

# Evaluation Report

# 512



## Advantor Model F-3 Aeration Fan

A Co-operative Program Between



# ADVANTOR MODEL F-3 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:

\$625.95 (November, 1986, f.o.b. Lethbridge, Alberta).

## SUMMARY OF RESULTS

TABLE 1. Advantor Model F-3 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)	1400	(661)	2.80	27	3489
1.5	(374)	1290	(609)	2.54	27	3506
2.0	(498)	1220	(576)	2.36	28	3515
2.5	(623)	1140	(538)	2.19	29	3523
3.0	(747)	1060	(500)	2.03	31	3532
3.5	(872)	970	(458)	1.87	32	3540
4.0	(996)	871	(411)	1.69	32	3548
4.5	(1121)	753	(355)	1.50	32	3556
5.0	(1246)	519	(245)	1.21	26	3567
5.5	(1370)	223	(105)	0.85	17	3581
6.0	(1495)	148	(70)	0.80	12	3582
6.5	(1630)	66	(31)	0.75	7	3584

## 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 F-3 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 F-3 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 3 hp (2.24 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 F-3 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.

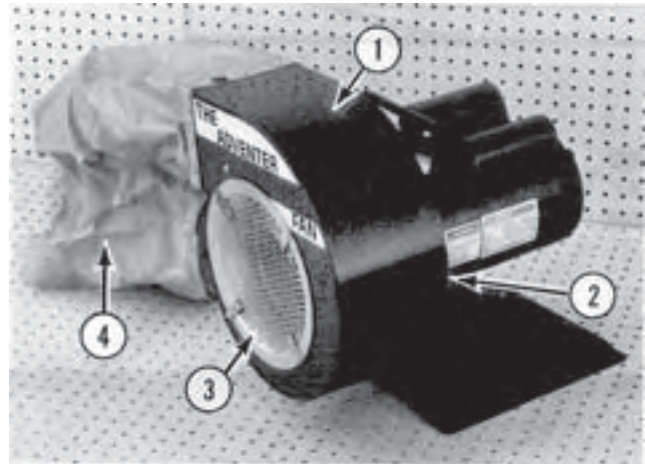


FIGURE 1. Advantor Model F-3 Aeration Fan: (1) Fan Housing, (2) Motor Mount, (3) Inlet Bell and Guard Grill, (4) Transition.

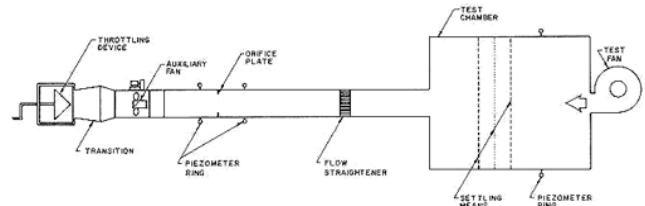


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

## RESULTS AND DISCUSSION

### FAN PERFORMANCE

All fan performance results in this report are given at standard air<sup>1</sup> 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<sup>2</sup>) are given in TABLE 1. The air flow rate ranged from 66 cfm (31 L/s) at 6.5 in wg (1630 Pa) to 1400 cfm (661 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 F-3.

**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 the 0.75 kW at maximum static pressure and minimum air flow rate to 2.8 kW at 1.0 in wg (249 Pa) static pressure and an air flow rate of 1400 cfm (661 L/s). The maximum amperage drawn by the motor was 12.14 amps, which was less than the rated motor amperage of 15.2 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 32%. The maximum total efficiency of 32% occurred at 970 cfm (458 L/s) at a static pressure of 3.5 in wg (872 Pa).

### EASE OF OPERATION

**Maintenance:** The inlet screen was easily removed which allowed for cleaning of the wheel and fan housing. No other maintenance was required.

<sup>1</sup>Standard air is air with a density of 0.075 lbm/ft<sup>3</sup> (1.2 kg/m<sup>3</sup>), which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

<sup>2</sup>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).

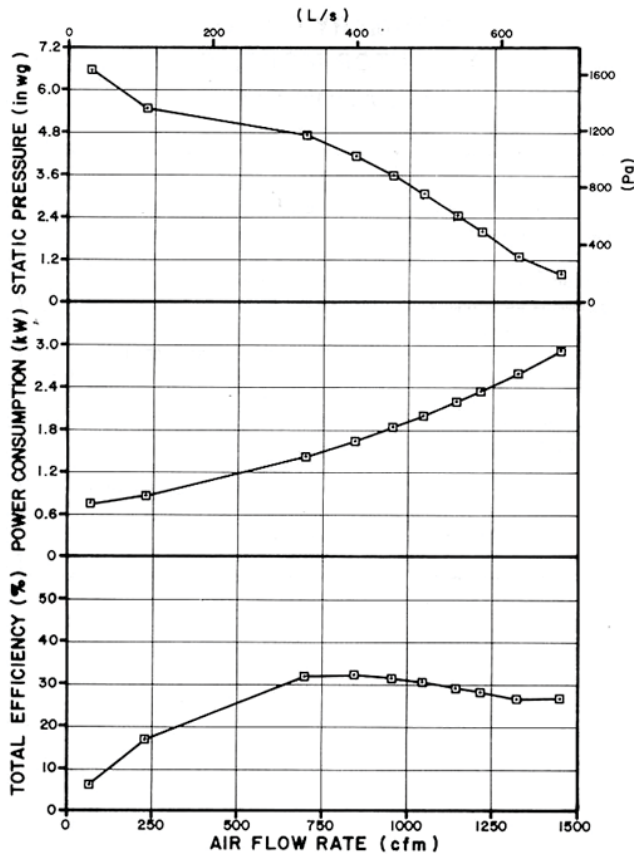


FIGURE 3. Advantor Model F-3 Fan Performance Curves.

### 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 F-3 was CSA approved.

The noise level of the Advantor Model F-3, 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 F-3 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	
<b>MAKE:</b>	Advantor
<b>MODEL:</b>	F-3
<b>SERIAL NUMBER:</b>	0145
<b>MANUFACTURER:</b>	All Size Perforating Limited P.O. Box 1441 Winkler, Manitoba R0G 2X0
<b>OVERALL DIMENSIONS:</b>	-- housing width 13.0 in (330 mm) -- housing depth 17.0 in (432 mm) -- housing height 15.75 in (400 mm) -- inlet bell diameter 6.125 in (156 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 5.5 in (140 mm) by 4.8 in (122 mm)
<b>IMPELLER:</b>	-- diameter 7.5 in (191 mm) -- inside flange diameter 6.5 in (165 mm) -- number of blades 40 -- blade angle 46 degrees
<b>WEIGHT:</b>	53.0 lb (24 kg)
<b>MOTOR NAMEPLATE DATA:</b>	-- make Century -- frame N56C -- class B -- type CP -- code F -- duty Continuous -- rpm 3450 rpm -- service factor 1.15 -- ambient temperature rise 40°C -- volts 230 -- amps 15.2 -- phase 1 -- cycles 60 -- horsepower 3 hp (2.24 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 F-3 AERATION FAN

<b>RETAIL PRICE:</b>	\$625.95 (November, 1986, f.o.b. Lethbridge)
<b>FAN DESCRIPTION:</b>	7.5 in (191 mm) single speed, direct drive, 3 hp (2.24 kW) electric motor.
<b>FAN SPEED:</b>	3489 to 3584 rpm
<b>MAXIMUM EFFICIENCY:</b>	32%
<b>AIR FLOW RATE:</b>	-- range 66 to 1400 cfm (31 to 661 L/s) -- at maximum efficiency 970 cfm (458 L/s) at a 3.5 in wg (872 Pa) static pressure
<b>INPUT POWER:</b>	0.75 to 2.80 kW
<b>OPERATOR SAFETY:</b>	guard grill provided, CSA approved noise level = 83 dB(A) at 4.9 ft (1.5 m) from fan inlet
<b>OPERATOR'S MANUAL:</b>	installation sheet



3000 College Drive South  
Lethbridge, Alberta, Canada T1K 1L6  
Telephone: (403) 329-1212  
FAX: (403) 329-5562  
<http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html>

### Prairie Agricultural Machinery Institute

Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0  
Telephone: (306) 682-2555

Test Stations:  
P.O. Box 1060  
Portage la Prairie, Manitoba, Canada R1N 3C5  
Telephone: (204) 239-5445  
Fax: (204) 239-7124

P.O. Box 1150  
Humboldt, Saskatchewan, Canada S0K 2A0  
Telephone: (306) 682-5033  
Fax: (306) 682-5080