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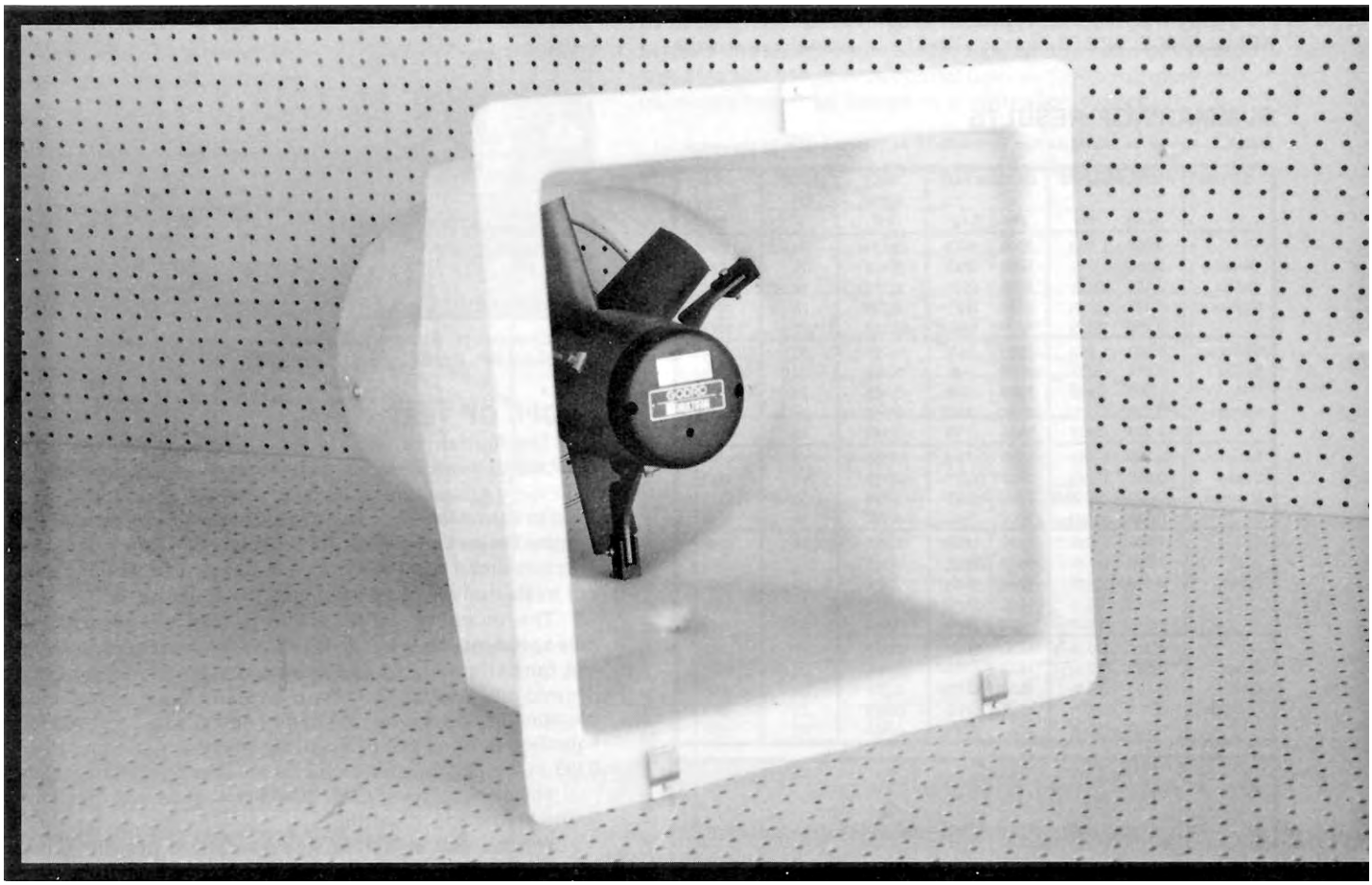
Evaluation Report 613



Agrifan 14" Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

AGRIFAN 14" VENTILATION FAN

MANUFACTURER:

Godro Inc.
C.P. 280
Roxton Pond, Quebec
J0E 1Z0

DISTRIBUTORS:

Better Air Manufacturing
P.O. Box 490
McGregor, Manitoba
R0H 0R0

Exacon Inc.
97 Thames Road
Exeter, Ontario
N0M 1S0

Nitom Fans & Blowers Inc.
#207, 20216 Fraser Highway
Langley, BC
V3A 4E6

RETAIL PRICE: $358.50 (October, 1989, f.o.b., Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Agrifan 14" Aeration 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
	0.000	(0.0)	2000	(943)	0.171	24	1691
Variable	0.050	(12.5)	1890	(892)	0.176	26	1683
Speed	0.100	(24.9)	1790	(847)	0.182	27	1676
Maximum	0.125	(31.1)	1740	(821)	0.183	28	1673
	0.250	(62.3)	1410	(665)	0.181	30	1677
Variable	0.000	(0.0)	1820	(858)	0.157	20	1556
Speed	0.050	(12.5)	1710	(805)	0.162	22	1539
Mid	0.100	(24.9)	1580	(746)	0.166	23	1517
Range	0.125	(31.1)	1520	(715)	0.167	24	1510
	0.250	(62.3)	1080	(508)	0.160	24	1545
Variable	0.000	(0.0)	1540	(725)	0.150	12	1345
Speed	0.050	(12.5)	1330	(627)	0.152	13	1243
Minimum	0.100	(24.9)	1140	(539)	0.153	14	1234
	0.125	(31.1)	1060	(500)	0.154	14	1252
	0.000	(0.0)	1970	(928)	0.160	24	1694
	0.050	(12.5)	1870	(882)	0.166	27	1686
Direct	0.100	(24.9)	1790	(845)	0.171	29	1683
	0.125	(31.1)	1740	(821)	0.171	31	1680
	0.250	(62.3)	1400	(661)	0.170	32	1682
	0.000	(0.0)	1780	(841)	0.169	17	1687
Direct	0.050	(12.5)	1670	(790)	0.169	20	1687
With	0.100	(24.9)	1560	(737)	0.169	22	1682
Louvres	0.125	(31.1)	1510	(714)	0.069	23	1681
	0.250	(62.3)	1030	(485)	0.163	23	1690

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.
2. Supplying detailed operating instructions containing illustrations and information on general operation, installation, maintenance, safety aspects and troubleshooting.

Manager: R. R Atkins

Project Engineer: Robert Maze

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Fan performance data over a complete range of static pressure will be supplied, if requested.
2. Wiring diagrams, service center locations and installation instructions will be supplied with each unit.

GENERAL DESCRIPTION

The Agrifan 14" ventilation fan is a 14.5 in (368 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.

The Agrifan 14" ventilation fan is a flush-mounted unit equipped with a wire outlet guard grill, inlet louvres, optional five speed control and mounting face plate. The 6 blade polypropylene propeller and plastic hub are mounted directly on a 0.24 hp (0.18 kW), single phase, 220 V electric motor. The housing is constructed out of molded polypropylene treated UV. The motor mount consists of three enamel coated metal brackets bolted to the housing.

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

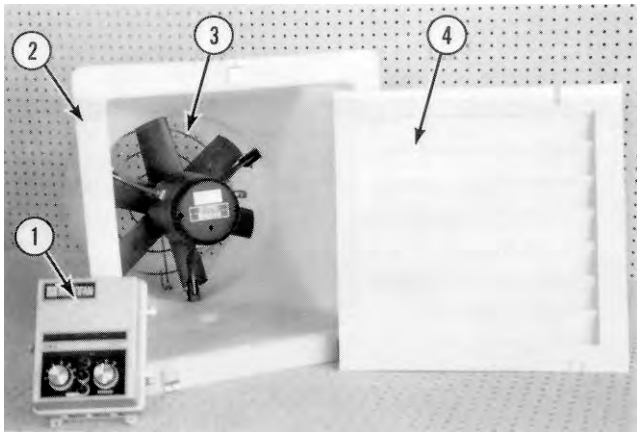


FIGURE 1. Agrifan 14" Ventilation Fan: (1) Five-Speed Control, (2) Mounting Face Plate, (3) Outlet Guard Grill, (4) Inlet Louvres.

SCOPE OF TEST

The Agrifan 14" was tested in the inlet chamber set-up (FIGURE 2) in accordance with test procedures developed by the Prairie Agricultural Machinery Institute and adopted by the Alberta Farm Machinery Research Centre. 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. With the Multifan STW-A variable speed control, fan performance was determined at the maximum setting, the mid-range setting and the minimum setting with the variable speed control. The minimum setting was established by selecting a fan speed at a setting where a static pressure of 0.125 in wg (31.1 Pa) could still be obtained.

The effect of louvres 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.

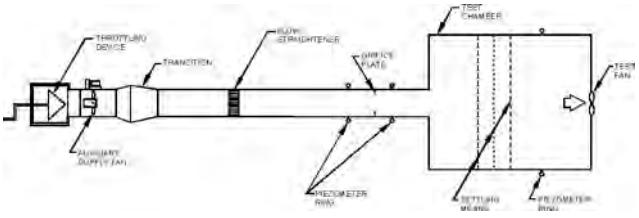


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Set-Up.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air[1] conditions so that direct comparisons can be made

[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).

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 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 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 1740 cfm (821 L/s) to 1520 cfm (715 L/s) to 1060 cfm (500 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). Alberta Farm Machinery Research Centre's measured flow rate in the single speed mode was 1740 cfm (821 L/s). There was no manufacturer's performance information provided. 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.

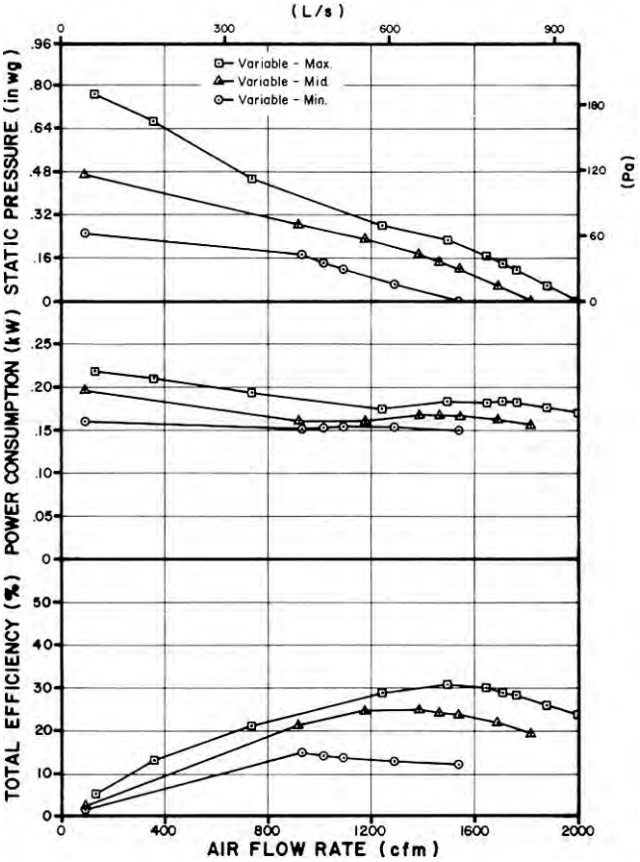


FIGURE 3. Agrifan 14" Fan Performance Curves.

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 depended on fan speed. For typical levels of static pressure (TABLE 1), the input power varied from 0.160 to 0.171 kW in the single speed mode, from 0.171 to 0.183 kW at maximum speed, from 0.157 to 0.167 kW at mid-range and from 0.150 to 0.154 kW at minimum speed. The maximum amperage drawn by the motor was 0.9 amps, which was less than the rated motor amperage of 0.9 amps plus the +- 10% allowable limit established by CSA Standards. Prolonged operation in excess of 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 24 to 30% at maximum speed, 20 to 24% at mid-range and 12 to 14% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 28%.

Effect of Louvres: The optional louvres were installed on the inlet side of the fan to determine their effect on fan output. The fan was tested under these conditions in the single speed mode only. Using the louvres reduced the air flow rate by 9 to 27% (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 13%, from 1740 cfm (821 L/s) to 1510 cfm (714 L/s) (TABLE 1). The efficiency was in turn reduced from 31 to 23%. The use of other control devices such as shutters, 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.

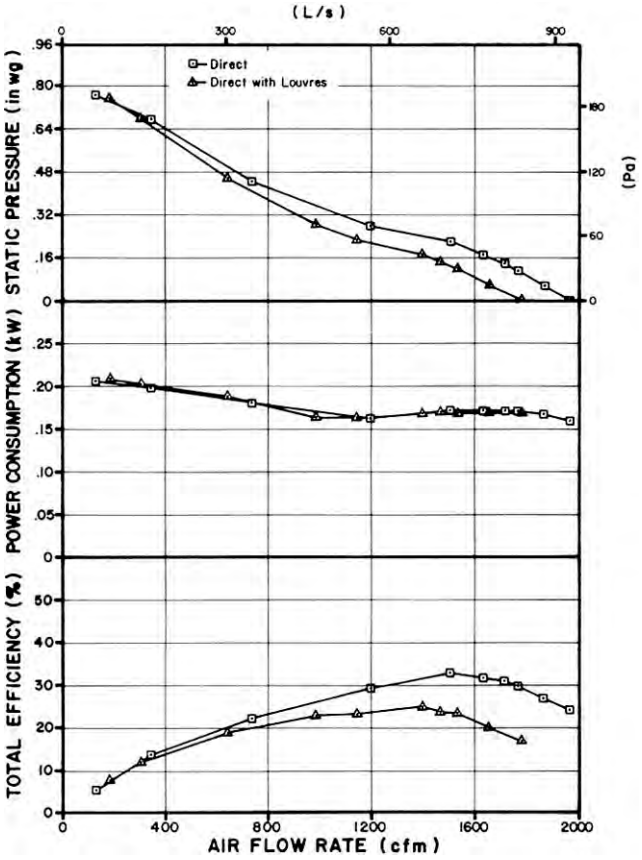


FIGURE 4. Effect of Louvres on Fan Performance.

EASE OF OPERATION

Maintenance: No maintenance instructions were supplied. The inlet louvres 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 outlet guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Agrifan 14" was CSA approved.

The noise level of the Agrifan 14" at a distance of 4.9 ft (I.5 m) from the centre of the fan inlet, while operating at a 0.125

[2]Static 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).

in wg (31.1 Pa) static pressure, was 76 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Agrifan 14" falls within range 3 of the Alberta Farm Machinery Research Centre 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 instruction sheet contained information on wiring the fan motor. It is recommended that the manufacturer supply a detailed manual containing illustrations and information on general operation, maintenance, rated performance, safety aspects and troubleshooting.

APPENDIX I

SPECIFICATIONS

MAKE:	Agrifan
MODEL:	14"
SERIAL NUMBER:	8711
MANUFACTURER:	Godro Inc. C.P. 280 Roxton Pond, Quebec J0E 1Z0
OVERALL DIMENSIONS:	
- housing width	17.8 in (452 mm)
- housing depth (motor included)	26.1 in (663 mm)
- housing height	17.8 in (452 mm)
- discharge opening	14.8 in (376 mm)
- guard grill diameter	12.8 in (325 mm)
- grill opening	0.19 in (5 mm) dia. wire spaced at 2.0 in (51 mm) in a circular pat,'ern
IMPELLER:	
- diameter	14.5 in (368 mm)
- hub diameter	3.75 in (95 mm)
- number of blades	6
-blade angle	Hub 32°, Tip 17°
WEIGHT:	28.4 lb (12.9 kg)
MOTOR NAMEPLATE DATA:	
make	A. Vostermans BV Venlo Holland
model	4E35
rpm	1600
volts	220
amps	0.9
phase	Single
cycles	60
horsepower	0.24 hp (0.18 kW)

APPENDIX II

NOISE LEVELS RANGES

RANGE	SOUND LEVEL (dBA)	COMMENTS
1	up to 45	Tolerable, low level background noise.
2	45to60	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
AGRIFAN 14" VENTILATION FAN

RETAIL PRICE:	$358.50 (October, 1989, f.o.b. Lethbridge)
FAN DESCRIPTION:	14.5 in (368 mm) propeller fan, variable speed, direct drive, 0.24 hp (0.18 kW), 220 V electric motor.
FAN PERFORMANCE:	
Air Flow Rate:	
- range	1030 to 2000 cfm (485 to 943 L/s)
- at 0.125 in wg (31.1 Pa)	1740 cfm (821 L/s) without louvres 1510 cfm (714 L/s) with louvres
Power Consumption:	0.150 to 0.183 kW
Efficiency Range:	
- without louvres	24 to 32%
- with louvres	17 to 23%
Efficiency at 0.125 in wg (31.1 Pa):	
- without louvres	31%
- with louvres	23%
OPERATOR SAFETY:	Outlet guard provided CSA approved noise level = 76 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	None supplied

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