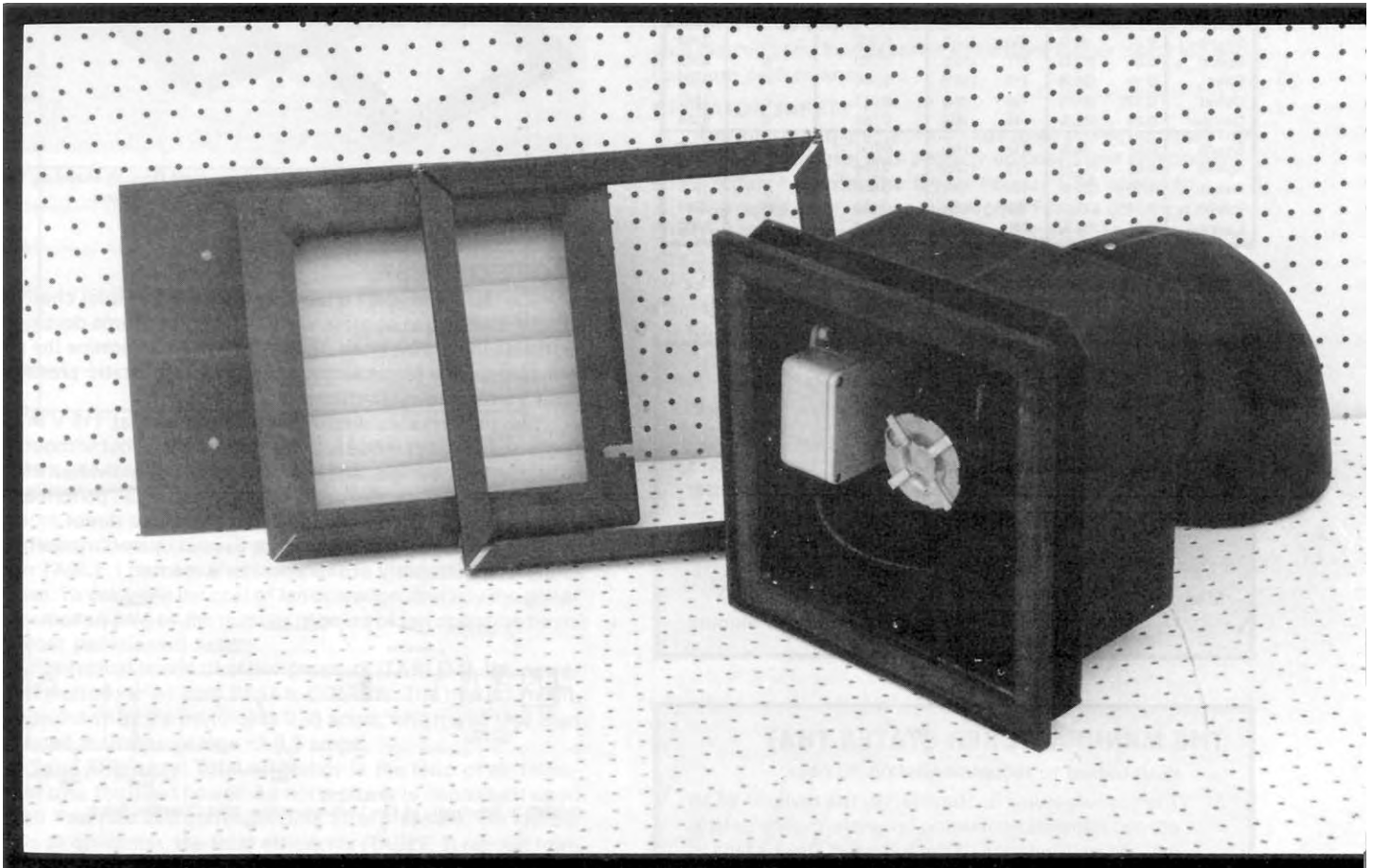


Evaluation Report

480



Del-Air Model F6 Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

DEL-AIR MODEL F6 VENTILATION FAN

MANUFACTURER AND DISTRIBUTOR:

Del-Air Systems Limited
P.O. Box 2500
Humboldt, Saskatchewan S0K 2A0

RETAIL PRICE:

\$255.00 (June, 1986, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Del-Air Model F6 Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE		AIR FLOW RATE		POWER CONSUMPTION	TOTAL EFFICIENCY	FAN SPEED
	in wg	(Pa)	cfm	(L/s)	kW	%	rpm
Single Speed Direct	0.0	(0.0)	357	(169)	0.058	12	3381
	0.05	(12.5)	339	(160)	0.057	15	3373
	0.10	(24.9)	321	(152)	0.057	15	3367
	0.125	(31.1)	306	(144)	0.059	15	3365
	0.25	(62.3)	204	(96)	0.058	12	3364
Single Speed Direct, Outlet Damper	0.0	(0.0)	298	(141)	0.058	7	3362
	0.05	(12.5)	277	(131)	0.060	8	3365
	0.10	(24.9)	213	(101)	0.055	7	3382
	0.125	(31.1)	199	(94)	0.057	7	3382
	0.25	(62.3)	145	(68)	0.059	8	3354
Single Speed Direct, Intake Louvres	0.0	(0.0)	313	(148)	0.057	8	3378
	0.05	(12.5)	272	(128)	0.056	8	3376
	0.10	(24.9)	190	(90)	0.056	6	3396
	0.125	(31.1)	182	(86)	0.055	6	3391
	0.25	(62.3)	140	(66)	0.057	8	3362

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.
2. Supplying a detailed operator's manual containing illustrations and information on general operation, installation, maintenance, rated performance, and trouble shooting.

Manager/Senior Engineer: E. H. Wiens

Project Engineer: K. Shimek

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The manufacturer is considering the revision of all printed material containing fan performance data to include performance of the 5 sizes of Del-Air fans at varying static pressures.
2. The manufacturer, at PAMI's suggestion, is preparing a detailed Operator's Manual to be included with each fan.

GENERAL DESCRIPTION

The Del-Air Model F6 ventilation fan is a 6.4 in (162 mm) diameter, single speed, direct drive, propeller type axial flow fan. It is primarily used in livestock and poultry barns as an exhaust fan located in the wall.

The Del-Air Model F6 is a flush mounted unit equipped with an inlet guard grill, mounting face plate, fan hood, optional PVC intake louvres, outlet butterfly damper, and insulated door. The fan hood is an integral part of the fan housing. The 5 blade propeller and hub are made of plastic and are mounted directly on a 0.5 amp, 115 V, single phase, high speed electric motor. The

motor mount consists of four steel wire struts bolted to the motor casing and the molded PVC fan housing. The steel inlet guard grill is plastic coated for corrosion protection.

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

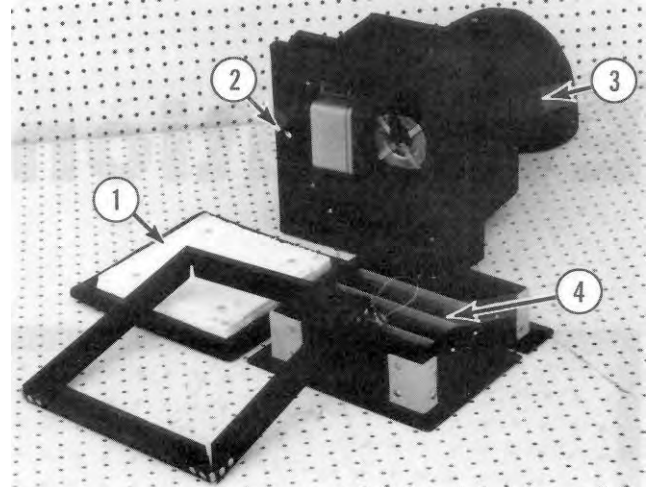


FIGURE 1. Del-Air Model F6 Ventilation Fan: (1) Insulated Door, (2) Mounting Face Plate, (3) Fan Hood and Outlet Butterfly Damper, (4) Intake Louvres.

SCOPE OF TEST

The Del-Air Model F6 fan was tested in the inlet 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 initially determined at 115 V in the single speed direct mode with the hood in place but without the outlet butterfly damper and intake louvres. The individual effect of both the outlet damper and intake louvres on fan performance were then also determined in the single speed direct mode.

The fan was also evaluated for ease of operation, operator safety and suitability of the operator's manual.

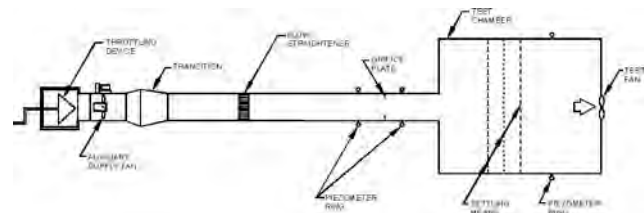


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air¹ 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: Air flow rates at typical levels of operation (i.e. static pressure²) are given in TABLE 1. Ventilation fans are often rated on their output at a static pressure of 0.125 in wg (31.1 Pa). PAMI's measured flow rate at this same condition was 306 cfm (144 L/s). There was no manufacturer's performance in-

¹Standard 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).

²Static 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).

formation provided. Since building ventilation design is possible over a range of static pressures, it is recommended that, for fan selection purposes, the manufacturer include a table or curve of air flow rates over a complete range of static pressures.

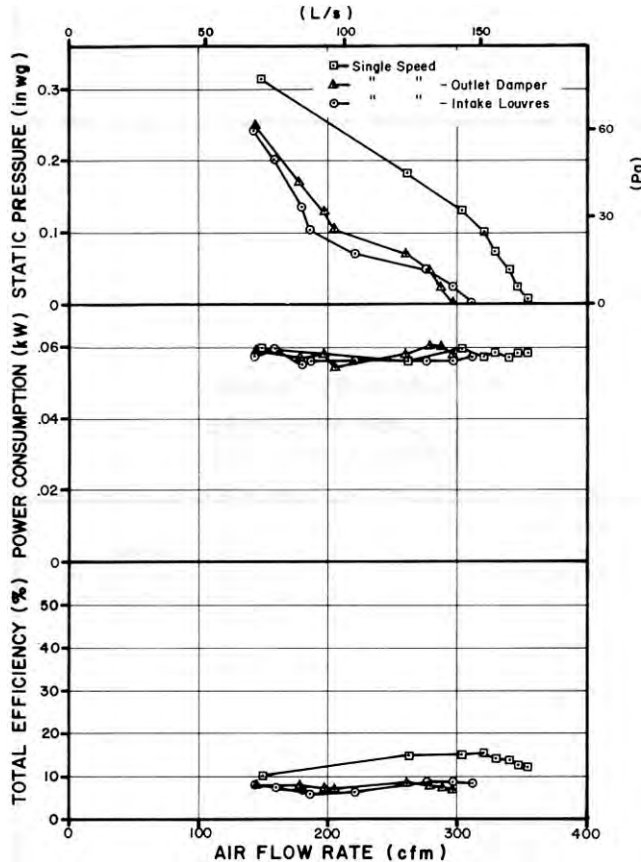


FIGURE 3. Del-Air Model F6 Fan Performance Curves. With and Without the Outlet Damper and Louvres, in the Single Speed Direct Mode.

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.

For typical levels of static pressure (TABLE 1), the power consumption varied from 0.057 to 0.059 kW. The maximum amperage drawn by the motor was 0.46 amps, which was less than the rated motor amperage of 0.5 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 12 to 15%. The total efficiency at a static pressure of 0.125 in wg (31.1 Pa), in the single speed direct mode, was 15%.

Effect of Outlet Butterfly Damper: The optional outlet butterfly damper was installed within the fan hood on the outlet side of the fan to determine its effect on fan output. The fan was tested under these conditions in the single speed direct mode only. Using the butterfly damper reduced the air flow rate by 16 to 35% (FIGURE 3) over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the damper reduced the air flow rate by 35%, from 306 to 199 cfm (144 to 94 L/s)(TABLE 1). The efficiency was in turn reduced from 15 to 7%.

Effect of Louvres: The optional intake louvres were installed on the intake side of the fan (FIGURE 4) to determine their effect on fan output. The fan was tested under these conditions in the single speed direct mode only. Using the louvres reduced the air flow rate by 12 to 41% (FIGURE 3) over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the louvres reduced the air flow rate by 38%, from 306

to 182 cfm (144 to 86 L/s) (TABLE 1). The efficiency was in turn reduced from 15 to 6%.

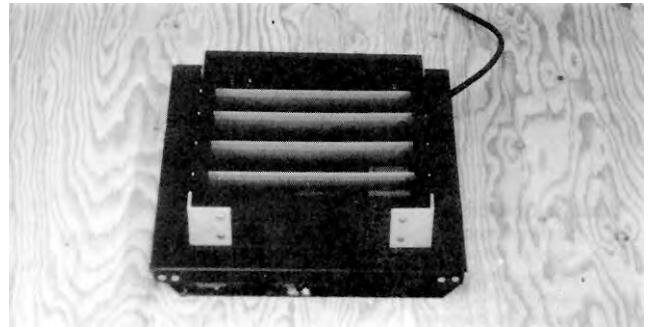


FIGURE 4. Louvres Located on Fan Intake.

EASE OF OPERATION

Maintenance: The inlet guard grill, motor mount and motor could all be easily removed for cleaning. Regularly scheduled cleaning and maintenance will ensure longer motor life and optimum performance.

OPERATOR SAFETY

The inlet guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Model F6 was CSA approved.

The noise level range of the Model F6, at a distance of 4.9 ft (1.5 m) from the centre of the fan discharge, while operating at a 0.125 in wg (31.1 Pa) static pressure, was 66 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Model F6 falls within range 3 of the PAMI noise level 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 of the fan. It is recommended that the manufacturer supply a detailed manual containing illustrations and information on general operation, installation, maintenance, rated performance, safety aspects and trouble shooting.

APPENDIX I

SPECIFICATIONS

MAKE: Del-Air
MODEL: F6
SERIAL NUMBER: FE6-014
MANUFACTURER: Del-Air Systems Limited
 P.O. Box 2500
 Humboldt, Saskatchewan
 S0K 2A0

OVERALL DIMENSIONS:
 housing width 11.8 in (298 mm)
 housing height 11.7 in (297 mm)
 housing length 21.4 in (543 mm)
 housing diameter 6.3 in (160 mm)
 guard grill diameter 6.5 in (165 mm)
 grill opening 0.2 in (5 mm) wire spaced at
 1 in (25 mm)

IMPELLERS:
 diameter 6.4 in (167 mm)
 hub diameter 2 in (51 mm)
 number of blades 5
 blade angle variable - 28° at tip, 35° at hub

WEIGHT: 11 lb (5 kg)

MOTOR NAMEPLATE DATA:
 make Fasco
 model 7162-1336
 type U62
 rpm 3400
 volts 115 V
 amps 0.5 A
 cycles 60 Hz

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 = millimeters (mm)
 inches water gauge (in wg) x 249.1 = pascals (Pa)
 pounds (lb) x 0.45 = kilograms (kg)

**SUMMARY CHART
 DEL-AIR MODEL F6
 VENTILATION FAN**

RETAIL PRICE: \$255.00
 (June, 1986, f.o.b. Lethbridge)

FAN DESCRIPTION: 6.375 in (162 mm) propeller fan, single speed, direct drive, 0.5 A, 115 V electric motor

FAN SPEED:
 - single speed direct 3364 to 3381 rpm

EFFICIENCY RANGE:
 - without damper or louvres 12 to 15%
 - with damper 7 to 8%
 - with louvres 6 to 8%

EFFICIENCY AT 0.125 in wg (31.1 Pa):
 - without damper or louvres 15%
 - with damper 7%
 - with louvres 6%

AIR FLOW RATE:
 - range 140 to 357 cfm (66 to 169 L/s)
 - at 0.125 in wg (31.1 Pa) 306 cfm (144 L/s) without dampers or louvres
 199 cfm (94 L/s) with dampers
 182 cfm (86 L/s) with louvres

POWER CONSUMPTION: 0.057 to 0.059 kW

OPERATOR SAFETY: inlet guard provided
 CSA approved
 noise level = 66 dB(A) at 4.9 ft (1.5 m) from fan discharge

OPERATOR'S MANUAL: installation instructions only.

APPENDIX II

NOISE LEVELS

RANGE	SOUND LEVEL (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.



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