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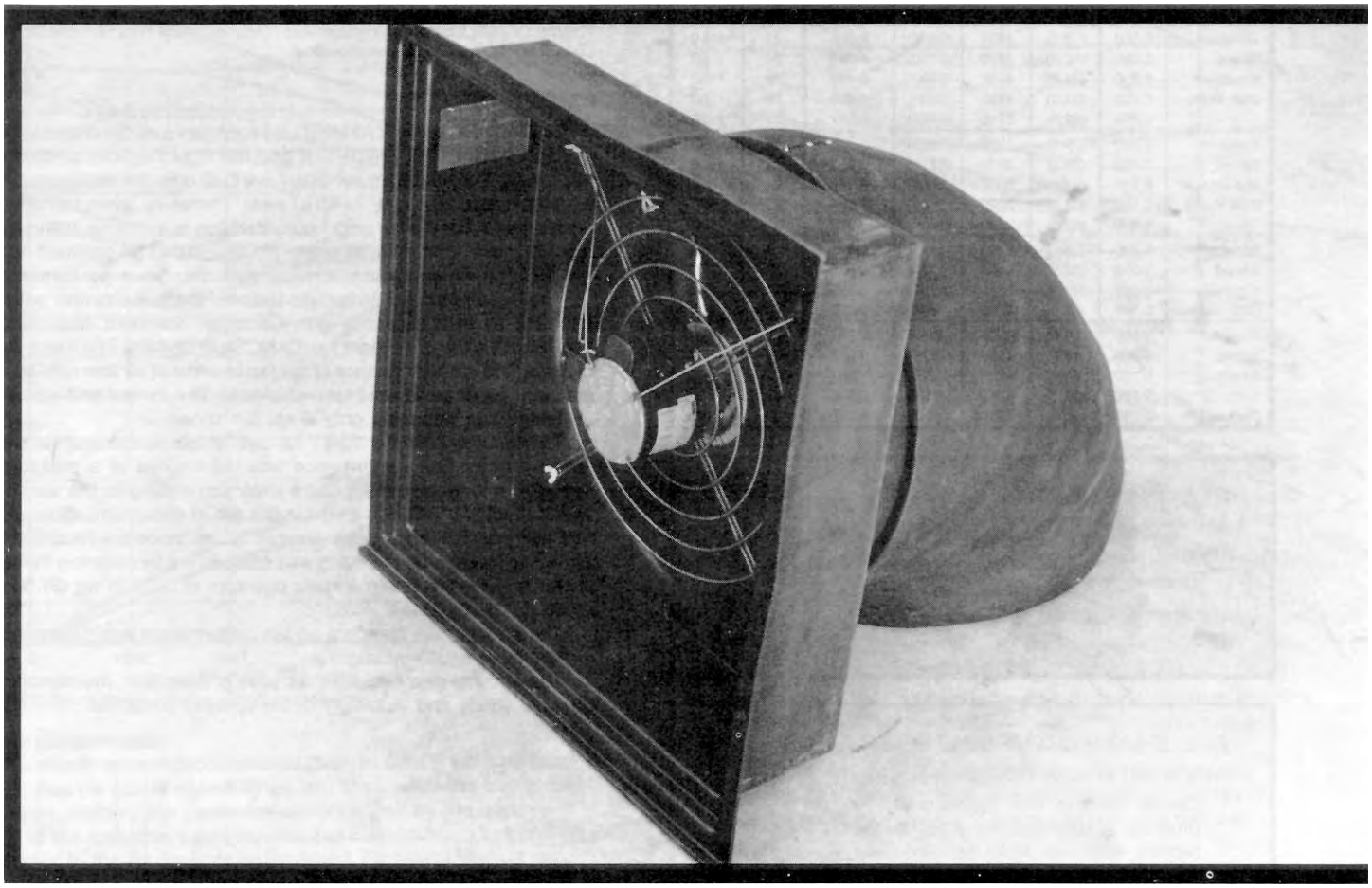

Del-Air Model J-24 Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

DEL-AIR MODEL J-24 VENTILATION FAN

MANUFACTURER AND DISTRIBUTOR:

Del-Air Systems Ltd.
P.O. Box 2500
Humboldt, Saskatchewan
S0K 2A0
Phone: (306) 682-5011

RETAIL PRICE: $756 (January 1991, f.o.b., Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Del-Air Model J-24 Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE in wg	(Pa)	AIR FLOW RATE cfm	(L/S)	INPUT POWER kW	TOTAL EFF. %	FAN SPEED rpm
Single	0.000	(0.0)	4900	(2310)	0.379	20	1090
Speed	0.050	(12.5)	4660	(2200)	0.378	25	1100
Direct	0.100	(24.9)	4340	(2050)	0.371	28	1100
	0.125	(31.1)	4160	(1960)	0.366	29	1100
	0.250	(62.3)	3140	(1480)	0.350	31	1110
Variable	0.000	(0.0)	4930	(2330)	0.391	20	1110
Speed	0.050	(12.5)	4770	(2250)	0.393	24	1100
Maximum	0.100	(24.9)	4430	(2090)	0.403	26	1100
(225 Volts)	0.125	(31.1)	4220	(l990)	0.398	28	1100
	0.250	(62.3)	3140	(1480)	0.361	31	1110
Variable	0.000	(0.0)	4280	(2020)	0.361	14	950
Speed	0.050	(12.5)	3970	(1870)	0.357	18	940
Mid Range	0.100	(24.9)	3600	(1700)	0.340	21	960
(156 Volts)	0.125	(31.1)	3420	(1620)	0.334	23	960
	0.250	(62.3)	2160	(1020)	0.329	21	970
Variable	0.000	(0.0)	3100	(1460)	0.289	7	690
Speed	0.050	(12.5)	2680	(1270)	0.288	10	700
Minimum	0.100	(24.9)	2300	(1090)	0.283	12	740
(125 Volts)	0.125	(31.1)	1500	(710)	0.287	9	690
Single	0.000	(0.0)	4970	(2340)	0.387	20	1110
Speed	0.050	(12.5)	4690	(2210)	0.389	24	1100
Direct	0.100	(24.9)	4400	(2080)	0.387	27	1100
With	0.125	(31.1)	4240	(2000)	0.385	29	1100
Dampers	0.250	(62.3)	3040	(1440)	0.356	30	1110

RECOMMENDATIONS

It is recommended the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.

Manager: R.P. Atkins

Project Engineer: R.C. Maze

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. Del-Air Systems Ltd. makes every effort to have our products PAMI tested. We distribute the unbiased PAMI reports whenever performance data is requested, and we use PAMI data in our product advertising and free ventilation design service. We wish to point out that our products are tested with the integral wind hood and butterfly damper, whereas many other fans are "PAMI rated" with no accessories. This must be taken into account when comparing fan performance curves.

GENERAL DESCRIPTION

The Del-Air Model J-24 ventilation fan is a 24 in (610 mm) diameter, variable speed, direct drive, propeller type axial flow fan. This type of ventilation fan is primarily used in livestock and poultry barns as an exhaust fan located in the building wall.

The Del-Air Model J-24 ventilation fan is a flush mounted unit equipped with an inlet guard grill, outlet guard grill, integral fan shroud, outlet dampers, mounting face plate and insulating door. The 5 blade polypropylene propeller and aluminum hub are mounted directly on a 1/3 hp (0.25 kW), single phase, 115/230 volt electric motor. The motor mount is integral with the wire inlet guard grill and is bolted to the motor and fan housing. FIGURE 1 shows the location of major components, while detailed specifications are given in APPENDIX 1.

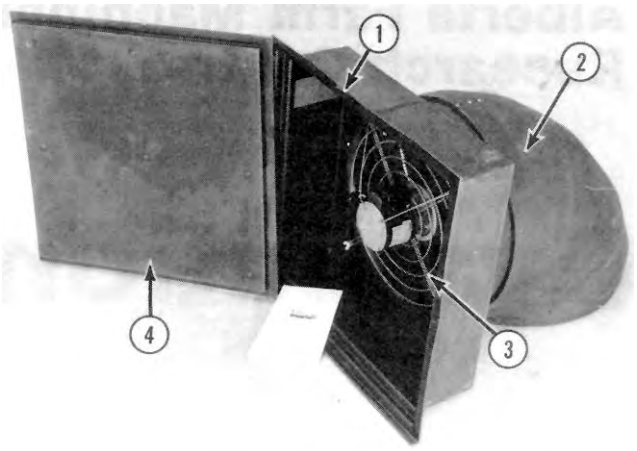

FIGURE 1. Del-Air Model J-24 Ventilation Fan: (1) Mounting Face Plate, (2) Outlet Damper, (3) Inlet Guard Grill and (4) Insulation Door.

SCOPE OF TEST

The fan evaluated by AFMRC was configured as described in the General Description, FIGURE 1, and the Specifications section of this report. The manufacturer may have built different configurations of this fan before or after AFMRC tests. Therefore, when using this report check that the fan under consideration is the same as the one reported here. If differences exist, assistance can be obtained from AFMRC or the manufacturer to determine changes in performance.

The Del-Air Model J-24 fan was tested in the inlet chamber set-up (FIGURE 2) in accordance with Canadian Standard Association Ventilation Fan Test Standard No. CANCSA C320-M86. The intent was to determine the performance of the fan in terms of air flow rate, static pressure, input power and total efficiency. The control unit was not evaluated and was used only to set fan speed.

The fan was tested at 230 V for both single speed and variable speed modes. Fan performance was determined at a maximum setting, a mid-range setting and a minimum setting for the variable speed mode. Voltages supplied to the fan at maximum, mid-range and minimum settings in the variable speed mode are recorded in TABLE 1. The minimum setting was established by reducing the fan speed to the point where a static pressure of 0.125 in wg (31.1 Pa) could still be obtained.

The effect of the dampers on fan performance was determined in the single speed setting.

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

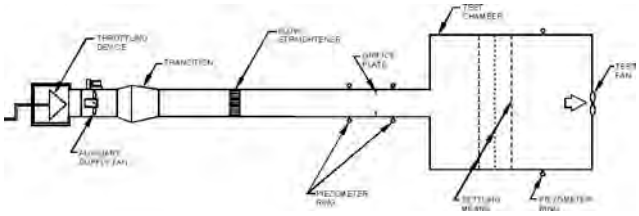

FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Set-up.

RESULTS AND DISCUSSION

Fan Performance:

All fan performance results in this report are given at standard air[1] so that direct comparisons can be made with other fan test results. 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 in both the single speed mode and at the maximum setting on the variable speed control were similar (FIGURE 3). Reducing the fan speed greatly reduced the air flow rate for a given

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

static pressure[2]. For example, at a static pressure of 0.125 in wg (31.1 Pa), reducing the speed from maximum to mid-range to minimum setting reduced the air flow rate from 4220 cfm (1990 LS) to 3420 cfm (1620 L/S) to 1500 cfm (710 L/S), respectively. At higher static pressures the reductions were even larger. Air flow rates at typical levels of operation (i.e., static pressure) 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). The Alberta Farm Machinery Research Centre's measured flow rate in a single speed direct mode at 0.125 in wg (31.1 Pa) was 4160 cfm (1960 L/S). There was no manufacturer's information provided on air flow rates. 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.

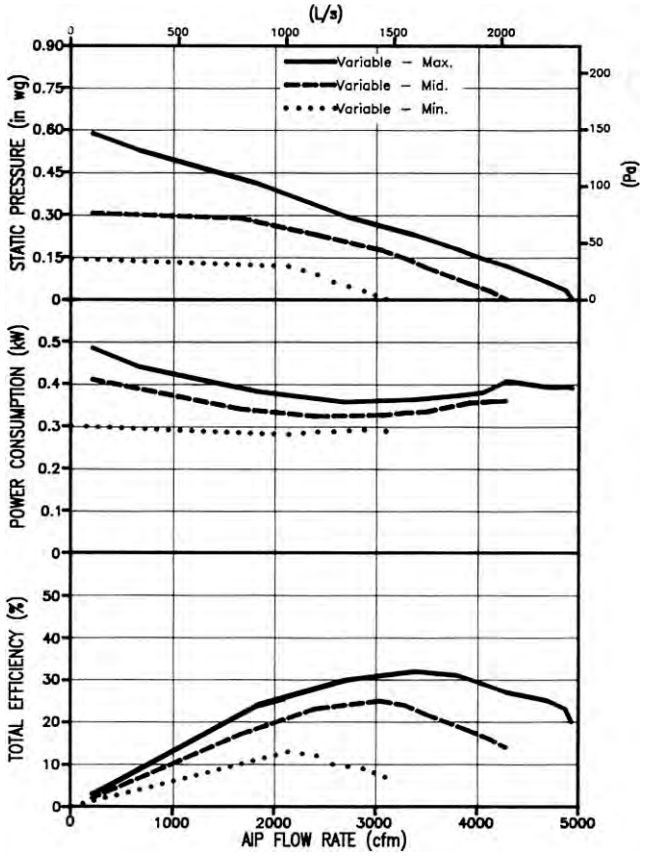

FIGURE 3. Del-Air Model J-24 Fan Performance Curves.

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 depends on fan speed. For typical levels of static pressure (TABLE 1), the input power varied from 0.350 to 0.379 kW in the single speed mode, from 0.361 to 0.403 kW at maximum speed, from 0.329 to 0.361 kW at mid-range speed and from 0.283 to 0.289 kW at minimum speed. The maximum amperage drawn by the motor was 2.7 amperes, which was greater than the rated motor amperage of 2.2 amperes plus the 10% allowable limit established by CSA standards. Prolonged operation in excess of the rated amperage could reduce motor life.

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) using the variable speed control ranged from 20 to 31% at maximum speed, 14 to 23% at mid-range and 7 to 12% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 28%.

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

Effect of Dampers:

The optional dampers were installed on the outlet side of the fan (FIGURE 4) to determine their effect on fan output. The fan was tested under these conditions in the single speed mode only. Using the dampers had little effect on the air flow rate (FIGURE 5) over a typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the dampers slightly increased the air flow by 2%, from 4160 cfm (1960 L/s) to 4240 cfm (2000 L/s) (TABLE 1). The efficiency at 0.125 in wg (31.1 Pa) was 29% regardless if dampers were used or not.

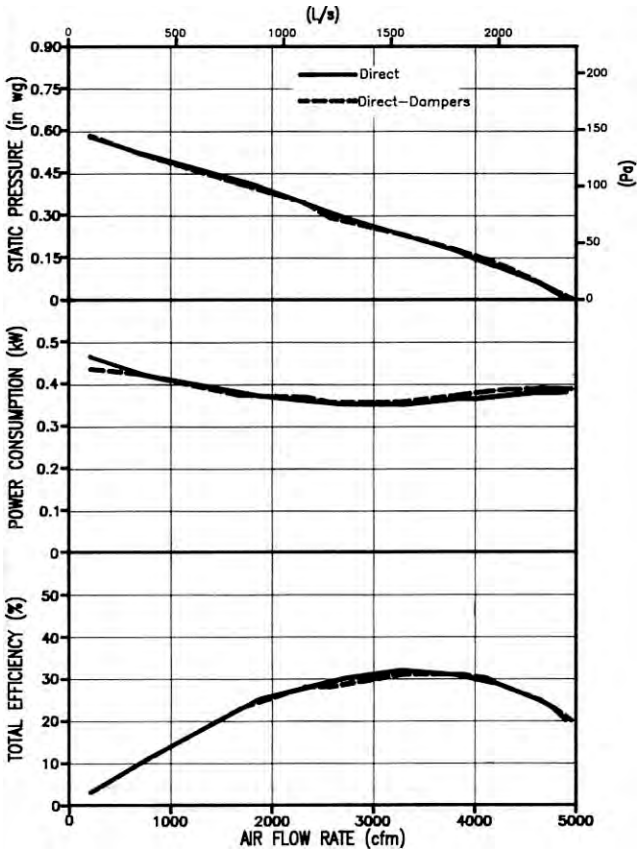

FIGURE 4. Effect of Dampers on Fan Performance.

EASE OF OPERATION

Maintenance:

The operator's manual advised a routine cleaning program to remove dust and dirt build-up and a yearly check of the free movement of the fan if it had been idle for long periods. The fan motor mount and outlet dampers were easily removed, which made for easy access to clean the fan blades and housing. 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 Del-Air Model J-24 ventilation fan was CSA approved. The noise level of the Del-Air Model J-24 fan at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 0.125 in wg (31.1 Pa) static pressure, was 81 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Del-Air Model J-24 ventilation fan falls within Range 3 of the AFMRC noise level range classi4ication (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 blower for prolonged periods.

OPERATOR'S MANUAL

The operator's manual was very informative and contained information on operation, specifications, installation, wiring, maintenance, safety, service and troubleshooting. However, the manual did not include information specifically for the Del-Air Model J-24 fan.

APPENDIX I

SPECIFICATIONS

MAKE:	Del-Air
MODEL:	J-24
MANUFACTURER:	Del-Air Systems Ltd. P.O. Box 2500 1704 Fourth Avenue Humbolt, Saskatchewan S0K 2A0
OVERALL DIMENSIONS:	
- housing width	33.3 in (845 mm)
- housing depth (motor included)	37.0 in (940 mm)
- housing height	33.3 in (845 mm)
- discharge opening	25.0 in (635 mm)
- inlet guard grill diameter	20.0 in (508 mm)
- outlet guard grill diameter	20.0 in (508 mm)
- grill opening	0.25 in (6.4 mm) diameter wire spaced at 2.0 in (51 mm).
IMPELLER:	
- diameter	23.3 in (592 mm)
- hub diameter	6.75 in (171 mm)
- number of blades	5
- blade angle	38° Hub, 15° Tip
WEIGHT:	61 lb (27 kg)
MOTOR NAMEPLATE DATA:	
- make	Fasco Industries
- model	7126-1961
- type	U26B1
- cap.	5/370
- rpm	1100
- rev	A
- rot	CCWLE
- volts	115/230
- amps	4.4/2.2
- phase	1
- horsepower	0.33 hp (250 W)

APPENDIX II

NOISE LEVEL RANGES

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.

SUMMARY CHART

DEL-AIR MODEL J-24 VENTILATION FAN

RETAIL PRICE:	$756 (January, 1991, f.o.b. Lethbridge)
FAN DESCRIPTION:	23.3 in (592 mm) propeller fan, variable speed, direct drive, 0.33 hp (250 W), 230 volt electric motor.
FAN PERFORMANCE:	
Air Flow Rate:	
- range	1500 to 4970 cfm (710 to 2340 L/s)
- at 0.125 in wg (31.1 Pa)	4160 cfm (1960 L/S) without dampers 4240 cfm (2000 L/S) with dampers
Power Consumption:	0.283 to 0.403 kW
Efficiency Range:	
- without dampers	20 to 31%
- with dampers	20 to 30%
Efficiency at 0.125 in wg: (31.1 Pa):	
- without dampers	29%
- with dampers	29%
OPERATOR SAFETY:	inlet guard provided CSA approved noise level - 81 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	very good, needs performance information for Del-Air Model J-24

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