respectively.

QUALITY OF WORK

Grain Damage: Damage in dry wheat was less than 0.2% for each pass through the auger. This was insignificant as long as the same grain was not augered many times. Cracking would be lower at higher moisture contents.

OPERATOR SAFETY

The Bergen 50 SD met current safety standards for grain augers. It was safe to operate if normal precautions were observed. Safety signs were appropriately displayed alerting the operator of potentially hazardous areas.

Shielding was provided for all rotating shafts and pinch points. An adequate inlet safety guard (FIGURE 4) was provided. All capacities were determined with this inlet safety guard in place. The Institute strongly recommends that grain augers be operated with all safety equipment in place.

OPERATOR'S MANUAL

The operator's manual included instruction on lubrication, operation, storage and warranty. It lacked information on safety and assembly as well as descriptive illustrations, and the operation section was sketchy. It is recommended that the manufacturer consider providing an operator's manual with more detailed information and illustrations on operation, assembly and safety.

MECHANICAL HISTORY

The Bergen 50 SD was operated for about 30 hours. No mechanical problems arose during the test.

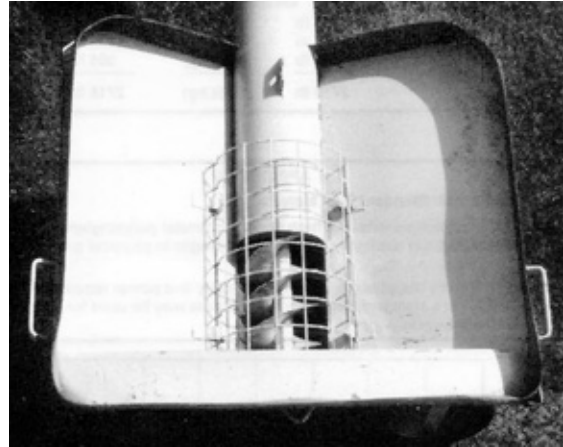


FIGURE 4. Inlet Hopper and Safety Guard.

APPENDIX I

SPECIFICATIONS

MAKE: Bergen
MODEL: 50 SD
SERIAL NUMBER: 318

OVERALL DIMENSIONS:

-- transport length along ground 52.4 ft (16.0 m)
 -- field width 17.1 ft (5.2 m)
 -- transport width 9.2 ft (2.8 m)
 -- transport height 11.8 ft (3.6 m)

DRIVE:

Main Auger
 -- 540 rpm tractor power take-off
 -- direct drive
 -- power take-off to flighting speed ratio 1:1

Intake Feed Auger
 -- hydraulic motor displacement 4.3 in³ (70.5 cm³)
 -- motor to flighting speed ratio 1:1

LUBRICATION:

-- pressure grease fittings 7
 -- sealed bearings 2
 -- packed wheel bearings 2

AUGER TUBE:

-- inside diameter 10.6 in (270 mm)
 -- material thickness 0.1 in (2.5 mm)
 -- discharge spout 11.8 x 11.0 in (300 x 280 mm)

FLIGHTING:

-- diameter 8.3 in (210 mm)
 -- pitch 9.5 in (240 mm)
 -- double in hopper
 -- exposed length 15.5 in (390 mm)
 -- thickness
 -- inner 0.20 in (5.0 mm)
 -- outer 0.10 in (2.5 mm)

INLET SAFETY GUARD:

- material dimensions 0.25 in dia, (6.5 mm)
- overall size 26 x 16 in (665 x 415 mm)
- grill openings
 - maximum open area 9.2 in² (59 cm²)
 - maximum open dimension 4.3 in (109 mm)

LIFT MECHANISM:

- type hydraulic cylinder
- cylinder size 3.0 x 114 in (75 x 2900 mm)

WEIGHT:

	Maximum Elevation		Minimum Elevation	
-- right wheel	1188 lb	(540 kg)	1237 lb	(562 kg)
-- left wheel	1078 lb	(490 kg)	1122 lb	(510 kg)
-- hitch	449 lb	(204 kg)	356 lb	(162 kg)
TOTAL	2715 lb	(1234 kg)	2715 lb	(1234 kg)

APPENDIX III

MACHINE RATINGS

The following rating scale is used in Machinery Institute Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

APPENDIX II

Performance with Standard Test Material

The standard test material is a high density granular polyethylene. The material is consistent and not subject to damage or changes in physical properties as are grains.

FIGURE 5 gives the capacity, specific capacity and power requirements for the Bergen 50 SD in a standard test material. This data may be used for comparison of different grain augers.

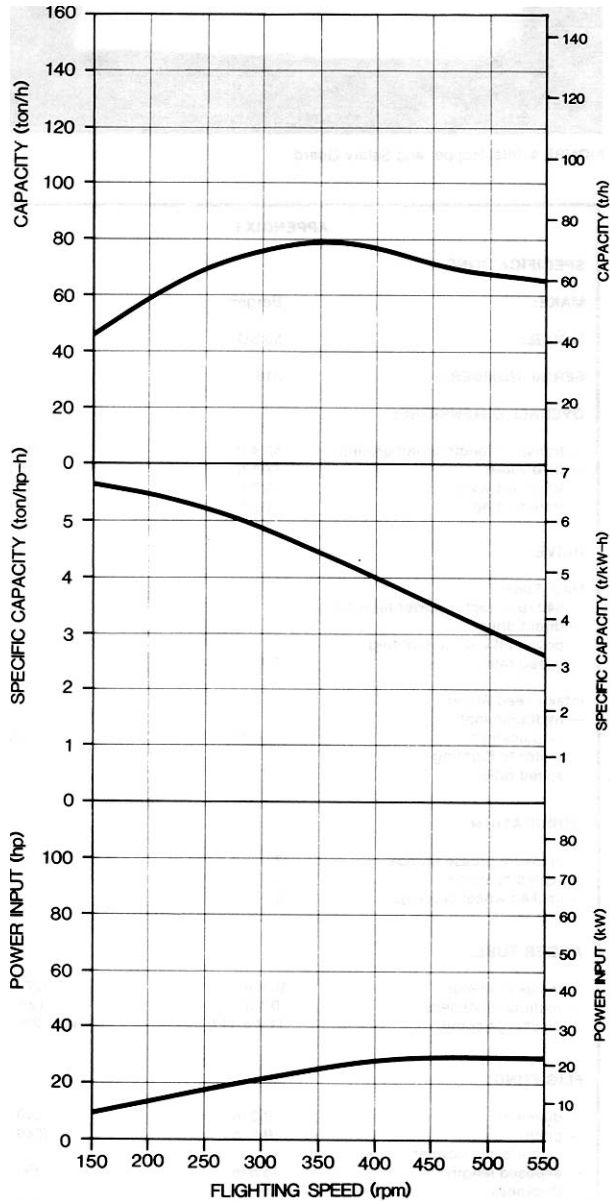


FIGURE 5. Capacity, Specific Capacity and Power Requirements with Standard Test Material at 30° Elevator Angle.

SUMMARY CHART

BERGEN 50 SD SWING-AWAY AUGER

RETAIL PRICE	\$5,300 (October 1985, f.o.b. Portage la Prairie)	
EASE OF OPERATION:		
Maneuverability	Good	
Transportability	Very Good	
RATE OF WORK:		
Capacity at 30°		
-- Wheat (dry)	4800 bu/h	(131 t/h)
-- Standard Material	97 ton/h	(88 t/h)
POWER REQUIREMENTS:		
Dry Grain	8.1 to 40 hp	(6.0 to 30 kW)
QUALITY OF WORK:		
Dry Wheat	Less than 0.2% damage per pass	
OPERATOR SAFETY		
	Guarded in accordance with safety standards	
OPERATOR'S MANUAL		
	Lacked information and illustrations on assembly, operation and safety.	
MECHANICAL HISTORY		
	No failure occurred during the test.	



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