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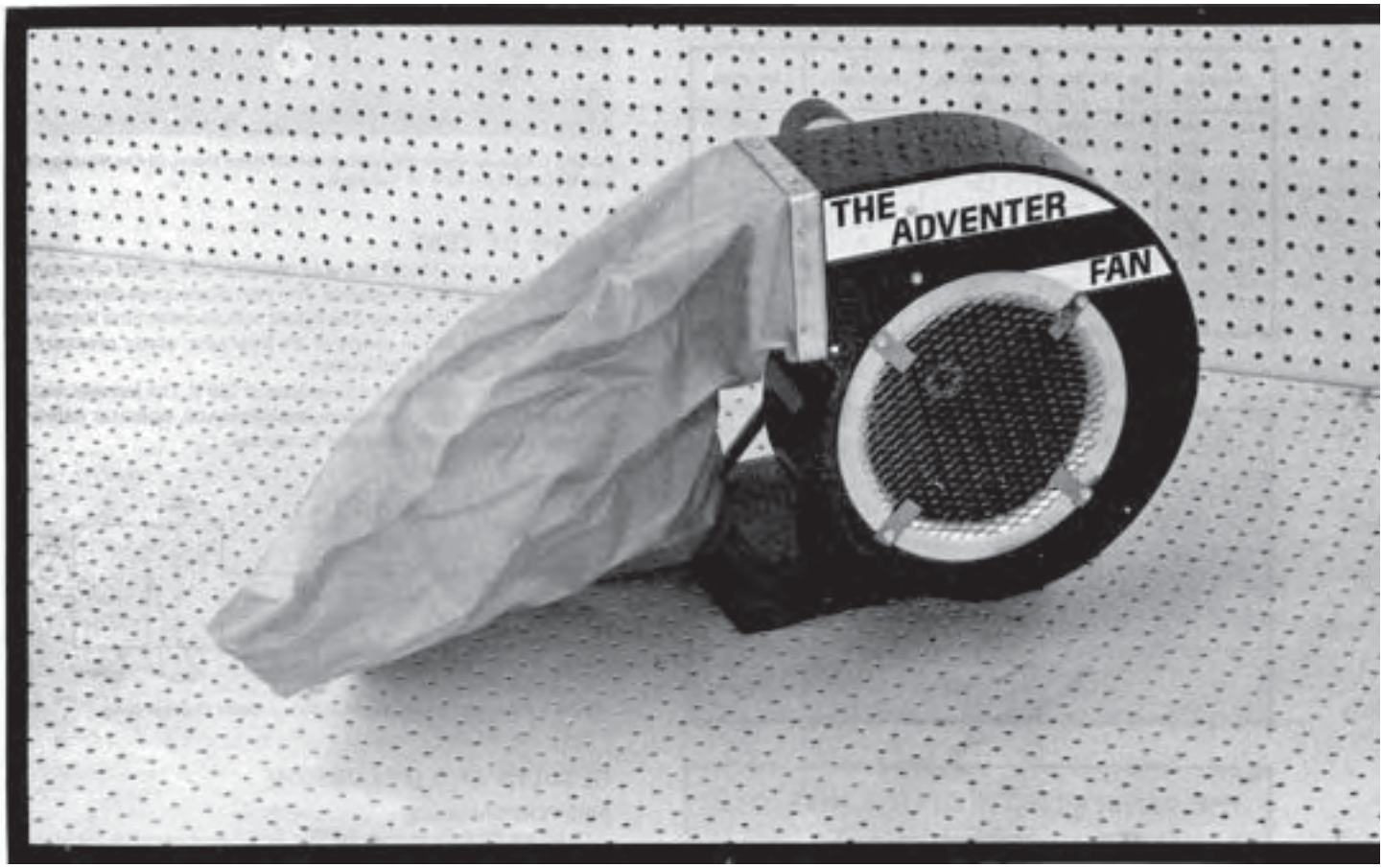
Evaluation Report 511



Advantor Model B-2 Aeration Fan

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

ADVANTOR MODEL B-2 AERATION FAN

MANUFACTURER:
All Size Perforating Limited
P.O. Box 1441
Winkler, Manitoba
R0G 2X0

DISTRIBUTOR:
Federated Co-op
P.O. Box 1050
Saskatoon, Saskatchewan
S7K 3M9

RETAIL PRICE:
$517.00 (November, 1986, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Advantor Model B-2 Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Power Consumption	Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kWh	%	rpm
1.0	(249)	1230	(581)	2.40	18	3469
1.5	(374)	1200	(566)	2.32	35	3475
2.0	(498)	1120	(529)	2.12	35	349O
2.5	(623)	1020	(481)	1.92	35	3504
3.0	(747)	940	(444)	1.76	35	3516
3.5	(872)	862	(407)	1.63	35	3527
4.0	(996)	773	(365)	1.48	35	3537
4.5	(1121)	654	(309)	1.30	34	3547
5.0	(1246)	493	(233)	1.08	30	3557
5.5	(1370)	295	(139)	0.84	19	3565
6.1	(1520)	57	(27)	0.65	7	3582

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a table or curve of air flow rates over a complete range of static pressures.
2. Supplying a detailed manual containing information on installation, maintenance, rated performance, safety aspects and trouble shooting.

Project Manager: R. P. Atkins

Project Engineer: K. Shimek

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A performance curve or chart will be supplied with each blower.
2. An operator's manual will be included, containing information on installation, maintenance, rated performance, safety aspects and trouble shooting.

GENERAL DESCRIPTION

The Advantor Model B-2 is a 7.5 in (191 mm) diameter, single speed, direct drive, centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Advantor Model B-2 is equipped with an expanded metal guard grill, an inlet bell and fibre reinforced PVC cloth transition. The steel impeller consists of a hub backplate, 40 forward curved blades and a flange. The impeller is directly mounted on the 2 hp (1.49 kW), single phase, 230 V electric motor. The fan housing, motor mount, and supports are of steel construction with a painted finish for corrosion protection.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Advantor Model B-2 was tested in the outlet chamber setup (FIGURE 2) in accordance with test procedures developed by the Machinery Institute. The intent was to determine the performance of the fan in terms of air flow rate, static pressure, input power and total efficiency.

Fan performance was determined at 230 V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

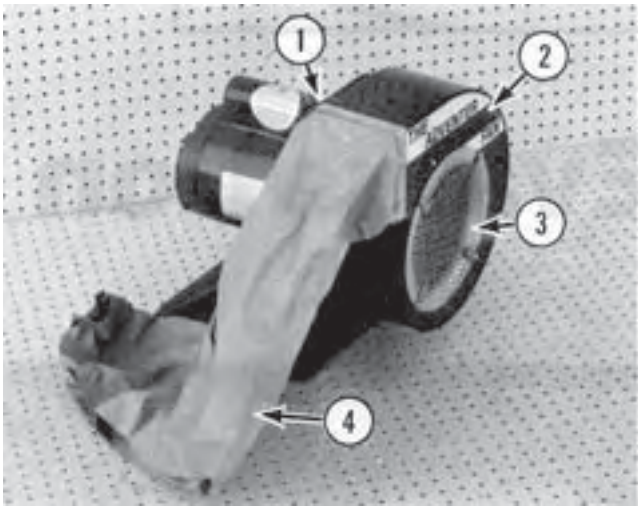


FIGURE 1. Advantor Model B-2 Aeration Fan: (1) Motor Mount, (2) Fan Housing, (3) Inlet Bell and Guard Grill, (4) Transition.

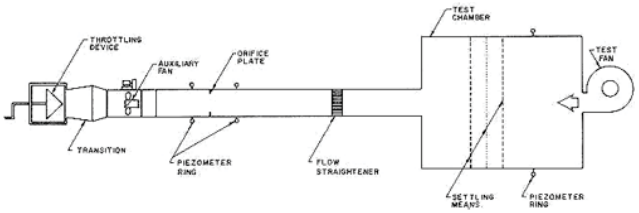


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air[1] conditions so that direct comparisons can be made with other fan test reports. Fan performance under actual operating conditions could differ from these results by up to 10%, depending on such things as temperature, barometric pressure, humidity and elevation above sea level.

Air Flow Rate: Fan output at typical levels of operation (i.e. static pressure[2]) are given in TABLE 1. The air flow rate ranged from 57 cfm (27 L/s) at 6.1 in wg (1520 Pa) to 1230 cfm (581 L/s) at 1.0 in wg (249 Pa). Performance below 1 in wg (249 Pa) became very unstable which is characteristic of a forward curved centrifugal fan. FIGURE 3 illustrates the fan performance curves for the Advantor Model B-2.

Power Consumption: The power consumption numbers given in TABLE 1 can be used to calculate the cost of operating the fan. To calculate the cost of fan operation, multiply the power consumption (kW) by the number of hours of fan operation times the cost per kilowatt hour.

The power consumed by the fan depended upon the point of operation of the fan. The power consumption varied from 0.65 kW at maximum static pressure and minimum air flow rate to 2.40 kW at 1.0 in wg (249 Pa) static pressure and an air flow rate of 1230 cfm (581 L/s). The maximum amperage drawn by the motor was 9.6 amps, which was less than the rated motor amperage of 10.5 amps.

Total Efficiency: Total efficiency is the ratio of air horsepower over the input power. Air horsepower is dependent upon the air flow rate and corresponding total pressure. For typical levels of operation, the total efficiency (TABLE 1) ranged from 7 to 35%. The maximum total efficiency of 35% occurred at 1200 cfm (566 L/s) at a static pressure of 1.5 in wg (374 Pa).

EASE OF OPERATION

Maintenance: The inlet screen was easily removed which

[1]Standard air is air with a density of 0.075 lbm/ft³ (1.2 kg/m³), which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

[2]Static pressure is a measure of the pressure difference between the pressure inside the building and the pressure on the outside of the building. Static pressure is usually expressed in inches of water gauge (in wg) or Pascals (Pa).

allowed for cleaning of the wheel and fan housing. No other maintenance was required.

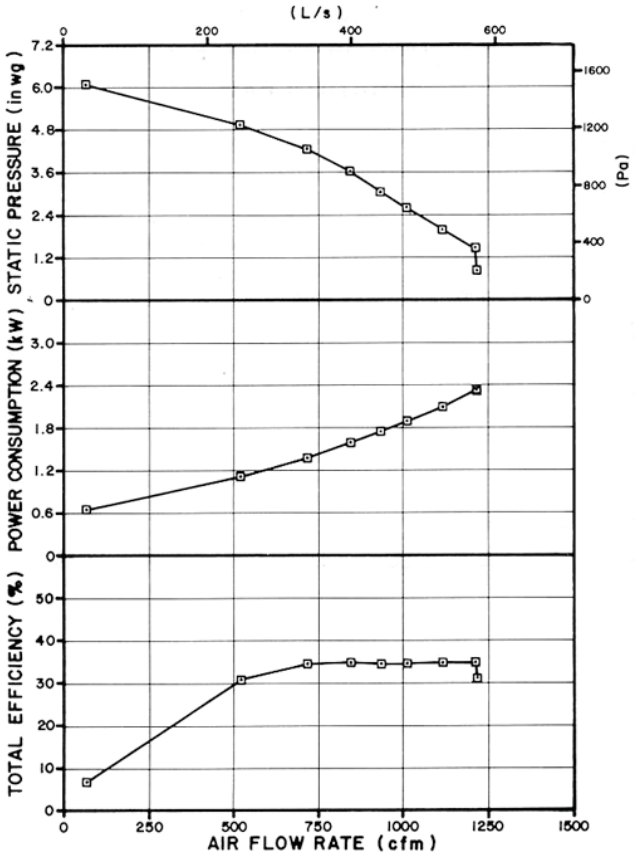


FIGURE 3. Advantor Model B-2 Fan Performance Curves.

OPERATOR SAFETY

The guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Advantor Model B-2 was CSA approved.

The noise level of the Advantor Model B-2, at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 1.0 in wg (249 Pa) static pressure, was 83 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Advantor Model B-2 falls within range 3 of the PAMI noise level range classification (APPENDIX II).

The noise level produced by this fan can be considered annoying and be detrimental to hearing and operator performance under continuous exposure. Ear protection should be considered if working near the fan for prolonged periods.

OPERATOR'S MANUAL

The operator's instruction sheet contained information on installation and wiring. It is recommended that the manufacturer consider including information on maintenance, fan performance, and trouble shooting.

APPENDIX I
SPECIFICATIONS

MAKE:	Advantor
MODEL:	B-2
SERIAL NUMBER:	0201
MANUFACTURER:	All Size Perforating Limited P.O. Box 1441 Winkler, Manitoba R0G 2X0
OVERALL DIMENSIONS:	
-- housing width	13.0 in (330 mm)
-- housing depth	15.5 in (394 mm)
-- housing height	15.5 in (394 mm)
-- inlet bell diameter	6.25 in (159 mm)
-- guard grill diameter	7.5 in (191 mm)
-- grill opening	10.0 in (254 mm) diameter wire, spaced at 10.0 in (254 mm) discharge opening 4.5 in (114 mm) by 4.6 in (117 mm)
IMPELLER:	
-- diameter	7.5 in (191 mm)
-- inside flange diameter	6.5 in (165 mm)
-- number of blades	40
-- blade angle	46 degrees
WEIGHT:	49.0 lb (22 kg)
MOTOR NAMEPLATE DATA:	
-- make	Century
-- model	B124
-- frame	M56C
-- class	B
-- type	CX
-- code	G
-- duty	Continuous
-- rpm	3450 rpm
-- service factor	1.20
-- ambient temperature rise	50°C
-- volts	230
-- amps	10.5
-- phase	1
-- cycles	60
-- horsepower	2 hp (1.49 kW)

APPENDIX II
NOISE LEVEL RANGES
SOUND LEVEL

Range	(dBA)	Comments
1	up to 45	Tolerable, low level background noise.
2	45 to 60	Dominating background noise that would interfere with normal conversation.
3	60 to 85	Could be annoying and be detrimental to hearing and operator performance under long-term continuous exposure. Ear protection should be considered.
4	over 85	Could damage hearing, depending on level and exposure time. Ear protection is definitely recommended.

APPENDIX III
CONVERSION TABLE

cubic feet/minute (cfm) x 0.472	= litres/second (L/s)
horsepower (hp) x 745.7	= watts (W)
inches (in) x 25.4	= millimetres (mm)
inches water gauge (in wg) x 249.1	= pascals (Pa)
pounds (lb) x 0.45	= kilograms (kg)

SUMMARY CHART
ADVANTOR MODEL B-2 AERATION FAN

RETAIL PRICE:	$517.00 (November, 1986, f.o.b. Lethbridge)
FAN DESCRIPTION:	7.5 in (191 mm) single speed, direct drive, 2 hp (1.49 kW) electric motor.
FAN SPEED:	3469 to 3582 rpm
MAXIMUM EFFICIENCY:	35%
AIR FLOW RATE:	
-range	57 to 1230 cfm (27 to 581 L/s)
-at maximum efficiency	1200 cfm (566 L/s) at a 1.5 in wg (374 Pa) static pressure
INPUT POWER:	0.65 to 2.40 kW
OPERATOR SAFETY:	guard grill provided, CSA approved noise level = 83 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	installation sheet

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