

Evaluation Report

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Fan International (Gold) Model 4E50 Ventilation Fan

A Co-operative Program Between



FAN INTERNATIONAL (GOLD) MODEL 4E50 VENTILATION FAN

MANUFACTURER:

A. Vosterman BV
P.O. Box 366-5900 AJ
Venlo, Holland

DISTRIBUTOR:

Euromac Imports Incorporated
Box 40
Port Williams, Nova Scotia
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RETAIL PRICE:

\$299.00 (November, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Fan International (Gold) Model 4E50 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)	kWh	%	rpm
Single Speed Direct	0.0	(0.0)	4900	(2310)	0.473	38	1639
	0.05	(12.5)	4800	(2760)	0.479	41	1634
	0.10	(24.9)	4630	(2190)	0.489	42	1630
	0.125	(31.1)	4560	(2150)	0.492	43	1628
	0.25	(62.3)	4160	(1960)	0.503	46	1610
Setting Number 5	0.0	(0.0)	4900	(2310)	0.490	38	1642
	0.05	(12.5)	4790	(2260)	0.496	40	1638
	0.10	(24.9)	4650	(2190)	0.507	41	1632
	0.125	(31.1)	4570	(2160)	0.510	42	1627
	0.25	(62.3)	4160	(1960)	0.518	45	1616
Setting Number 4	0.0	(0.0)	4140	(1950)	0.444	24	1307
	0.05	(12.5)	3910	(1840)	0.432	27	1350
	0.10	(24.9)	3490	(1650)	0.434	27	1298
	0.125	(31.1)	3510	(1660)	0.434	27	1302
	0.25	(62.3)	2900	(1370)	0.434	28	1299
Setting Number 3	0.0	(0.0)	2460	(1160)	0.271	9	825
	0.05	(12.5)	2070	(977)	0.271	9	782
	0.10	(24.9)	1700	(804)	0.267	10	791
	0.125	(31.1)	1540	(726)	0.265	10	800
	0.25	(62.3)	678	(320)	0.270	6	803
Setting Number 2	0.0	(0.0)	1900	(899)	0.190	5	640
	0.05	(12.5)	1415	(668)	0.191	6	604
	0.10	(24.9)	724	(342)	0.192	5	630
	0.125	(31.1)	420	(198)	0.190	3	595
Setting Number 1	0.0	(0.0)	1880	(887)	0.193	5	632
	0.05	(12.5)	1370	(648)	0.191	6	595
	0.10	(24.9)	741	(350)	0.190	5	629
	0.125	(31.1)	445	(210)	0.194	4	598
Single Speed Direct with Louvres	0.0	(0.0)	4580	(2160)	0.477	32	1639
	0.05	(12.5)	4460	(2110)	0.480	33	1635
	0.10	(24.9)	4300	(2030)	0.490	35	1628
	0.125	(31.1)	4200	(1980)	0.488	35	1622
	0.25	(62.3)	3600	(1700)	0.491	37	1613

Manager/Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Fan International (Gold) Model 4E50 ventilation fan is a 19.75 in (502 mm) diameter variable 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 or ceiling.

The Fan International (Gold) Model 4E50 is a flush mounted unit equipped with an inlet guard grill and a mounting face plate. Optional features include PVC louvres and an automatic five speed control. The six polypropylene blades are attached to a nylon reinforced hub. The propeller is directly mounted to a 0.58 hp (430 W), single phase, 220 V motor. The motor is suspended by three tapered supports bolted directly to the motor casing and fan housing. The cast aluminum housing, motor casing and motor supports are coated with a lacquer finish for corrosion protection.

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

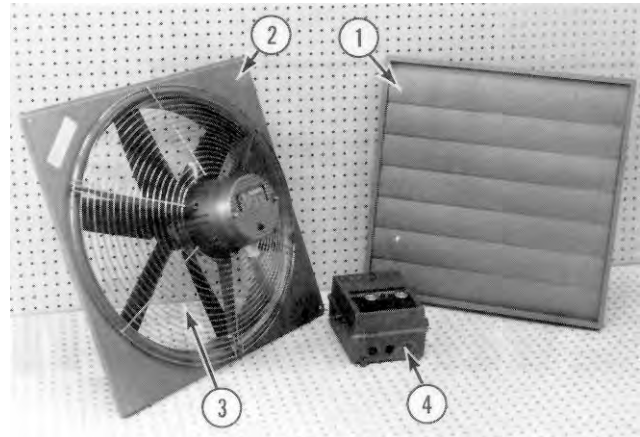


FIGURE 1. Fan International (Gold) Model 4E50 Ventilation Fan: (1) Optional Louvres, (2) Mounting Face Plate, (3) Inlet Guard Grill, (4) Motor Controls.

SCOPE OF TEST

The Fan International (Gold) Model 4E50 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, power consumption and total efficiency. The control unit was not evaluated and was only used to set fan speed.

Fan performance was determined at 230 V in the single speed direct mode and with the five speed control. The five speed control consisted of a stepped transformer to regulate the speed at predetermined levels.

The effect of louvres on fan performance was determined in the single speed direct mode only.

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

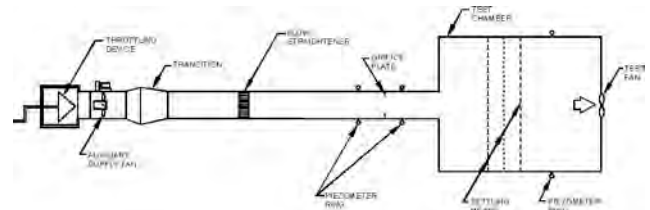


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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; Fan output in both the single speed direct mode and at the maximum setting on the five speed control were similar (FIGURE 3). Reducing the fan speed, greatly reduced the air flow rate for a given static pressure². For example, at a static pressure of 0.125 in wg (31.1 Pa), reducing the speed from setting number 5 to settings number 4, 3, 2 and 1 reduced the air

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).

flow rate from 4570 cfm (2160 L/s) to 3510 cfm (1660 L/s), 1540 cfm (726 L/s), 420 cfm (198 L/s), and 445 cfm (210 L/s), respectively.

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 manufacturer's rated air flow rate at 0.125 in wg (31.1 Pa), in the single speed mode, was 4306 cfm (2032 L/s). PAMI's measured flow rate at the same conditions was 4560 cfm (2150 L/s) or 6% greater than the manufacturer's rating.

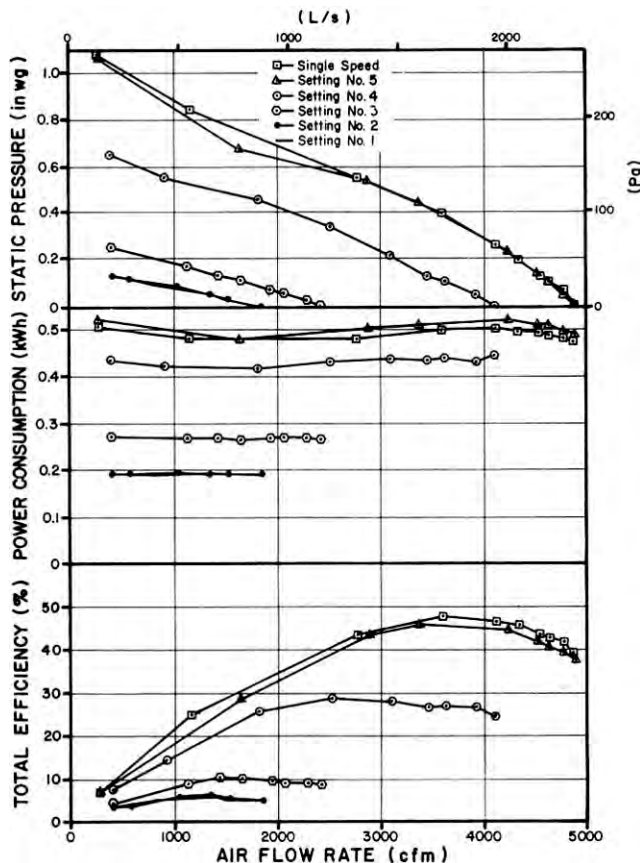


FIGURE 3. Fan International (Gold) Model 4E50 Fan Performance Curves in the Single Speed Mode and at Five Speed Settings.

Power Consumption: Power consumption is the amount of energy (kWh) used by the fan motor. These numbers can be used directly to determine fan operating costs. For typical levels of static pressure (TABLE 1), the power consumption varied from 0.473 to 0.503 kWh in the single speed direct mode, from 0.490 to 0.518 kWh at control setting number 5, from 0.432 to 0.444 kWh at control setting number 4, from 0.265 to 0.271 kWh at control setting number 3, from 0.190 to 0.192 kWh at control setting number 2, and from 0.190 to 0.194 kWh at control setting number 1. The maximum amperage drawn by the motor was 2.1 amps, which was slightly less than the rated motor amperage of 2.18 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 38 to 46% in the single speed direct mode, from 38 to 45% at control setting number 5, from 24 to 28% at control setting number 4, from 6 to 10% at control setting number 3, and from 3 to 6% at control setting number 2, and from 4 to 6% at control setting number 1. The total efficiency in the single speed direct mode at a static pressure of 0.125 in wg (31.1 Pa) was 43%.

Effect of Louvres: The optional louvres were installed on

the outlet side of the fan 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 7 to 13% (FIGURE 4) 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 8%, from 4560 cfm (2150 L/s) to 4200 cfm (1980 L/s) (TABLE 1). The efficiency was in turn reduced from 43 to 35%. The use of other control devices such as shutters, dampers, screens, and hoods would also reduce air flow rates by varying amounts. The use of such control devices have to be taken into consideration when designing a ventilation system.

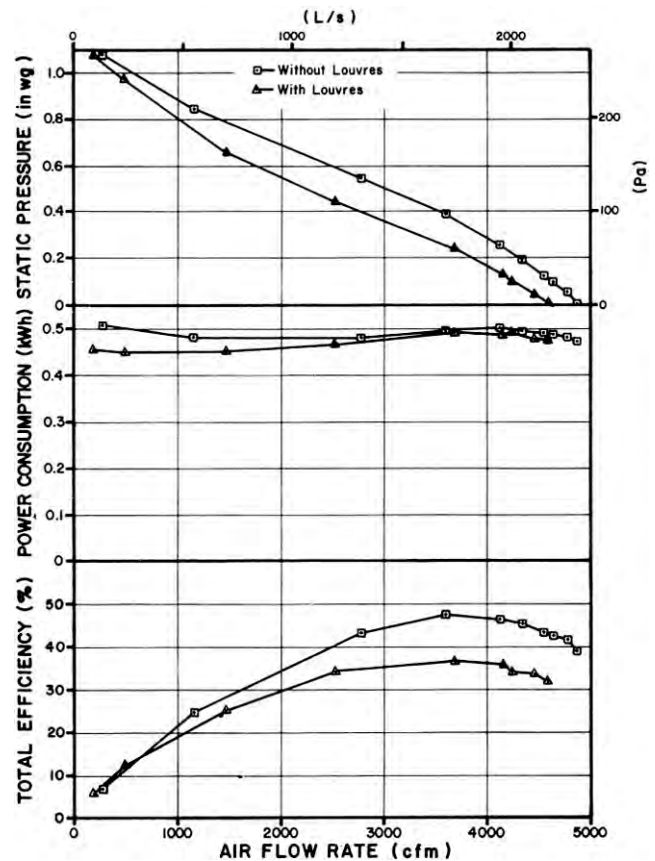


FIGURE 4. Effect of Louvres on Fan Performance.

EASE OF OPERATION

Maintenance: The inlet guard grill was easily removed, which made for easy 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 4E50 was CSA approved.

The noise level of the model 4E50, 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 75 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The model 4E50 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 manual contained information on specifications, installation, maintenance, rated performance and service. Additional information could be supplied on safety aspects and trouble shooting.

APPENDIX I

SPECIFICATIONS

MAKE: Fan International (Gold)
MODEL: 4E50
MANUFACTURER: A. Vosterman BV
P.O. Box 366-5900 AJ
Venlo, Holland

OVERALL DIMENSIONS:
- housing width 23.5 in (597 mm)
- housing height 23.5 in (597 mm)
- housing depth (including motor) 11.0 in (279 mm)
- housing diameter 20 in (508 mm)
- guard grill diameter 22.75 in (578 mm)
- grill opening 0.09 in (2 mm) diameter wire spaced at 0.38 in (10 mm) in a circular pattern

PROPELLER:
- diameter 19.75 in (502 mm)
- hub diameter 4 in (102 mm)
- number of blades 6
- blade angle variable - 31° at the hub, 19° at the tip

WEIGHT: 26 lb (12 kg)

MOTOR NAMEPLATE DATA:
make Fan International
type 4E50
rpm 1600
volts 220 V
amps 2.18 A
phase 1
cycles 60 Hz
horsepower 0.58 hp (430 W)

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
FAN INTERNATIONAL (GOLD) MODEL
4E50 VENTILATION FAN**

RETAIL PRICE: \$299.00
(November, 1985, f.o.b. Lethbridge)

FAN DESCRIPTION: 19.75 in (502 mm) propeller fan, variable speed, direct drive, 0.58 hp (430 W) 220 V electric motor.

FAN SPEED:
- single speed 1610 to 1639 rpm
- variable speed 595 to 1642 rpm

EFFICIENCY RANGE:
- without louvres 3 to 46%
- with louvres 32 to 37%

EFFICIENCY AT 0.125 in wg (31.1 Pa):
Single Speed Direct
- without louvres 43%
- with louvres 35%

AIR FLOW RATE:
- range 420 to 4900 cfm (198 to 2310 L/s)
- at 0.125 in wg (31.1 Pa) 4560 cfm (2150 L/s) without louvres and 4200 cfm (1980 L/s) with louvres)

POWER CONSUMPTION: 0.190 to 0.518 kWh

OPERATOR SAFETY: inlet guard provided
CSA approved
noise level -- 75 dB(A) at 4.9 ft (1.5 m) from fan discharge

OPERATOR'S MANUAL: adequate

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.



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