

Evaluation Report

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Brandt Auger Kleen

A Co-operative Program Between



BRANDT AUGER KLEEN

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RETAIL PRICE:

\$1,450 (February, 1978, f.o.b. Regina)

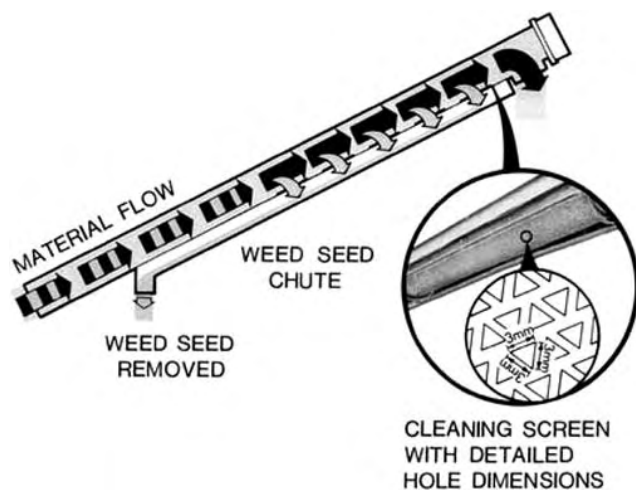


FIGURE 1. Brandt Auger Klean.

SUMMARY AND CONCLUSIONS

The Brandt Auger Klean was effective both in conveying grain and in removing small weed seeds from grain during normal conveying. Cleaning effectiveness depended upon weed seed type, flighting speed, auger elevation and inlet gate opening. At 30° elevation with a 50 mm (2 in) inlet gate opening while conveying dry wheat, the Auger Klean removed up to 38% of the wild buckwheat and up to 84% of the millet seeds in the wheat, in a single pass. Cleaning effectiveness was lower, with larger weed seeds, or with small weed seeds at low elevation angles.

At the manufacturer's recommended flighting speed of 630 rpm at 30° elevation, corresponding to a lift of 5.21 m (17 ft), the capacity of the Auger Klean was; 47.9 t/h (1760 bu/h) in wheat; 34.7 t/h (2390 bu/h) in oats and 40.0 t/h (1595 bu/h) in corn. Power requirements ranged from 2.3 to 6.3 kW (3.1 to 9.3 hp). Capacity and power depended on auger speed and angle of elevation as well as on the moisture content and type of grain.

Grain damage in dry wheat was insignificant for a single pass through the Auger Klean. Germination test results, on samples of malting barley passed through the Auger Klean, indicated that a single pass did not significantly affect the malting properties of the grain.

The Brandt was easy to handle and convenient to operate. The input shaft of the auger gearbox failed, during the test, and was replaced.

The Auger Klean had several potential safety hazards. Guards were not provided for the drive belt pulleys and auger inlet. Extra weight was required on the intake end to prevent the auger from upending when raised near maximum elevation.

RECOMMENDATIONS

It is recommended that the manufacturer consider

1. Modifications to prevent the auger from upending when operating at or near maximum elevation.
2. Providing appropriate shields and warning signs to protect and caution against unsafe practices and danger areas.
3. Modifications to the existing decal, indicating that the auger should be operated at maximum elevation for best cleaning results.
4. Modifications to provide a more secure elevating stop on the auger support guides.
5. Providing a flexible weed seed discharge chute with a suitable bag attachment device as standard equipment, to allow convenient collection of weed seeds.
6. Providing a suitable operator's manual.

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Project Technologist -- P. H. Perk

THE MANUFACTURER STATES THAT

With regard to recommendation number

1. Modifications have been made to the undercarriage eliminating the upending at maximum elevation.
2. All Brandt augers will be equipped with pulley guards and all appropriate warning and safety decals as prescribed by industry standards in 1979.
3. This recommendation has been incorporated in the new decal.
4. This recommendation has already been taken under consideration. Brandt will make a suitable change to secure the elevating stop on the auger support guides.
5. This recommendation has also been taken under consideration. Brandt will develop a suitable collection chute as standard equipment.
6. Brandt Machine has developed an operators manual which will include complete set up instructions, operating instructions, parts list, warranty and will be provided with all augers in 1979 production.

MANUFACTURER'S ADDITIONAL COMMENTS:

The Brandt Auger Klean will not be available in 1979, as the manufacturer is conducting further tests on the multitude of applications of the product.

GENERAL DESCRIPTION

The Brandt Auger Klean (FIGURE 1) is a nominal 180 mm (7 in) diameter, 10.7 m (35 ft) long portable screw conveyor with a screened conveyor tube, designed to remove small weed seeds from grain during conveying. The conveyor tube is mounted on a tubular frame supported by a single axle with two wheels. Five rolled perforated steel screens with 3 mm triangular holes (FIGURE 1) form the underside of the conveyor tube. A sheet metal chute, attached below the screens directs the screenings to the ground.

Discharge height is varied with a crank operated cable winch. The auger flight is supported by bearings at both the intake and outlet ends. An adjustable inlet gate may be positioned to vary the length of exposed auger inlet.

The Brandt Auger Klean may be powered with a tractor power take-off, stationary engine or an electric motor, using the same mounting arrangement. The engine attaches to a self-levelling mount near the axle with power transmitted through two 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 Auger Klean was operated for about ten hours while conveying wheat, oats and corn and while removing millet, rapeseed and wild buckwheat from wheat. In addition, it was transported over gravel and paved roads for about 50 km (30 miles). It was evaluated for ease of operation and adjustment, rate of work, power

requirements, cleaning performance, grain damage, operator safety and suitability of the operator's manual.

RESULTS AND DISCUSSION

EASE OF OPERATION AND ADJUSTMENT

Discharge Height: The discharge height could be varied from 2.3 to 5.3 m (7.5 to 17.3 ft) with a crank operated, cable winch. Elevating the auger was easy, and required a maximum winch handle force of 54 N (12 lb) with the auger empty and the lifting mechanism well lubricated. The winch was conveniently located. It took about 44 turns of the winch crank to fully raise or lower the auger.

Auger Reach: Horizontal reach and clearance of the Brandt are shown in FIGURE 2. Horizontal reach, measured from the top of the front supports to the outlet varied from 1.2 m (4.0 ft) at 12° to 3.4 m (11.0 ft) at maximum elevation. Clearance, measured from the tire to the outlet, varied from 3.6 to 3.5 m (11.9 to 11.5 ft).

Hitch weight varied from 18 kg (40 lb) at minimum elevation to minus 7 kg (-20 lb) at maximum elevation.

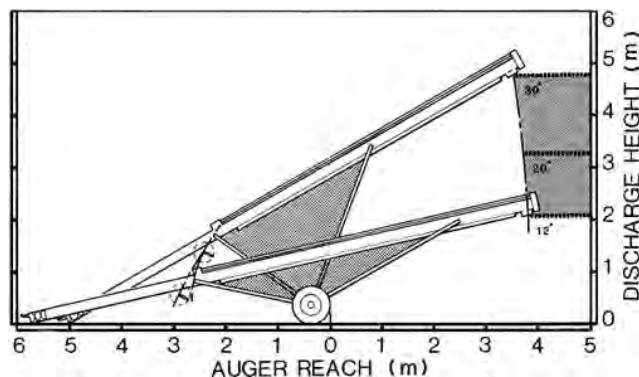


FIGURE 2. Auger Reach at Various Discharge Heights.

Adjustments: A convenient slotted lever was supplied for adjusting the drive belt tension for either engine or power takeoff applications.

The length of effective auger intake could be varied by moving a gate intake cover.

Transporting: The Brandt 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. A fixed clevis hitch at the inlet end, when used with a proper hitch pin, provided a reliable connection. It is recommended that the operator use a suitable safety chain to prevent accidental unhitching when transporting on public roads. Transport height, with the auger fully lowered, was about 2.7 m (9 ft), providing adequate clearance under power lines.

RATE OF WORK

Capacity: FIGURE 3 shows the capacity of the Auger Kleen in dry wheat over the full range of auger elevations and over a range of flying speeds from 500 to 800 rpm, with a fully open inlet completely submerged in grain. Maximum capacities ranged from 56.2 t/h (2060 bu/h), at the minimum elevation of 12° to 47.9 t/h (1760 bu/h) at an elevation of 30°. Maximum capacity occurred within an auger flying speed range from 575 to 680 rpm.

FIGURE 4 shows capacities of the Brandt Auger Kleen in dry wheat, oats and corn at an elevation angle of 30°. Maximum capacities were 47.9, 34.7 and 40.8 t/h (1760, 2400 and 1600 bu/h) for wheat, oats and corn respectively. Maximum capacities occurred at flying speeds ranging from 500 to 675 rpm. Lower capacities can be expected in tough or damp grain at normal operating speeds.

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 5 shows the specific capacity of the Brandt Auger Kleen, per metre of vertical lift, in dry wheat, oats and corn at an auger elevation of 30°. Specific capacity ranged from 1.4 to 2.6 t/kW-h. Lower specific capacities can be expected for tough or damp grain.

Critical Speeds: As indicated in FIGURES 3 and 4, maximum capacities occurred at a certain flying speed for each grain and

elevation angle. In general, suitable speeds were about 680, 600 and 550 rpm in wheat, oats and corn respectively. In addition, at certain critical speeds, unusual flying 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 this critical speed.

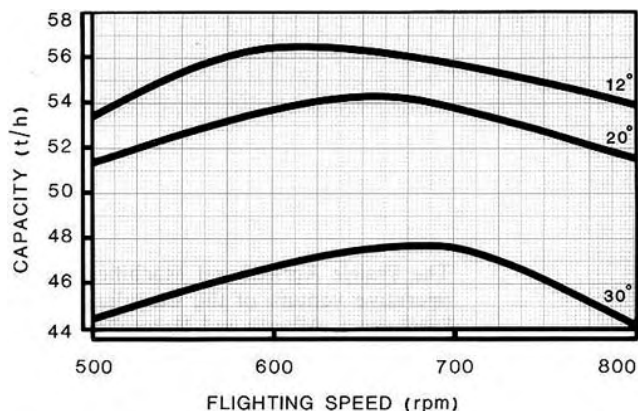


FIGURE 3. Capacity in Dry Wheat.

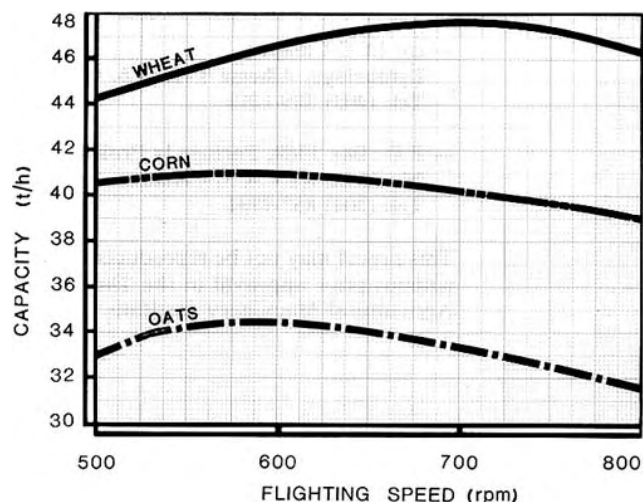


FIGURE 4. Capacities at 30° Elevation.

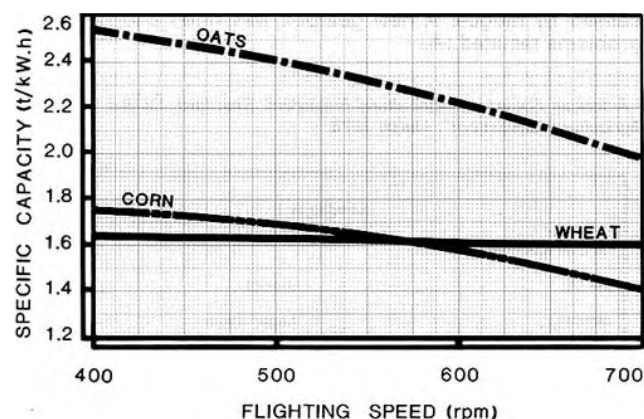


FIGURE 5. Specific Capacities per Metre of Vertical Lift.

POWER REQUIREMENTS

FIGURE 6 shows the power requirements for the Brandt in dry wheat, oats and corn for an elevation angle of 30°. More power would be needed to auger grain with higher moisture content or in unusual conditions. In general, a 10 kW (14 hp) engine would have ample power to operate the Brandt at maximum capacity in most conditions.

CLEANING PERFORMANCE

Flying Speeds: FIGURE 7 shows the effectiveness of the

Brandt Auger Kleen in removing small weed seeds from wheat, during normal conveying, at maximum elevation of 30° with the inlet gate fully open. These data were obtained while conveying dry wheat with a weed seed concentration of about 5% by weight. The three curves are for wheat contaminated with millet, rapeseed and wild buckwheat, respectively.

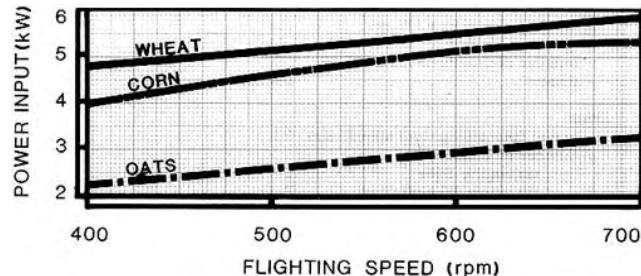


FIGURE 6. Power Requirements at 30° Elevation.

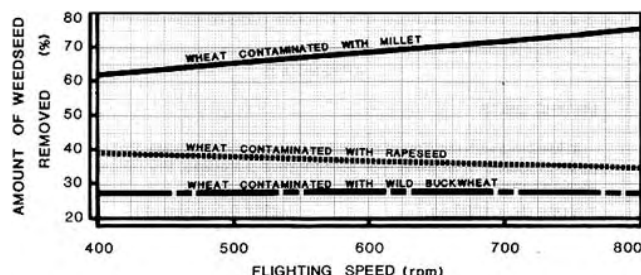


FIGURE 7. Cleaning Effectiveness Over a Range of Flying Speeds with Inlet Gate Fully Open at 30° Auger Elevation.

In wheat, contaminated with 5% millet, the Auger Kleen removed from 62 to 70% of the millet over a range of flying speeds from 400 to 800 rpm, with the most effective cleaning occurring at 800 rpm. Speeds above 800 rpm did not significantly improve cleaning performance in millet. In wheat contaminated with rapeseed or with wild buckwheat, maximum cleaning effectiveness occurred at 480 and 500 rpm, respectively. At these speeds, the Auger Kleen removed about 40% of the rapeseed and about 30% of the wild buckwheat in a single pass.

Variations in weed seed concentration, in the range below 5%, had no significant effect on cleaning effectiveness. Best cleaning performance was with the Auger Kleen set at maximum elevation. At low elevation, the cleaning chute tended to plug.

Inlet Gate Setting: Cleaning effectiveness could be increased by closing the inlet gate (FIGURE 8) to reduce the conveying rate.



FIGURE 8. Gate Opening.

FIGURE 9 shows cleaning effectiveness at 30° elevation, over a range of inlet gate openings, when operating at optimum flying speeds of 800, 480 and 500 rpm in wheat contaminated with millet, rapeseed and wild buckwheat, respectively.

The inlet gate opening could be varied from 0 to 300 mm (0 to 12 in). Maximum cleaning effectiveness occurred with the inlet gate nearly closed. For example, with a gate opening of only 50 mm (2 in), the amount of weed seed removal from wheat, for a single pass through the Auger Kleen was increased to 84% with millet,

51% with rapeseed and 38% with wild buckwheat. Closing the inlet gate from 300 to 50 mm (12 to 2 in) reduced the conveying rate by about 60%.

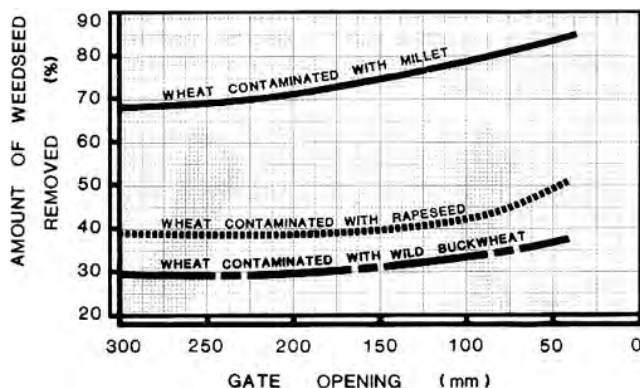


FIGURE 9. Cleaning Effectiveness Over a Range of Inlet Gate Openings at Optimum Flying Speed and at 30° Auger Elevation.

Weed Seed Collection: Weed seeds removed by the Auger Kleen fell into a conveying chute and were delivered to the ground at the lower auger end. (Collection of weed seeds was difficult.) It is recommended that the manufacturer modify the discharge chute and provide a suitable bag attachment device, as standard equipment, to allow convenient collection of weed seeds.

Grain Damage: Grain damage, in dry wheat (13% moisture content) was less than 0.2% for each pass through the Brandt Auger Kleen. This was insignificant as long as the same grain was not augered many times. Cracking at higher moisture contents would be lower. Damage to malting barley, based on germination tests, was insignificant for a single pass through the Auger Kleen.

OPERATOR SAFETY

When the Brandt Auger Kleen was operated near maximum elevation, additional weight was needed on the intake end to prevent the auger from upending. The tendency to upend was greater when the auger was full of grain. It is recommended that modifications be considered to prevent the Auger Kleen from upending.

Some features of the Brandt did not meet current auger safety recommendations.¹ No inlet guard was provided (FIGURE 10). The exposed nip-points on the belt drive posed a potential hazard that could be reduced with appropriate safety shields.

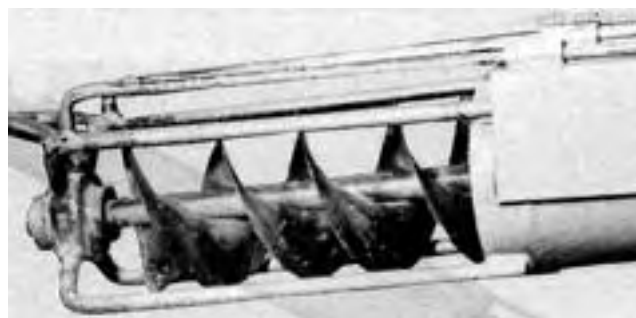


FIGURE 10. Exposed Auger Intake.

As with all augers, care should be exercised when operating around overhead power lines or when towing at high speed on curves or rough roads.

Appropriate caution signs were not supplied with the Brandt Auger Kleen.

OPERATOR'S MANUAL

No operator's manual was available for the Auger Kleen.

A factory-installed decal stated that an elevation of 45° was possible. Attempting to raise the auger beyond 30° caused the stop bolt to force the front support rollers from their guides. The conveying tube then fell onto the cross member below (FIGURE 11). It is recommended that the stop be modified to prevent similar

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

occurrences and that an appropriate decal and operator's manual be supplied.



FIGURE 11. Damage to Conveyor Tube Front Supports when Attempting to Raise the Auger Kleen higher than 30°.

DURABILITY RESULTS

The Brandt Auger Kleen was operated for about 10 hours. The intent of the test was an evaluation of functional performance and no extended durability evaluation was conducted. The gearbox input shaft failed after seven hours of operation. The failure was caused by fatigue. A new gearbox was fitted and no further problems resulted.

APPENDIX I SPECIFICATIONS

MAKE:	Brandt	
MODEL:	Auger Kleen	
SERIAL NUMBER:	26231	
Dimensions:		
-- overall length along auger tube	10,668 mm (420 in)	
-- overall width	2414 mm (95 in)	
-- wheel tread	2220 mm (87 in)	
Auger Tube:		
-- inside diameter	170 mm (6.7 in)	
-- length inlet to outlet centres 1	0,285 mm (405 in)	
-- length of inlet	305 mm (12 in)	
-- size of outlet (oval) 1	59 x 190 mm (6.25 x 7.5 in)	
Cleaning Screens:		
-- number of screens	5	
-- length/screen	915 mm (36 in)	
-- hole shape	triangular	
-- hole area	3.5 mm ² (0.05 in ²)	
-- open screen area	24.5%	
-- open auger tube area	8%	
Flighting:		
-- diameter	150 mm (6 in)	
-- pitch		
--exposed	70 mm (2.8 in)	
--in auger tube	140 mm (5.5 in)	
-- length of exposed intake flighting (adjustable)	0 to 305 mm (0 to 12 in)	
Elevating Height:		
-- maximum (30°)	5260 mm (207 in)	
--minimum (12°)	2130 mm (84 in)	
Lubrication:		
-- number of pressure fittings	5	
-- oil bath gear box	1	
-- number of prelubricated bearings	3	
-- wheels	packed	
Drive:		
-- power take-off/flighting speed ratio	1.1	
-- number of V-belts		
--engine drive	2	
--power take-off drive	2	
-- number of roller chains	1	
-- number of gear boxes	1	
Winch:		
-- manufacturer	Dutton-Lainson Co.	
-- model	B 1200	
-- average cable wind	50 mm (2 in) per turn	
-- turning torque	16 N•m (12 ft•lb)	
Tires: 2 - H78 x 15		
Weight (PTO Drive):		
	Raised	Lowered
-- left wheel	209 (460)	206 (450)
-- right wheel	218 (480)	196 (430)
-- hitch point	-7 (-20)	18 (40)
-- total	420 kg (920 lb)	420 kg (920 lb)
Optional Equipment:		Flexible discharge spout PTO drive kit.

APPENDIX II METRIC UNITS

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

1 tonne (t)	= 1000 kg	= 2204.6 pounds (lb)
1 metre (m)	= 1000 mm = 3.28 feet (ft)	= 39.37 inches (in)
1 kilowatt (kW)		= 1.34 horsepower (hp)
1 kilogram (kg)		= 2.2 pounds mass (lb)
1 newton (N)		= 0.22 pounds force (lb)



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