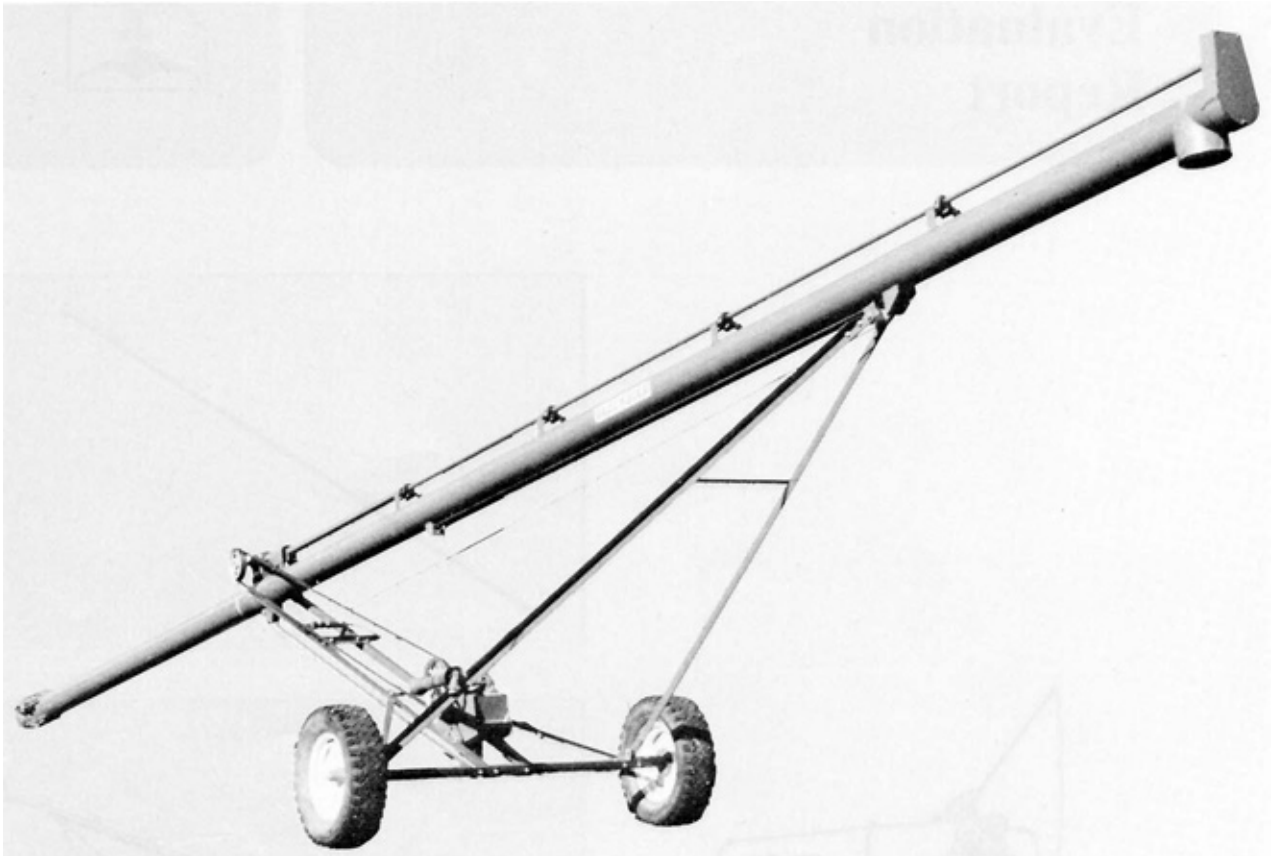


Evaluation Report

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Sakundiak HD&-41 Grain Auger

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

SAKUNDIAK HD7-41 GRAIN AUGER

MANUFACTURER:

Sakundiak Farm Equipment Ltd.
P.O. Box 1996
Regina, Saskatchewan
S4P 3E1

RETAIL PRICE:

\$1,124.00 (September 1978, f.o.b. Regina, complete with power take-off drive, less tires)

DISTRIBUTORS:

Sakundiak Farm Equipment Ltd.
P.O. Box 1996
Regina, Saskatchewan
S4P 3E1
Crawford's of Alberta Ltd.
P.O. Box 1720
Camrose, Alberta
T4V 1X6

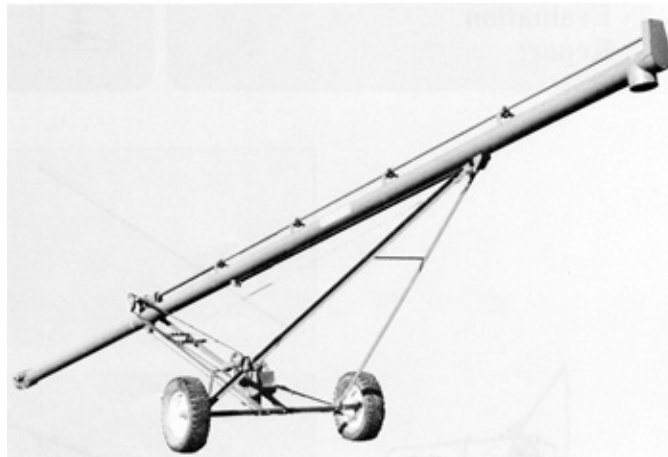


FIGURE 1. Sakundiak HD7-41 Grain Auger.

SUMMARY AND CONCLUSIONS

At the manufacturer's recommended flighting speed of 500 to 600 rpm with a 30° elevation angle, corresponding to a lift of 6.4 m (21 ft) the capacity of the Sakundiak HD7-41 was 37.5 t/h (1380 bu/h) in wheat, 37.0 t/h (1630 bu/h) in rapeseed, 25.5 t/h (1760 bu/h) in oats and 33.5 t/h (1320 bu/h) in corn.

Power requirements ranged from 2 to 6.4 kW (2.7 to 8.6 hp). Capacity and power depended on auger speed, elevation, grain type and moisture content.

Grain damage in dry wheat was less than 0.2% for each pass through the auger.

The Sakundiak was easy to handle although winch operation was inconvenient.

No major durability problems occurred during the test.

The Sakundiak HD7-41 had several potential safety hazards. No guards were provided to shield pulley drives or nip points and the cranking winch did not meet current auger safety standards.

The operator's manual provided some useful information.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to provide a safer and more convenient method

of raising and lowering the auger tube.

2. Modifications to strengthen the hitch and reduce the possibility of damage to the flighting inlet bearing when transporting.
3. Providing appropriate shields and warning signs to protect and caution against unsafe practices and danger points.
4. Providing a retaining bracket to hold the power take-off shaft when transporting.

Chief Engineer -- E.O. Nyborg

Senior Engineer -- J.C. Thauberger

Technical Officer -- J. Russell

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. All grain augers manufactured since January 1st, 1978 have been supplied with a brake winch manufactured by Dutton-Lainson Company of Hastings, Nebraska.
2. This recommendation is under consideration.
3. All grain augers manufactured since January 1st, 1978 are provided with appropriate shielding and warning decals.
4. This recommendation is under consideration.

MANUFACTURER'S ADDITIONAL COMMENTS

The safety guard on the auger intake has been redesigned for increased protection and capacity.

GENERAL DESCRIPTION

The Sakundiak HD7-41 Grain Auger (FIGURE 1) is a nominal 180 mm (7 in) diameter, 12.7 m (41.7 ft) long portable screw conveyor. The conveyor tube is mounted on an angle frame supported by a single axle with two wheels.

A crank operated cable winch varies the discharge height. Bearings at the intake and outlet ends support the auger flighting.

By using the same mounting arrangement, the Sakundiak HD7-41 may be powered with a tractor power take-off, stationary engine or electric motor. The engine attaches to a self-levelling mount near the axle with power transmitted through V-belts, a gearbox and drive chain.

The test machine was equipped with a power take-off drive.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Sakundiak HD7-41 Grain Auger was operated for about 15 hours while conveying wheat, oats, rapeseed and corn. In addition, it was transported over gravel and paved highways for a distance of 40 km (25 miles). It was evaluated for rate of work, power requirements, grain damage, ease of operation and adjustment, operator safety and suitability of the operator's manual.

RESULTS AND DISCUSSION

EASE OF OPERATION AND ADJUSTMENT

Discharge Height: A crank operated, cable winch varied the discharge height from 2.9 to 7.6 m (9.5 to 25.0 ft). With the auger empty and the lifting mechanism well lubricated, elevating the auger was easy, and required a maximum winch handle force of 82 N (18 lb). Lowering the auger tube was inconvenient and posed a potential safety hazard as continuous winch handle control was necessary to prevent the winch from free-wheeling due to the design of the locking device. The winch was inconveniently located at auger elevations above 20° (FIGURE 2). It is recommended that the winch be modified, to prevent free-wheeling, and relocated to make operation more convenient. To fully raise or lower the auger, about 46 turns of the winch crank were required.



FIGURE 2. Inconvenient Winch Handle Location.

Auger Reach: Horizontal reach and clearance of the Sakundiak are shown in FIGURE 3. Reach, measured from the top of the front support to the outlet, varied from 2.0 m (6.6 ft) at 14° to 4.6 m (15.1 ft) at 39°, while clearance, measured from the tire to the outlet, varied from 4.6 m (15.1 ft) to 4.2 m (13.8 ft).

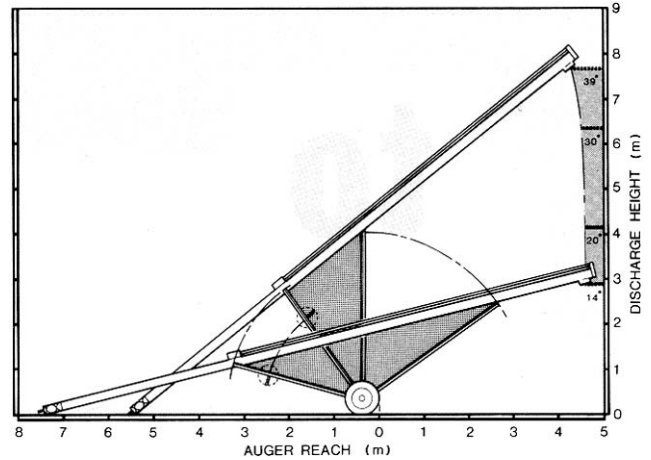


FIGURE 3. Auger Reach at Various Discharge Heights.

Hitch weight varied from 25.5 kg (56 lb), at minimum elevation, to 18 kg (40 lb), at maximum elevation.

Adjustments: A conveniently located belt tension lever enabled a constant belt tension to be maintained at all auger elevations.

Transporting: The Sakundiak HD7-41 transported well and was stable at speeds up to 100 km/h (60 mph) on paved highways and 50 km/h (30 mph) on gravel roads. When using the proper hitch pin, a fixed clevis hitch at the inlet end provides a reliable connection. It is recommended that the hitch be modified to prevent damage to the flighting inlet bearing when in transport. The operator is advised to use a suitable safety chain to prevent accidental unhitching when transporting on public roads. Clearance under power lines was adequate as the transport height, with the auger fully lowered, was about 2.9 m (9.5 ft).

RATE OF WORK

Capacity: FIGURE 4 shows the capacity of the Sakundiak in dry wheat over the full range of auger elevations and over a range of flighting speeds, with the inlet end completely submerged in grain. Maximum capacities ranged from 46.5 t/h (1710 bu/h) at the minimum elevation of 14° to 32 t/h (1180 bu/h) at the maximum elevation of 39°.

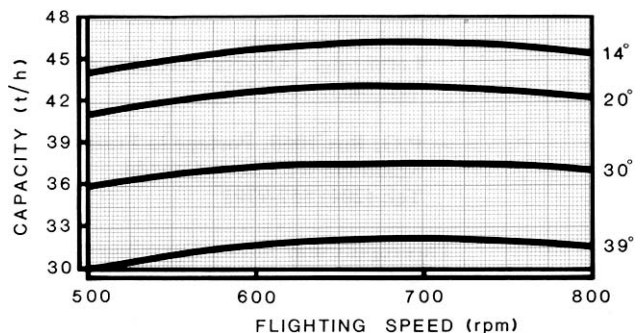


FIGURE 4. Capacity in Dry Wheat.

Maximum capacity occurred within an auger flighting speed range from 600 to 700 rpm. This corresponds to a power take-off speed of 660 to 770 rpm when equipped with the standard drive.

FIGURE 5 shows capacities of the Sakundiak HD7-41 in dry wheat, oats, corn and rapeseed at an elevation angle of 30°. Maximum capacities were 37.5, 25.5, 33.5 and 37.0 t/h (1380, 1760, 1320 and 1630 bu/h) for wheat, oats, corn and rapeseed respectively. Maximum capacities occurred at flighting speeds ranging from 550 to 675 rpm. Lower capacities can be expected for tough or damp grains at normal operating speeds.

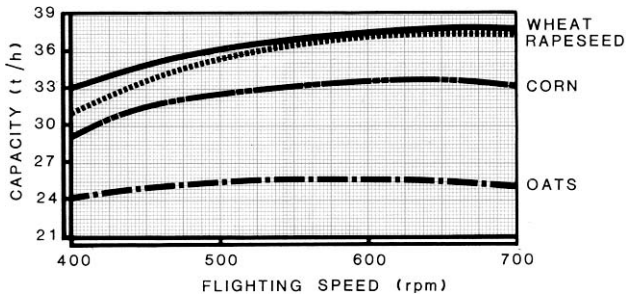


FIGURE 5. Capacity at 30° Elevation.

Specific Capacity: Specific capacity is a measure of the efficiency of a grain auger. A low specific capacity indicates inefficient power use while a high specific capacity indicates efficient operation. FIGURE 6 shows the specific capacity, per metre of vertical lift, when operating at 30° in dry wheat, oats, corn and rapeseed. Specific capacities ranged from 7.5 to 10.6 t/kW-h. Lower specific capacities can be expected for tough or damp grain.

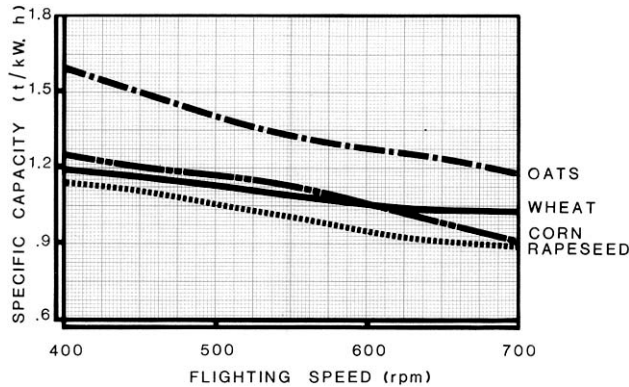


FIGURE 6. Specific Capacity Per Metre of Vertical Lift (at 30° elevation).

Critical Speeds: As indicated in FIGURES 4 and 5, maximum capacities occurred at a certain flighting speed for each grain and elevation angle. In general, suitable speeds were about 675, 575, 650 and 675 rpm in wheat, oats, corn and rapeseed respectively. In addition, at certain critical speeds, flighting vibration occurred. This phenomenon, known as resonance, is common to all grain augers. The resonant speed is dependent on grain type, condition and elevation angle. A close watch should be kept to ensure that the auger is not operated at the critical speed.

POWER REQUIREMENTS

FIGURE 7 shows the power requirements for the Sakundiak in dry wheat, oats, corn and rapeseed for an elevation angle of 30°. More power would be needed to auger grain with a higher moisture content or in unusual conditions. In general, a 10 kW (14 hp) engine would have ample power to operate the Sakundiak at maximum capacity in most conditions.

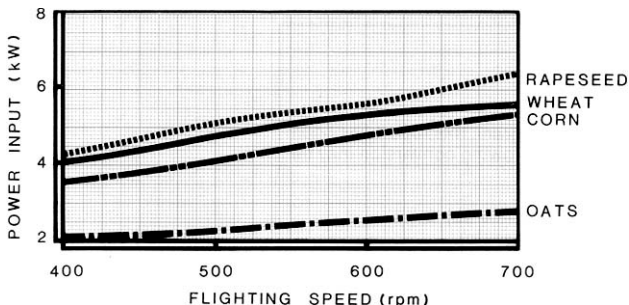


FIGURE 7. Power Requirements at 30° Elevation.

Grain Damage: Grain damage, in dry wheat, (at 11% moisture content) was less than 0.2% for each pass through the Sakundiak. This was insignificant as long as the same grain was not augered many times. Crackage at higher moisture contents would be lower.

OPERATOR SAFETY

Good operator protection was provided by the inlet guard (FIGURE 8).

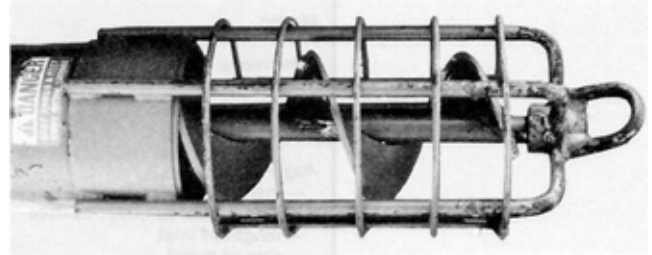


FIGURE 8. Removable Inlet Safety Guard.

Some features of the Sakundiak did not meet current auger safety recommendations.¹

The hand winch did not have an adequate locking mechanism to hold the auger at any angle of inclination. When lowering the tube, it was necessary to disengage the locking device; consequently, strict control of the winch handle was necessary to prevent free-wheeling.

No shields were provided to guard drive pulleys. It is recommended that the manufacturer provide suitable shields to reduce this potential safety hazard. As with all augers, when towing at high speed on curves or rough roads and when operating around overhead power lines, care should be exercised.

Appropriate caution signs were not supplied with the Sakundiak.

OPERATOR'S MANUAL

The operator's manual for the Sakundiak HD7-41 contained useful information on assembly, operation and servicing. The manufacturer recommended flight speeds from 500 to 600 rpm for maximum capacity. Test results indicated that flight speeds from 550 to 675 rpm were more appropriate, depending on grain type and condition.

DURABILITY RESULTS

The Sakundiak was operated for about 15 hours. The intent of the test was evaluation of functional performance and no extended durability evaluation was conducted. No serious mechanical problems occurred during the test, however, it was necessary to replace the flighting inlet bearing prior to the tests due to damage in transport.

¹American Society of Agricultural Engineers. Standard, S318.6 "Safety for Agricultural Equipment", March 1978.

APPENDIX I

SPECIFICATIONS

Serial Number:	17841			
Make:	Sakundiak			
Model:	HD7-41			
Dimensions:				
-- overall length along auger tube	12,700 mm (500 in)			
-- overall width	2040 mm (80.4 in)			
-- wheel tread	2040 mm (80.4 in)			
Auger Tube:				
-- inside diameter	170 mm (6.75 in)			
-- length inlet to outlet centres	12,255 mm (482 in)			
-- length of inlet	380 mm (15 in)			
-- size of outlet	(circular) 190 mm (7.5 in)			
Flighting:				
-- diameter	160 mm (6.25 in)			
-- pitch	155 mm (6.1 in)			
-- length of exposed intake flighting	330 mm (13 in)			
Elevating Height:				
-- maximum (39°)	7595 mm (299 in)			
-- minimum (14°)	2895 mm (114 in)			
Lubrication:				
-- number of pressure fittings				
-- oil bath gear box				
-- number of prelubricated bearings				
-- wheels	packed			
Drive:				
-- PTO/flighting speed ratio	1.11			
-- number of V-belts				
(a) engine type	2			
(b) power take-off drive	2			
-- number of roller chains	1			
-- number of gear boxes	1			
Winch:				
-- make and model	manufacturer's design (windlass)			
-- average cable wind	135 mm/turn (5.4 in/turn)			
-- turning torque (maximum)	27 N.m (19.5 ft.tb)			
Tires:	2-G78x15			
Inlet Safety Shield:				
-- grille openings	65 x 100 mm (2.5 x 4.0 in) approx.			
-- overall size	240 x 290 mm (9.5 x 11.5 in)			
Weight (PTO Drive):				
-- left wheel	200	(440)	188	(414)
-- right wheel	190	(418)	194	(427)
-- hitch point	18	(40)	26	(57)
	408 kg	(898 lb)	408 kg	(898 lb)
Optional Equipment:	1220 mm (48 in) flex spout, 535 x 1070 mm (21 x 42 in) hopper, gasoline engine.			



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