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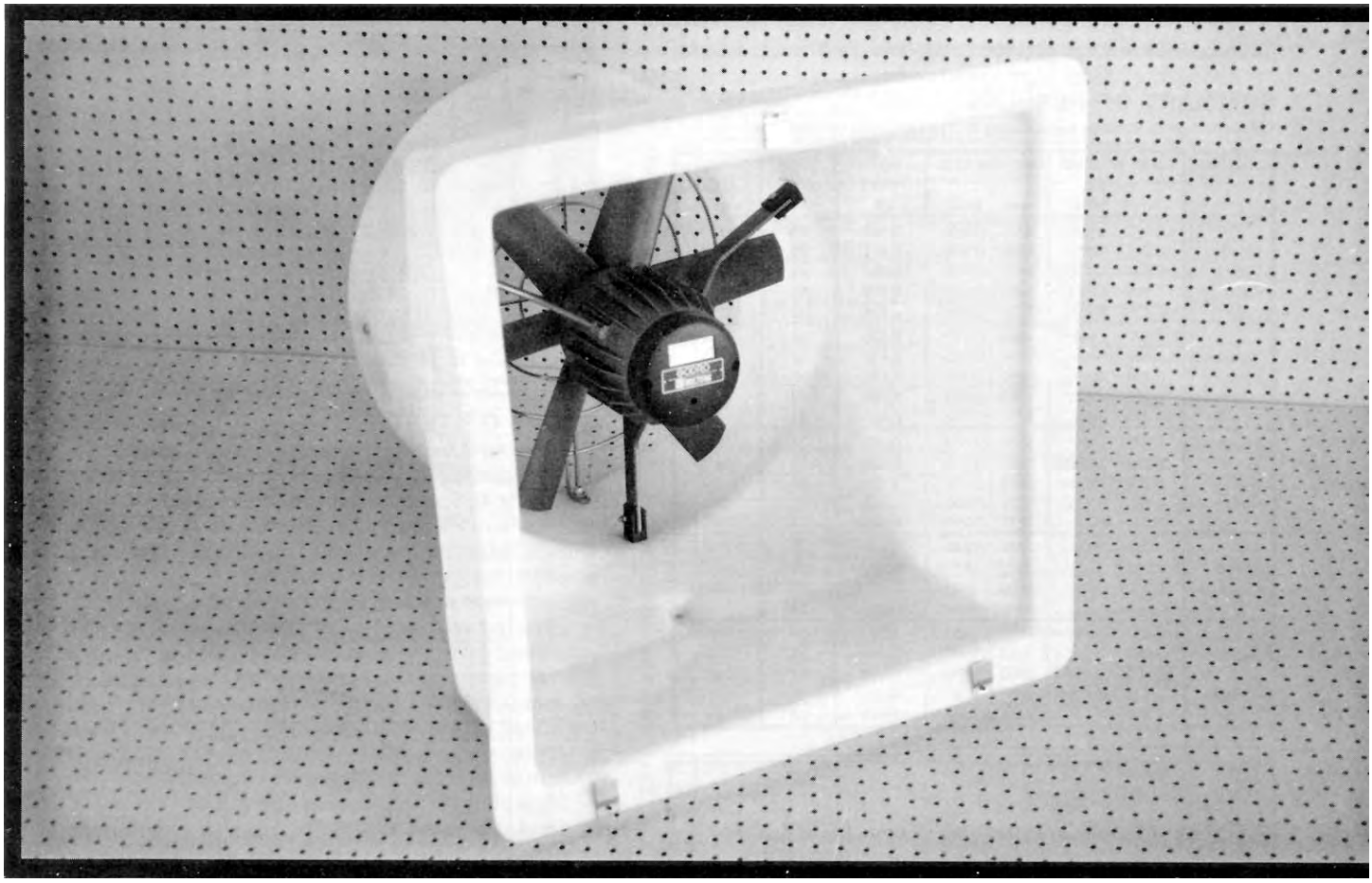
Evaluation Report 616



Agrifan 20" Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

AGRIFAN 20" 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: $478.25 (October, 1989, f.o.b., Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Agrifan 20" 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
Single Speed Direct	0.000	(0.0)	4750	(2240)	0.405	36	1664
	0.050	(12.5)	4580	(2160)	0.412	38	1656
	0.100	(24.9)	4400	(2080)	0.417	41	1650
	0.125	(31.1)	4300	(2030)	0.419	41	1648
	0.250	(62.3)	3730	(1760)	0.424	42	1644
Variable Speed Maximum	0.000	(0.0)	4690	(2210)	0.408	34	1662
	0.050	(12.5)	4530	(2140)	0.418	37	1655
	0.100	(24.9)	4360	(2060)	0.423	39	1649
	0.125	(31.1)	4260	(2010)	0.426	40	1647
	0.250	(62.3)	3700	(1750)	0.430	41	1643
Variable Speed Mid Range	0.000	(0.0)	4160	(1970)	0.329	30	1453
	0.050	(12.5)	3860	(1820)	0.334	31	1419
	0.100	(24.9)	3620	(1710)	0.336	32	1397
	0.125	(31.1)	3500	(1650)	0.337	32	1391
	0.250	(62.3)	2710	(1280)	0.336	31	1383
Variable Speed Minimum	0.000	(0.0)	2630	(1240)	0.202	12	911
	0.050	(12.5)	2070	(975)	0.202	12	855
	0.100	(24.9)	1480	(700)	0.201	10	830
	0.125	(31.1)	1170	(553)	0.202	10	836
Direct With Louvres	0.000	(0.0)	4070	(1920)	0.410	22	1660
	0.050	(12.5)	3910	(1850)	0.416	25	1657
	0.100	(24.9)	3760	(1770)	0.420	27	1652
	0.125	(31.1)	3670	(1730)	0.421	28	1651
	0.250	(62.3)	3230	(1520)	0.427	33	1643

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 20" ventilation fan is a 20.0 in (508 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 20" 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 0.58 hp (0.43 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.

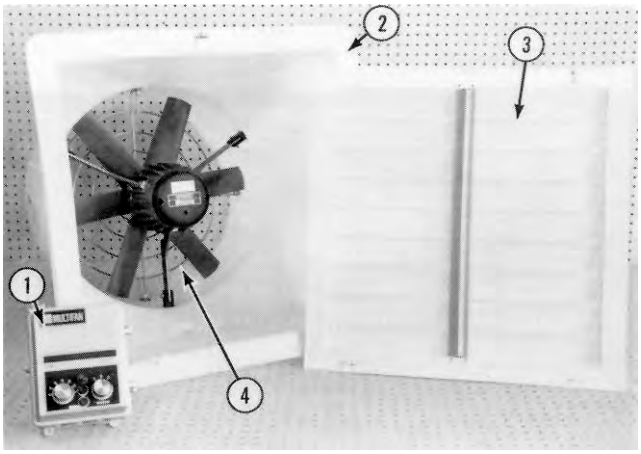


FIGURE 1. Agrifan 20" Ventilation Fan: (1) Five-Speed Control, (2) Mounting Face Plate, (3) Inlet Louvres, (4) Outlet Guard Grill.

SCOPE OF TEST

The Agrifan 20" 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 230V 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.

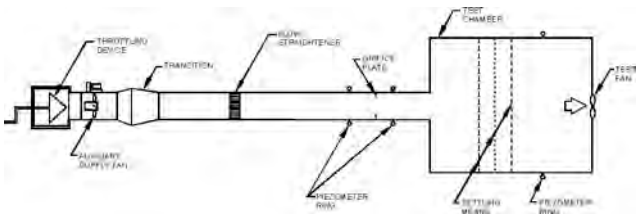


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Set-Up.

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 4260 cfm (2010 L/s) to 3500 cfm (1650 L/s) to 1170 cfm (553 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 4300 cfm (2030 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.

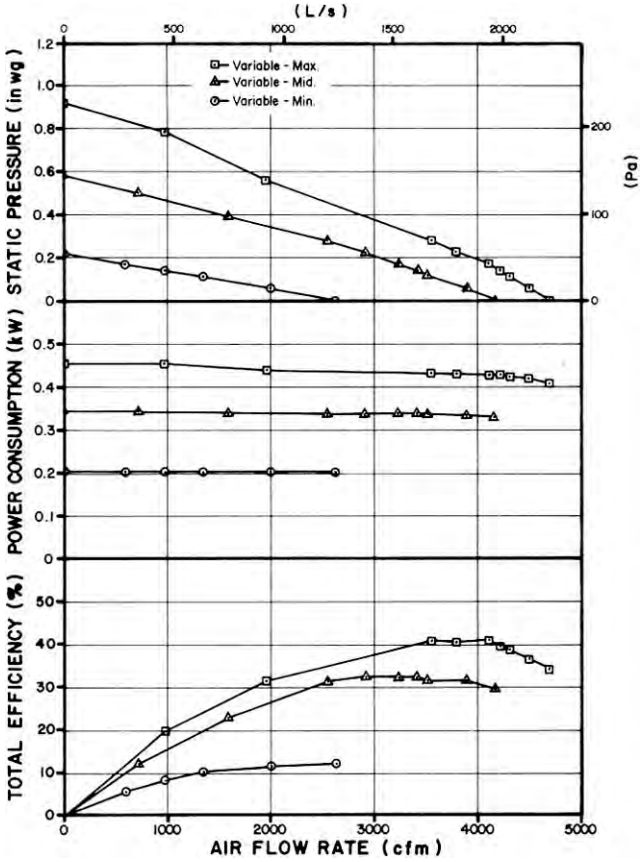


FIGURE 3. Agrifan 20" Fan Performance Curves.

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 0.405 to 0.424 kW in the single speed mode, from 0.408 to 0.430 kW at maximum speed, from 0.329 to 0.337 kW at mid-range and from 0.201 to 0.202 kW at minimum speed. The maximum amperage drawn by the motor was 1.84 amps, which was less than the rated motor amperage of 2.0 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 34 to 41% at maximum speed, 30 to 32% at mid-range and 10 to 12% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 40%.

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 13 to 15% (FIGURE 4) over the typical range of operation. For exampie, at a static pressure of 0.125 in wg (31.1 Pa), the louvres reduced the air flow rate by 15%, from 4300 cfm (2030 L/s) to 3670 cfm (1730 L/s) (TABLE 1). The efficiency was in turn reduced from 41 to 28%. 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.

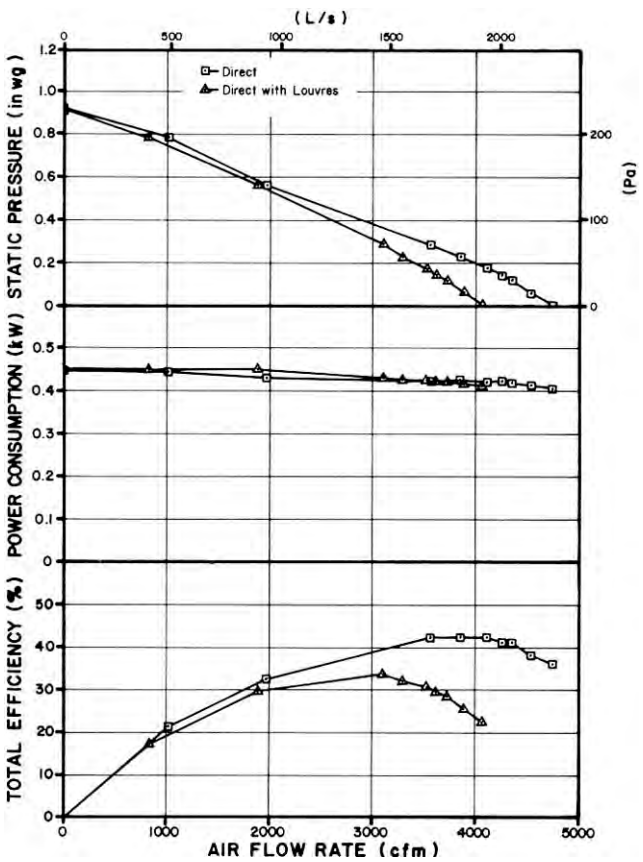


FIGURE 4. Effect of Louvres on Fan Performance.

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 20" was CSA approved.

The noise level of the Agrifan 20" at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 0.125 in wg (31.1 Pa) static pressure, was 82 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other

[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).

buildings. The Agrifan 20" 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:	20"
SERIAL NUMBER:	8807
MANUFACTURER:	Godro Inc. C.P. 280 Roxton Pond, Quebec J0E 1Z0
OVERALL DIMENSIONS:	
- housing width	23.5 in (597 mm)
- housing depth (motor included)	25.3 in (643 mm)
- housing height	23.5 in (597 mm)
- discharge opening	20.6 in (523 mm)
- guard grill diameter	16.8 in (427 mm)
- grill opening	0.19 in (5 mm) dia. wire spaced at 2.0 in (51 mm) in a circular pattern
IMPELLER:	
- diameter	20.0 in (508 mm)
- hub diameter	3.75 in (95 mm)
- number of blades	6
-blade angle	Hub 32°, Tip 10°
WEIGHT:	43.4 lb (19.7 kg)
MOTOR NAMEPLATE DATA:	
make	A. Vostermans BV Venlo Holland
model	4E50
rpm	1600
volts	220
amps	2.0
phase	Single
cycles	60
horsepower	0.58 hp (0.43 kW)

APPENDIX II

NOISE LEVELS 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.

SUMMARY CHART
AGRIFAN 20" VENTILATION FAN

RETAIL PRICE:	$478.25 (October, 1989, f.o.b. Lethbridge)
FAN DESCRIPTION:	20.0 in (508 mm) propeller fan, variable speed, direct drive, 0.58 hp (0.43 kW), 220 V electric motor.
FAN PERFORMANCE:	
Air Flow Rate:	
- range	1170 to 4750 cfm (553 to 2240 L/s)
- at 0.125 in wg (31.1 Pa)	4300 cfm (2030 L/s) without louvres 3670 cfm (1730 L/s) with louvres
Power Consumption:	0.201 to 0.430 kW
Efficiency Range:	
- without louvres	36 to 42%
- with louvres	22 to 33%
Efficiency at 0.125 in wg (31.1 Pa):	
- without louvres	41%
- with louvres	28%
OPERATOR SAFETY:	Outlet guard provided CSA approved noise level - 82 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	None supplied

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