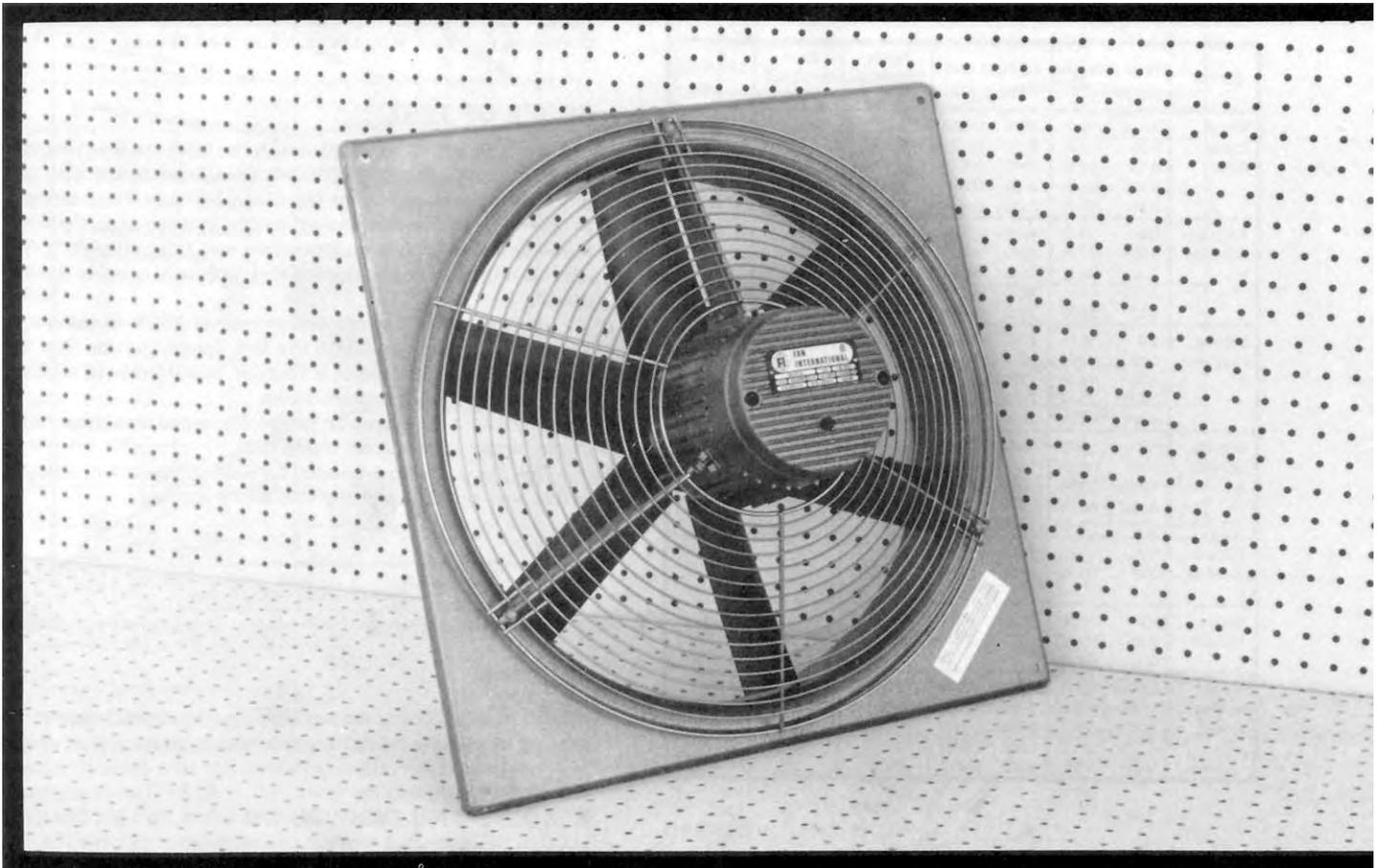


Evaluation Report

463



Fan International (Gold) Model 4E45 Ventilation Fan

A Co-operative Program Between



FAN INTERNATIONAL (GOLD) MODEL 4E45 VENTILATION FAN

MANUFACTURER:

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

DISTRIBUTOR:

Euromac Imports Incorporated
Box 40
Port Williams, Nova Scotia
B0P 1T0

RETAIL PRICE:

\$270.00 (November, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Fan International (Gold) Model 4E45 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)	3810	(1800)	0.368	35	1599
	0.05	(12.5)	3670	(1730)	0.374	37	1582
	0.10	(24.9)	3540	(1670)	0.376	39	1577
	0.125	(31.1)	3480	(1640)	0.381	39	1573
	0.25	(62.3)	3150	(1490)	0.396	41	1541
Setting Number 5	0.0	(0.0)	3830	(1810)	0.375	35	1603
	0.05	(12.5)	3680	(1740)	0.385	37	1589
	0.10	(24.9)	3560	(1680)	0.396	38	1579
	0.125	(31.1)	3500	(1650)	0.395	38	1573
	0.25	(62.3)	3160	(1490)	0.407	40	1540
Setting Number 4	0.0	(0.0)	2790	(1320)	0.313	16	1187
	0.05	(12.5)	2610	(1230)	0.317	18	1134
	0.10	(24.9)	2330	(1100)	0.317	18	1090
	0.125	(31.1)	2190	(1030)	0.315	18	1080
	0.25	(62.3)	1640	(775)	0.313	19	1123
Setting Number 3	0.0	(0.0)	1680	(792)	0.189	6	712
	0.05	(12.5)	1310	(616)	0.187	7	652
	0.10	(24.9)	866	(409)	0.187	6	700
	0.125	(31.1)	575	(271)	0.192	5	722
	0.15	(37.4)	211	(100)	0.091	2	649
Setting Number 2	0.0	(0.0)	1270	(599)	0.135	4	538
	0.05	(12.5)	759	(358)	0.135	4	508
Setting Number 1	0.0	(0.0)	1320	(621)	0.141	4	562
	0.05	(12.5)	823	(388)	0.137	5	515
	0.10	(24.9)	15	(7)	0.142	0.4	464
Single Speed Direct with Louvres	0.0	(0.0)	3500	(1650)	0.386	26	1577
	0.05	(12.5)	3320	(1570)	0.395	27	1559
	0.10	(24.9)	3150	(1490)	0.397	28	1550
	0.125	(31.1)	3070	(1450)	0.400	28	1549
	0.25	(62.3)	2660	(1250)	0.407	30	1533

Manager/Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Fan International (Gold) Model 4E45 ventilation fan is a 17.9 in (454 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 4E45 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 0.46 hp (340 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.

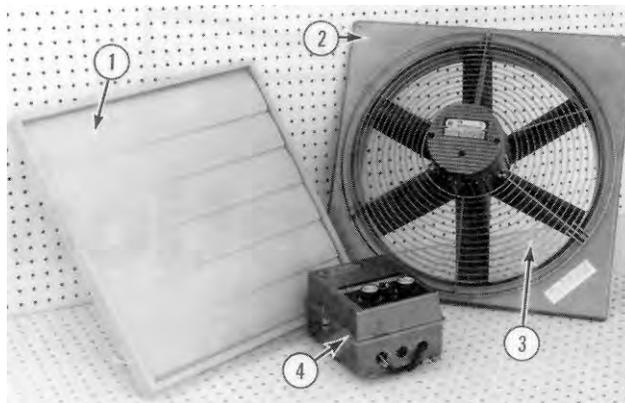


FIGURE 1. Fan International (Gold) Model 4E45 Ventilation Fan: (1) Optional Louvres, (2) Mounting Face Plate, (3) Inlet Guard Grill, (4) Motor Controls.

SCOPE OF TEST

The Fan International (Gold) Model 4E45 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.

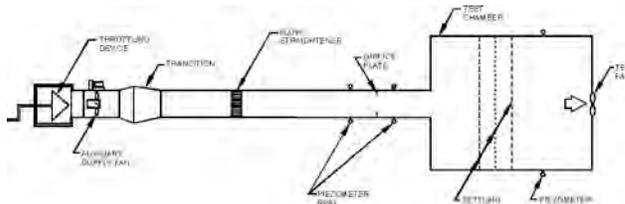


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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 control from setting number 5 to settings number 4 and 3 reduced the

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).

air flow rate from 3500 cfm (1650 L/s) to 2190 cfm (1030 L/s) to 575 cfm (271 L/s) respectively. Settings number 2 and 1 were unable to achieve static pressures of 0.125 in wg (31.1 Pa).

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 direct mode, was 3323 cfm (1568 L/s). PAMI's measured flow rate at the same conditions was 3480 cfm (1640 L/s) or 5% greater than the manufacturer's rating.

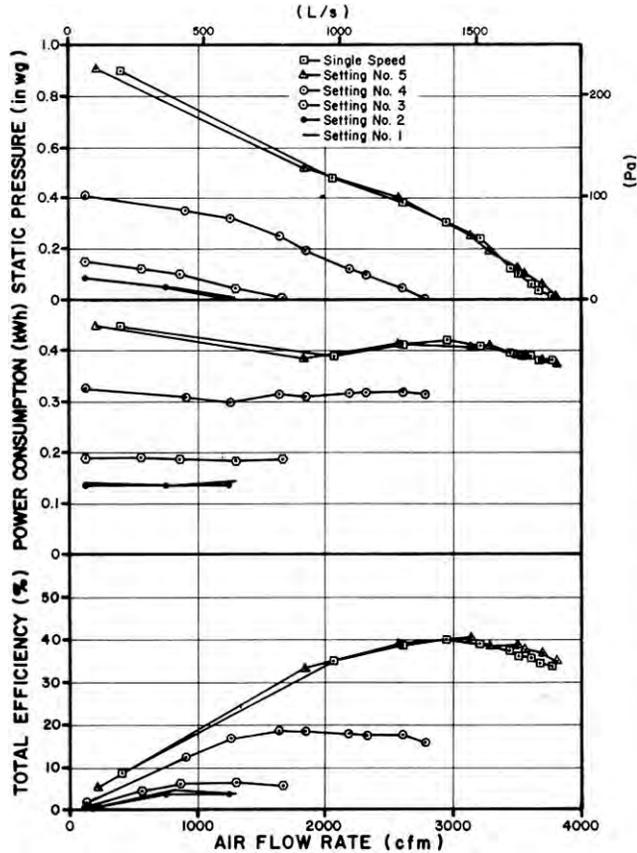


FIGURE 3. Fan International (Gold) Model 4E45 Fan Performance Curves in the Single Speed Mode and at Five Speed Settings.

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 0.368 to 0.396 kWh in the single speed direct mode, from 0.375 to 0.407 kWh at control setting number 5, from 0.313 to 0.317 kWh at control setting number 4, from 0.187 to 0.192 kWh at control setting number 3, and from 0.135 to 0.142 kWh at control settings number 2 and 1. The maximum amperage drawn by the motor was 1.90 amps, which was the same as the rated motor amperage.

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 35 to 41% in the single speed direct mode, from 35 to 40% at control setting number 5, from 16 to 19% at control setting number 4, from 2 to 7% at control setting number 3, and from 0.4 to 5% at control settings number 2 and 1. The total efficiency in the single speed direct mode at a static pressure of 0.125 in wg (31.1 Pa) was 39%.

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 8 to 16% (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 12%, from 3480 cfm (1640 L/s) to 3070 cfm (1450 L/s) (TABLE 1). The efficiency was in turn reduced from 39 to 28%. 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.

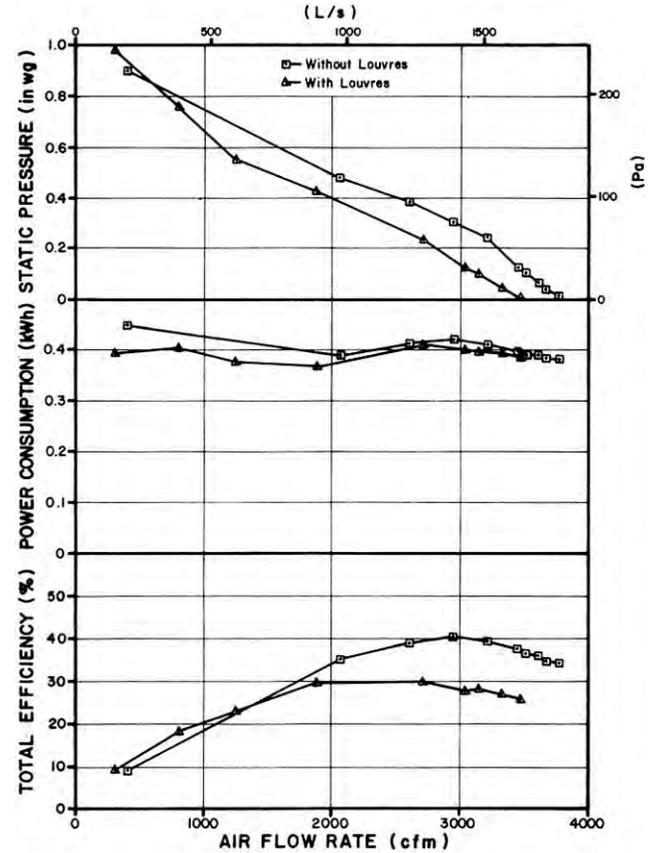


FIGURE 4. Effect of Louvres on Fan Performance.

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 4E45 was CSA approved.

The noise level of the model 4E45, 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 67 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The model 4E45 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:	4E45
MANUFACTURER:	A. Vosterman BV P.O. Box 366-5900 AJ Venlo, Holland
OVERALL DIMENSIONS:	
- housing width	21.5 in (546 mm)
- housing height	21.5 in (546 mm)
- housing depth (including motor)	11 in (279 mm)
- housing diameter	18 in (457 mm)
- guard grill diameter	20.25 in (514 mm)
- grill opening	0.09 in (2 mm) diameter wire spaced at 0.38 in (10 mm) in a circular pattern
PROPELLER:	
- diameter	17.9 in (454 mm)
- number of blades	6
- blade angle	variable - 36° at the hub, 28° at the tip
WEIGHT:	23 lb (11 kg)
MOTOR NAMEPLATE DATA:	
make	Fan International
type	4E45
rpm	1650
volts	220 V
amps	1.9 A
phase	1
cycles	60 Hz
horsepower	0.46 hp (340 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.

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
4E45 VENTILATION FAN**

RETAIL PRICE:	\$270.00 (November, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION:	17.9 in (454 mm) propeller fan, variable speed, direct drive, 0.46 hp (340 W) 220 V electric motor.
FAN SPEED:	
- single speed direct	1541 to 1599
- variable speed	464 to 1603 rpm
EFFICIENCY RANGE:	
- without louvres	0.4 to 41%
- with louvres	26 to 30%
EFFICIENCY AT 0.125 in wg (31.1 Pa):	
- without louvres	39%
- with louvres	28%
AIR FLOW RATE:	
- range	15 to 3830 cfm (7 to 1810 L/s)
- at 0.125 in wg (31.1 Pa)	3480 cfm (1640 L/s) single speed direct without louvres and 3070 cfm (1450 L/s) with louvres)
POWER CONSUMPTION:	0.135 to 0.407 kWh
OPERATOR SAFETY:	inlet guard provided CSA approved noise level = 67 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	adequate



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