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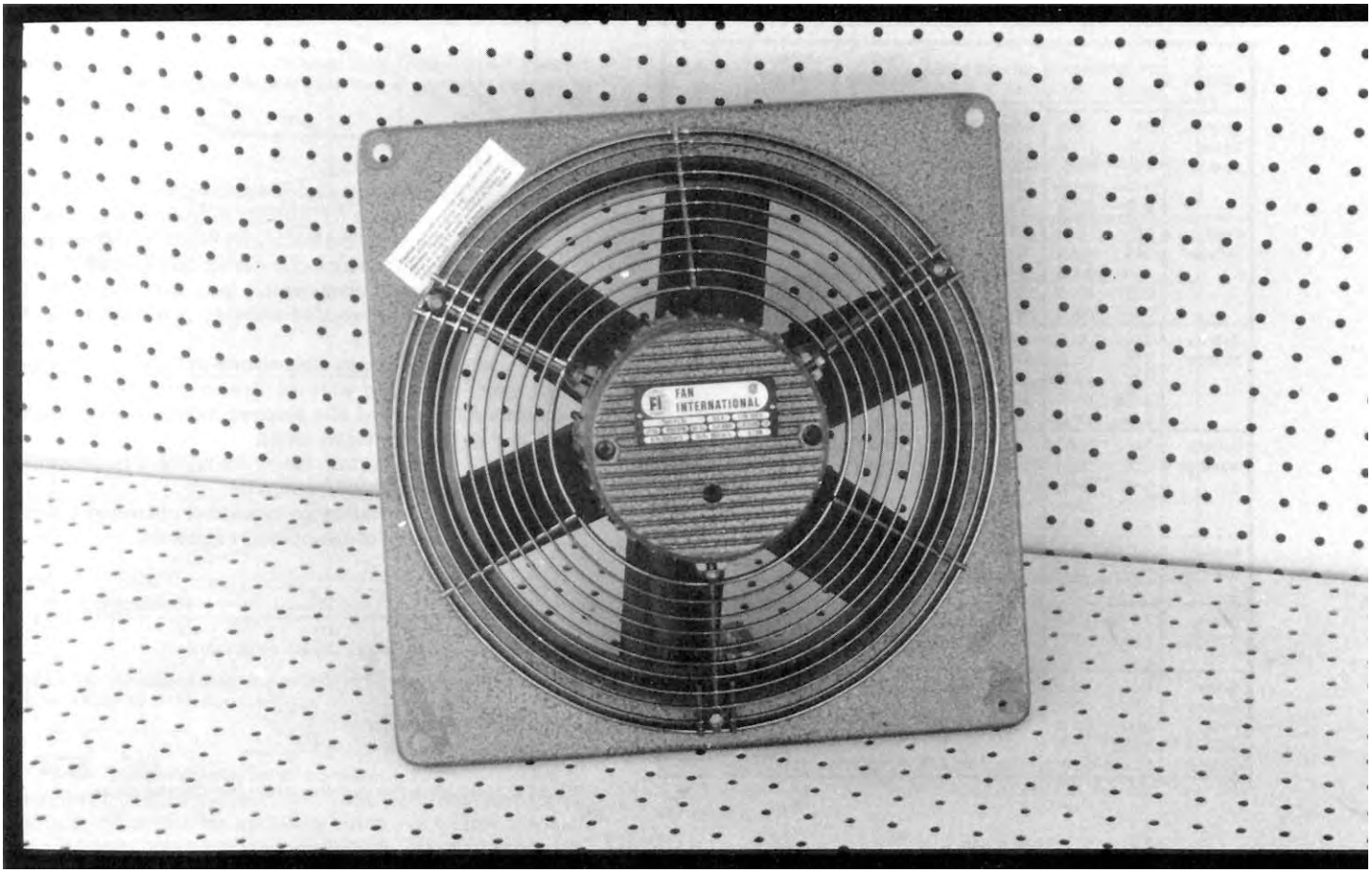

Fan International (Gold) Model 4E30 Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

FAN INTERNATIONAL (GOLD) MODEL 4E30 VENTILATION FAN

MANUFACTURER:

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

DISTRIBUTOR:

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

RETAIL PRICE:

$210.00 (November, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Fan International (Gold) Model 4E30 Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE in wg	(Pa)	AIR FLOW RATE cfm	(L/s)	POWER CONSUMPTION kWh	TOTAL EFFICIENCY %	FAN SPEED rpm
Single Speed Direct	0.0	(0.0)	1390	(657)	0.113	28	1703
	0.05	(12.5)	1310	(618)	0.116	29	1698
	0.10	(24.9)	1260	(593)	0.118	31	1695
	0.125	(31.1)	1220	(576)	0.117	34	1691
	0.25	(62.3)	1020	(480)	0.120	35	1682
Setting Number 5	0.0	(0.0)	1370	(645)	0.126	24	1701
	0.05	(12.5)	1320	(623)	0.129	27	1697
	0.10	(24.9)	1270	(599)	0.133	29	1693
	0.125	(31.1)	1220	(576)	0.133	29	1690
	0.25	(62.3)	999	(227)	0.139	29	1684
Setting Number 4	0.0	(0.0)	1280	(603)	0.111	22	1607
	0.05	(12.5)	1200	(566)	0.119	23	1593
	0.10	(24.9)	1140	(538)	0.118	26	1577
	0.125	(31.1)	1100	(518)	0.117	27	1569
	0.25	(62.3)	850	(401)	0.124	26	1561
Setting Number 3	0.0	(0.0)	770	(363)	0.095	6	1000
	0.05	(12.5)	692	(327)	0.099	8	971
	0.10	(24.9)	504	(238)	0.096	8	964
	0.125	(31.1)	470	(222)	0.094	9	1106
	0.25	(62.3)	211	(100)	0.096	4	914
Setting Number 2	0.0	(0.0)	581	(274)	0.072	3	729
	0.05	(12.5)	345	(163)	0.072	4	662
Setting Number 1	0.0	(0.0)	619	(292)	0.072	4	758
	0.05	(12.5)	364	(172)	0.077	4	678
Single Speed Direct with Louvres	0.0	(0.0)	1280	(605)	0.120	20	1696
	0.05	(12.5)	1230	(580)	0.118	24	1694
	0.10	(24.9)	1160	(547)	0.120	26	1690
	0.125	(31.1)	1100	(519)	0.121	26	1688
	0.25	(62.3)	611	(288)	0.108	19	1711

Manager/Senior Engineer: E. H. Wiens
Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Fan International (Gold) Model 4E30 ventilation fan is an 11.9 in (302 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 4E30 is a flush mounted unit equipped with an inlet guard grill and a mounting face plate. Optional features included 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 0.134 hp (100 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.

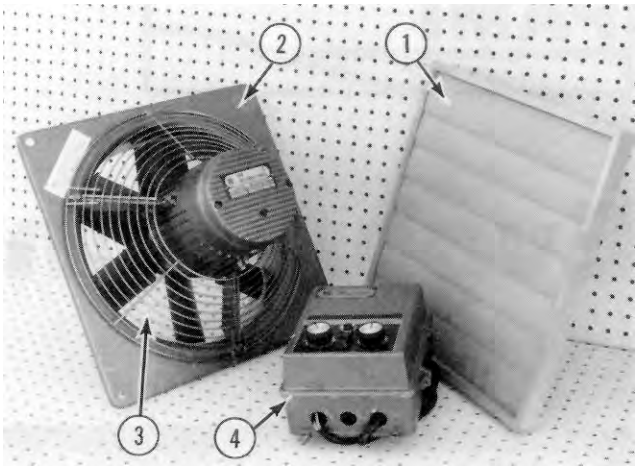

FIGURE 1. Fan International (Gold) Model 4E30 Ventilation Fan: (1) Optional **Louvres,** (2) Mounting Face Plate, (3) Inlet Guard Grill, (4) Motor Controls.

SCOPE OF TEST

The Fan International (Gold) Model 4E30 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.

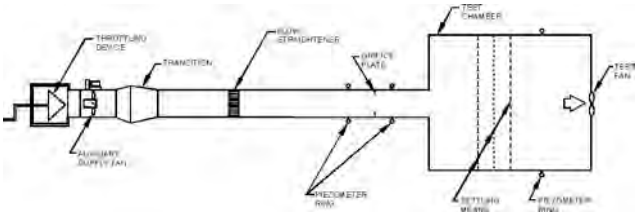

FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air[1] 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 the single speed direct mode and at the number 5 setting on the five speed control were similar (FIGURE 3). Reducing the fan speed, greatly reduced the air flow rate for a given static pressure[2]. For example, at a static

[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).

[2]Static pressure is a measure of the pressure differe'noe 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).

pressure of 0.125 in wg (31.1 Pa), reducing the speed control setting from number 5 to settings number 4 and 3 reduced the air flow rate from 1220 cfm (576 L/s) to 1100 cfm (518 L/s) to 470 cfm (222 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 1141 cfm (539 L/s). PAMI's measured flow rate at the same conditions was 1220 cfm (576 L/s) or 7% greater than the manufacturer's rating.

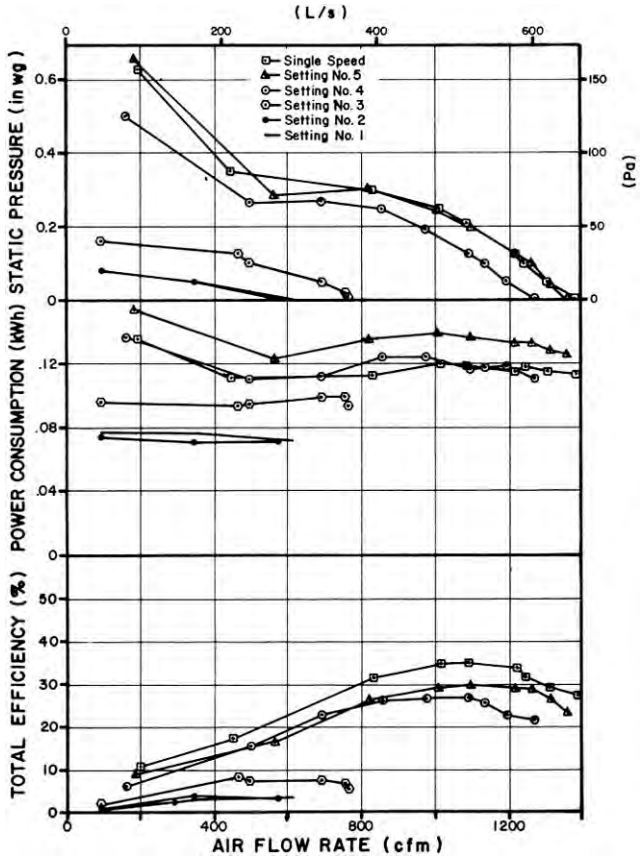

FIGURE 3. Fan International (Gold) Model 4E30 Fan Performance Curves in the Single Speed Mode and at Five Speed Settings.

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 0.113 to 0.120 kWh in the single speed direct mode, from 0.126 to 0.139 kWh at control setting number 5, from 0.111 to 0.124 kWh at control setting number 4, from 0.094 to 0.099 kWh at control setting number 3, from 0.072 to 0.077 kWh at control settings number 2 and 1. The maximum amperage drawn by the motor was 0.70 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 28 to 35% in the single speed direct mode, from 24 to 29% at control setting number 5, from 22 to 27% at control setting number 4, from 6 to 9% at control setting number 3, and from I to 4% 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 34%.

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 6 to 40% (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 10%, from 1220 cfm (576 L/s) to 1100 cfm (519 L/s) (TABLE 1). The efficiency was in turn reduced from 34 to 26%. 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.

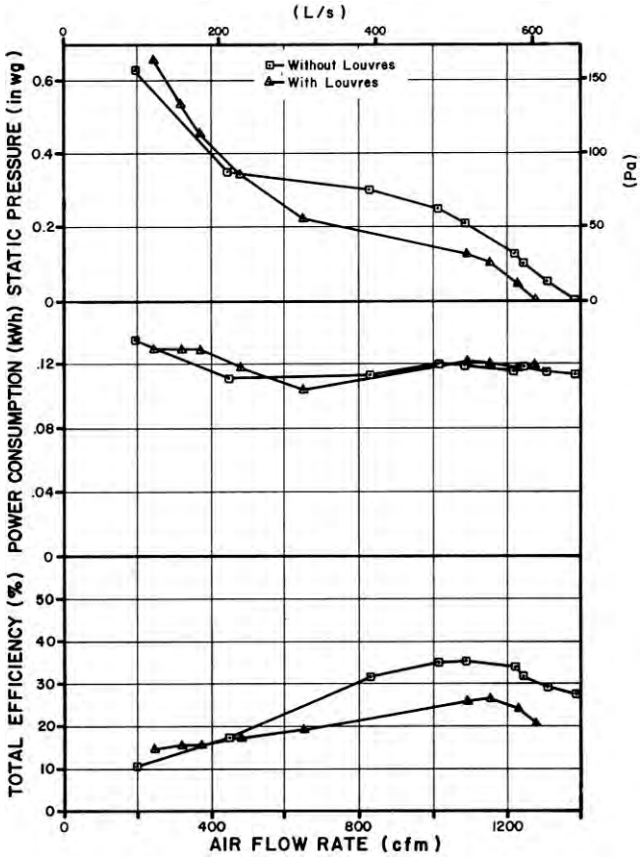

FIGURE 4. Effect of Louvres on Fan Performance.

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 4E30 was CSA approved.

The noise level of the model 4E30, 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 4E30 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:	4E30
MANUFACTURER:	A. Vosterman BV P.O. Box 366-5900 AJ Venlo, Holland
OVERALL DIMENSIONS:	
- housing width	15.5 in (394 mm)
- housing height	15.5 in (394 mm)
- housing depth (including motor)	10.75 in (273 mm)
- housing diameter	12 in (305 mm)
- guard grill diameter	14.5 in (368 mm)
- grill opening	0.09 in (2 mm) diameter wire spaced at 0.38 in (10 mm) in a circular pattern
PROPELLER:	
- diameter	11.9 in (302 mm)
- number of blades	6
- blade angle	variable - 33° at the hub, 29° at the tip
WEIGHT:	18 lb (8 kg)
MOTOR NAMEPLATE DATA:	
make	Fan International
type	4E30
rpm	1650
volts	220 V
amps	0.5 A
phase	1
cycles	60 Hz
horsepower	0.134 hp (100 W)

APPENDIX II

NOISE L EVEL 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 ex* posure 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
4E30 VENTILATION FAN

RETAIL PRICE:	$210.00 (November, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION:	11.9 in (302 mm) propeller fan, variable speed, direct drive, 0.134 hp (100 W) 220 V electric motor.
FAN SPEED:	
- single speed direct	1682 to 1703 rpm
- variable speed	678 to 1701 rpm
EFFICIENCY RANGE:	
- without louvres	28 to 35%
- with louvres	19 to 26%
EFFICIENCY AT 0.125 in wg (31.1 Pa):	
- without louvres	34%
- with louvres	26%
AIR FLOW RATE:	
- range	364 to 1390 cfm (172 to 657 L/s)
- at 0.125 in wg (31.1 Pa)	1220 cfm (576 L/s) single speed direct without louvres and 1100 cfm (519 Us) with louvres
POWER CONSUMPTION:	0.072 to 0.139 kWh
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:	adequate

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