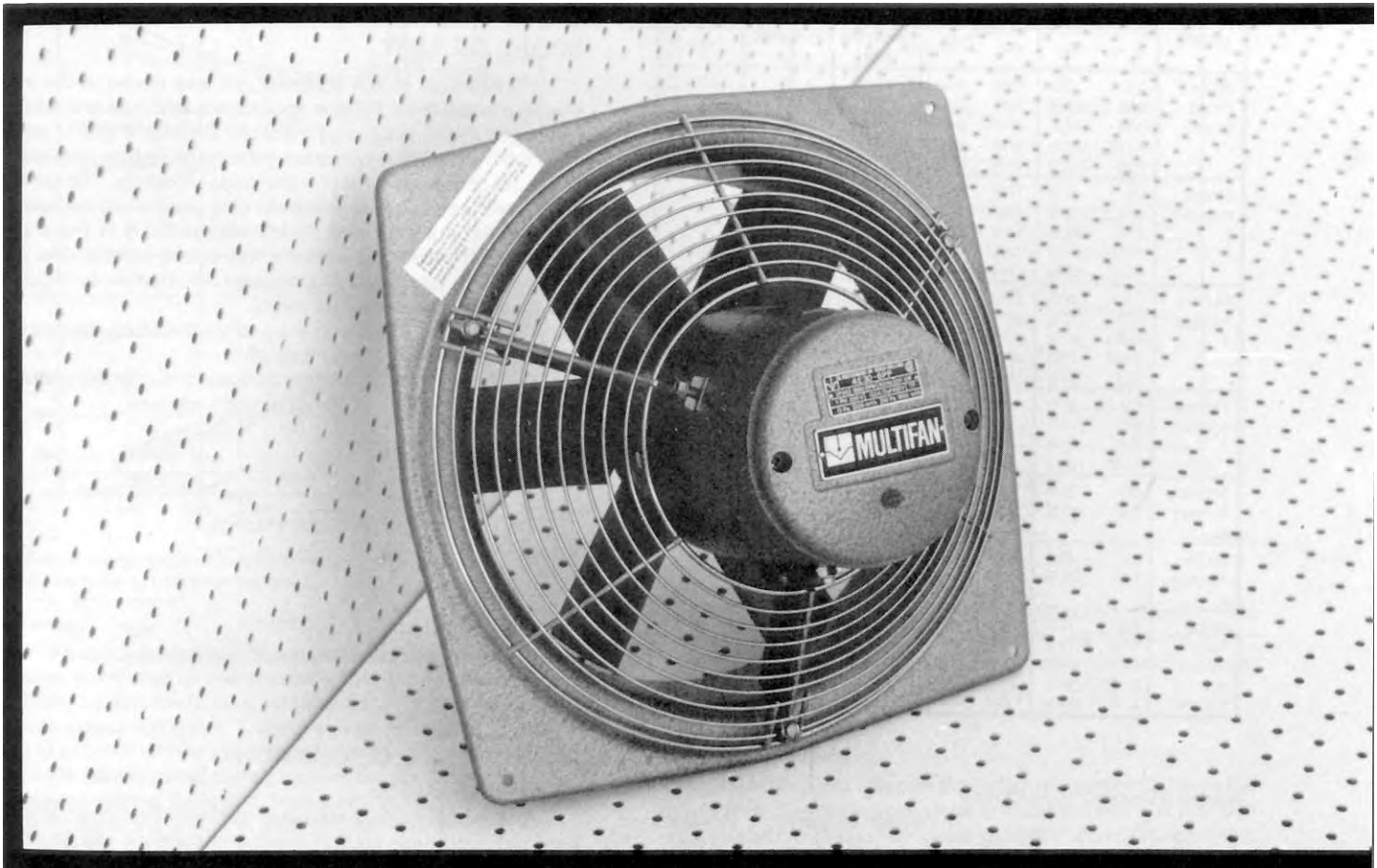


Evaluation Report

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Multifan Model 4E30-6PP Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE

PAMI

PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MULTIFAN MODEL 4E30-6PP VENTILATION FAN

MANUFACTURER:

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

DISTRIBUTOR:

Godro Equipment Inc.
 P.O. Box 280
 Roxton Pond, Quebec
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RETAIL PRICE:

\$192.00 (November, 1985, f.o.b. Roxton Pond, Quebec).

SUMMARY OF RESULTS

TABLE 1. Multifan Model 4E30-6PP 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)	1360 (642)	0.112	25	1702
	0.05 (12.5)	1330 (626)	0.111	32	1701
	0.10 (24.9)	1270 (598)	0.113	34	1698
	0.125 (31.1)	1210 (571)	0.117	33	1697
	0.25 (62.3)	1000 (470)	0.115	35	1699
Setting Number 5	0.0 (0.0)	1360 (641)	0.124	24	1701
	0.05 (12.5)	1300 (615)	0.123	27	1695
	0.10 (24.9)	1250 (588)	0.125	29	1694
	0.125 (31.1)	1200 (568)	0.126	30	1693
	0.25 (62.3)	940 (444)	0.119	31	1698
Setting Number 4	0.0 (0.0)	1280 (604)	0.107	23	1610
	0.05 (12.5)	1230 (582)	0.112	26	1601
	0.10 (24.9)	1170 (551)	0.113	28	1592
	0.125 (31.1)	1090 (515)	0.111	28	1587
	0.25 (62.3)	619 (292)	0.104	20	1616
Setting Number 3	0.0 (0.0)	683 (323)	0.084	4	876
	0.05 (12.5)	567 (267)	0.081	7	878
	0.10 (24.9)	194 (91)	0.081	3	831
	0.125 (31.1)	75 (35)	0.082	1	759
Setting Number 2	0.0 (0.0)	459 (216)	0.054	2	582
	0.05 (12.5)	93 (44)	0.053	1	498
Setting Number 1	0.0 (0.0)	462 (218)	0.052	2	595
	0.05 (12.5)	126 (59)	0.054	1	522
Single Speed Direct with Louvres	0.0 (0.0)	1300 (614)	0.119	22	1700
	0.05 (12.5)	1260 (596)	0.117	26	1694
	0.10 (24.9)	1170 (554)	0.124	26	1690
	0.125 (31.1)	1120 (529)	0.123	27	1689
	0.25 (62.3)	524 (247)	0.106	16	1713

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Multifan Model 4E30-6PP 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 Multifan Model 4E30-6PP is a flush mounted unit equipped with an inlet guard grill and a mounting face plate. Optional features include PVC louvres, a five speed control, a two speed control, a single speed control and a thermostatic control. The six polypropylene blades are attached to a nylon reinforced hub. The propeller is directly mounted to a 0.15 hp (110 W), single phase, 220 V, electric 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.

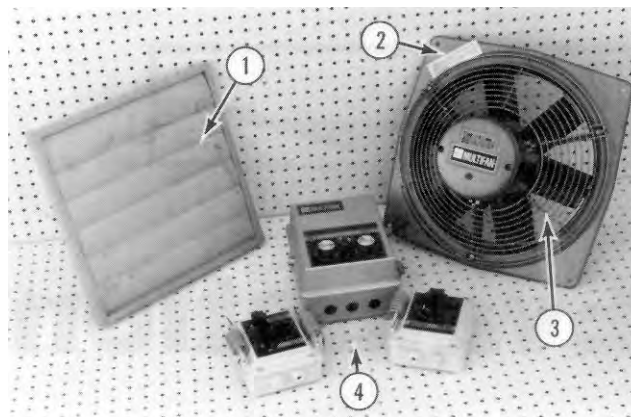


FIGURE 1. Multifan Model 4E30-6PP Ventilation Fan: (1) Optional Louvres, (2) Mounting Face Plate, (3) Inlet Guard Grill, (4) Motor Controls.

SCOPE OF TEST

The Multifan Model 4E30-6PP 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 units were not evaluated and were 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.

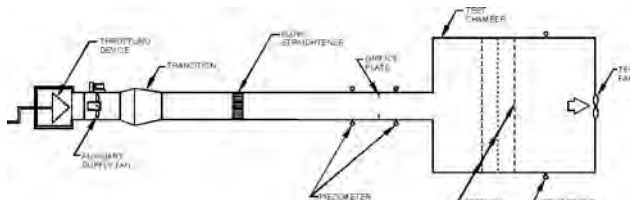


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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 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 pressure². For example, at a static pressure of 0.125 in wg (31.1 Pa), reducing the speed control setting from number 5 to number 4 and number 3 reduced the air flow rate from 1200 cfm (568 L/s) to 1090 cfm (515 L/s) to 75 cfm (35 L/s) respectively. Settings number 2 and number 1 were unable to achieve static pressures of 0.125 in wg (31.1 Pa).

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 pressure² is usually expressed in inches of water gauge (in wg) or Pascals (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 1477 cfm (697 L/s). PAMI's measured flow rate at the same conditions was 1210 cfm (571 L/s) or 18% lower than the manufacturer's rating.

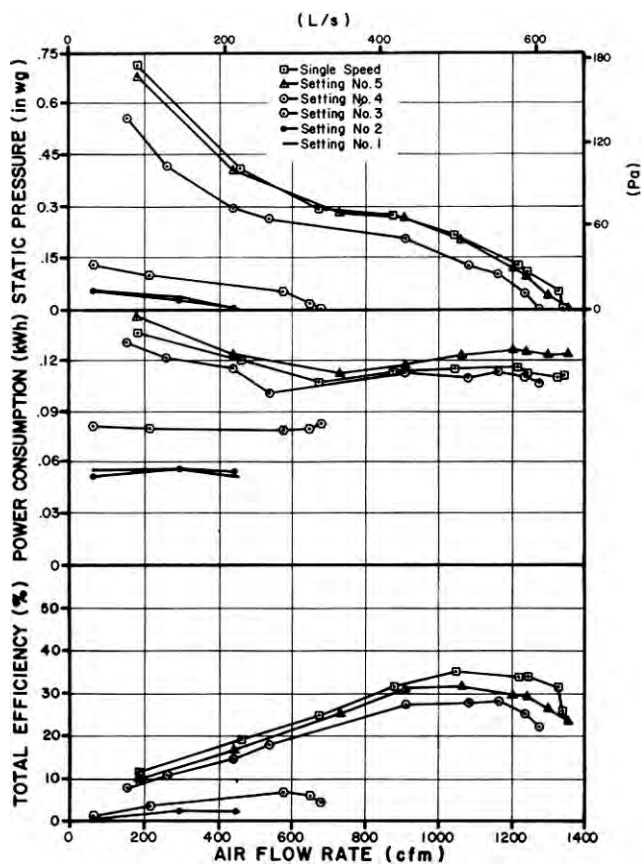


FIGURE 3. Multifan Model 4E30-6PP Fan Performance Curves in the Single Speed Direct Mode and at Five Speed Settings.

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 0.112 to 0.115 kWh in the single speed direct mode, from 0.119 to 0.126 kWh at speed setting number 5, from 0.104 to 0.113 kWh at speed setting number 4, from 0.081 to 0.084 kWh at speed setting number 3, and from 0.052 to 0.054 kWh at speed settings number 2 and number 1. The maximum amperage drawn by the motor was 0.62 amps, which was less than the rated motor amperage of 0.7 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, when using the five speed control, the total efficiency (TABLE 1) ranged from 24 to 31% at speed setting number 5, 20 to 28% at speed setting number 4, 1 to 7% at speed setting number 3, and 1 to 2% at speed settings number 2 and number 1. The total efficiency in the single speed direct mode at a static pressure of 0.125 in wg (31.1 Pa) was 33%.

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 3 to 48% (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 7%, from 1210 cfm (571 L/s) to 1120 cfm (529 L/s) (TABLE 1). The efficiency was in turn

reduced from 33 to 27%. 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.

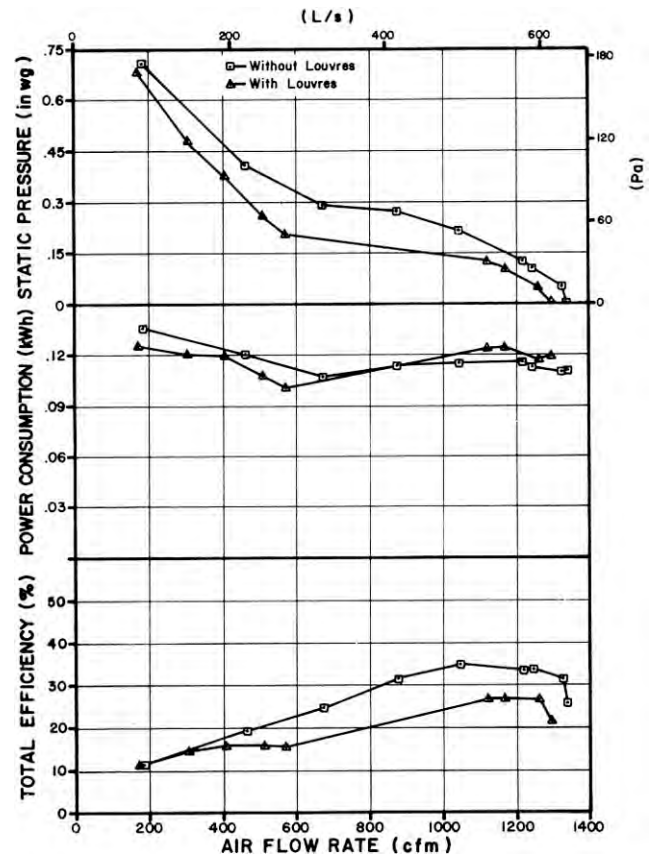


FIGURE 4. Effect of Louvres on Fan Performance.

EASE OF OPERATION

Maintenance: The inlet guard grill was easily removed. This made for easy access to clean the housing and fan blades. 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 4E30-6PP was CSA approved.

The noise level of the model 4E30-6PP, 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 4E30-6PP 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 consisted of a series of booklets and information sheets on the general operation, installation, maintenance, specifications, rated performance and trouble shooting of the Multifan and its controls.

APPENDIX I

SPECIFICATIONS

MAKE: Multifan
MODEL: 4E30-6PP
MANUFACTURER: A. Vostermans BV
 P.O. Box 366-5900 AJ
 Venlo, Holland

OVERALL DIMENSIONS:
 - housing width 15.6 in (397 mm)
 - housing height 15.6 in (397 mm)
 - housing depth (motor included) 10.6 in (270 mm)
 - housing diameter 12.1 in (306 mm)
 - guard grill diameter 16.9 in (430 mm)
 - grill opening 0.13 in (3 mm) diameter wire spaced at 0.6 in (14 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: 14 lb (6.4 kg)

MOTOR NAMEPLATE DATA:
 make Multifan
 model IP55
 class E
 type TP
 rpm 1650
 ambient temperature rise 40°C
 volts 220 V
 amps 0.7A
 phase single
 cycles 60 Hz
 horsepower 0.15 hp (110 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
 MULTIFAN MODEL 4E30-6PP
 VENTILATION FAN**

RETAIL PRICE: \$192.00
 (November, 1985, f.o.b. Roxton Pond)

FAN DESCRIPTION: 11.9 in (302 mm) propeller fan, variable speed, direct drive, 0.15 hp (110 W) 220 V electric motor.

FAN SPEED:
 - single speed direct 1697 to 1702 rpm
 - 5 speed setting 498 to 1701 rpm

EFFICIENCY RANGE:
 - without louvres 25 to 35%
 - with louvres 16 to 27%

EFFICIENCY AT 0.125 in wg (31.1 Pa):
 - without louvres 33%
 - with louvres 27%

AIR FLOW RATE:
 - range 75 to 1360 cfm (35 to 642 L/s)
 - at 0.125 in wg (31.1 Pa) 1210 cfm (571 L/s) without louvres and 1120 cfm (529 L/s) with louvres

POWER CONSUMPTION: 0.052 to 0.126 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

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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