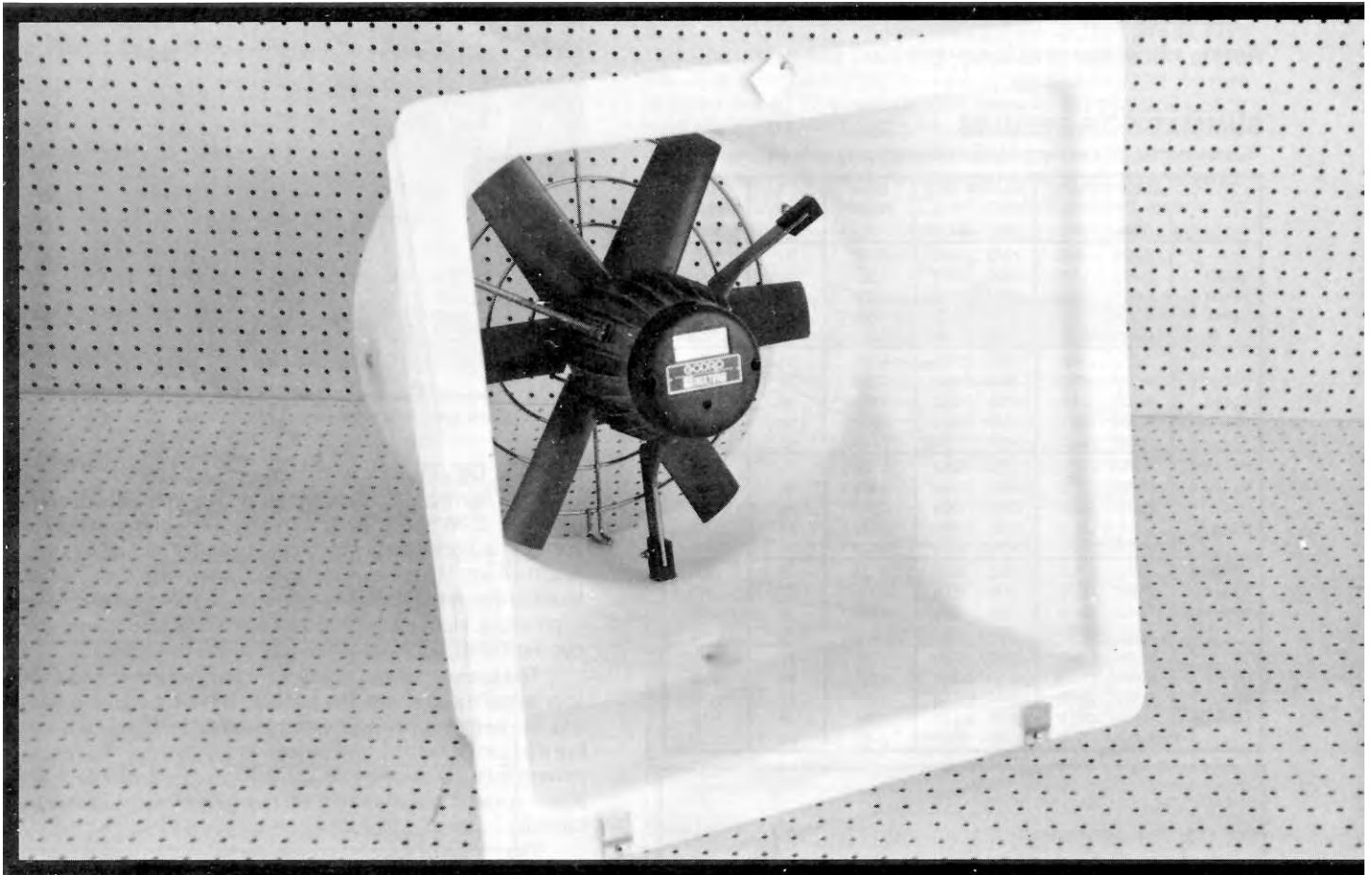


# Evaluation Report

# 614



## Agrifan 16" Ventilation Fan

A Co-operative Program Between



## AGRIFAN 16" VENTILATION FAN

### MANUFACTURER:

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

### DISTRIBUTOR:

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:** \$394.00 (October, 1989, f.o.b., Lethbridge, Alberta)

## SUMMARY OF RESULTS

TABLE 1. Agrifan 16" Fan Performance At Typical Levels of Operation.

SETTING	STATIC PRESSURE		AIR FLOW RATE		INPUT POWER kW	TOTAL EFF. %	FAN SPEED rpm
	in wg	(Pa)	cfm	(L/s)			
Single Speed Direct	0.000	( 0.0)	2940	(1390)	0.248	33	1667
	0.050	(12.5)	2800	(1320)	0.252	34	1660
	0.100	(24.9)	2740	(1290)	0.259	38	1651
	0.125	(31.1)	2710	(1280)	0.263	39	1644
	0.250	(62.3)	2400	(1130)	0.270	42	1629
Variable Speed Maximum	0.000	( 0.0)	2950	(1390)	0.262	31	1659
	0.050	(12.5)	2840	(1340)	0.266	34	1652
	0.100	(24.9)	2750	(1300)	0.271	36	1643
	0.125	(31.1)	2710	(1280)	0.273	38	1639
	0.250	(62.3)	2400	(1130)	0.281	40	1623
Variable Speed Range	0.000	( 0.0)	2640	(1250)	0.258	23	1466
	0.050	(12.5)	2450	(1160)	0.224	27	1443
	0.100	(24.9)	2250	(1060)	0.225	28	1386
	0.125	(31.1)	2150	(1010)	0.229	27	1358
	0.250	(62.3)	1610	(750)	0.229	26	1358
Variable Speed Minimum	0.000	( 0.0)	1550	(733)	0.144	8	884
	0.050	(12.5)	1210	(570)	0.144	9	773
	0.100	(24.9)	836	(395)	0.144	8	844
	0.125	(31.1)	583	(275)	0.144	6	805
	Direct With Louvres	0.000	( 0.0)	2590	(1220)	0.261	21
0.050		(12.5)	2510	(1180)	0.265	24	1646
0.100		(24.9)	2400	(1140)	0.266	27	1646
0.125		(31.1)	2350	(1110)	0.265	28	1636
0.250		(62.3)	1990	(937)	0.259	32	1632

## 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 16" ventilation fan is a 16.5 in (419 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 16" 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 0.31 hp (0.23 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 .

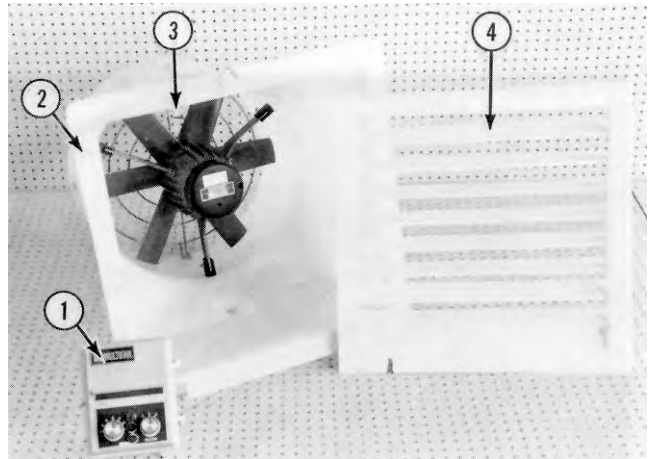


FIGURE 1. Agrifan 16" Ventilation Fan: (1) Five-Speed Control, (2) Mounting Face Plate, (3) Outlet Guard Grill, (4) Inlet Louvres.

## SCOPE OF TEST

The Agrifan 16" 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. 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.

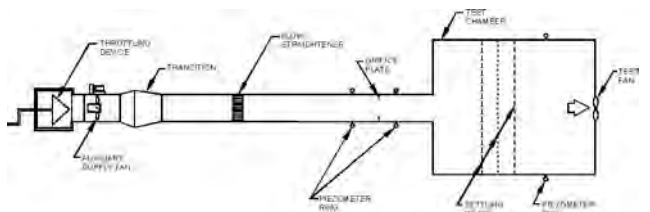


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Set-Up.

## RESULTS AND DISCUSSION

### FAN PERFORMANCE

All fan performance results in this report are given at standard air<sup>1</sup> 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 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<sup>2</sup>. 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 2710 cfm (1280 L/s) to 2150 cfm (1010 L/s) to 583 cfm (275 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 2710 cfm (1280 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.

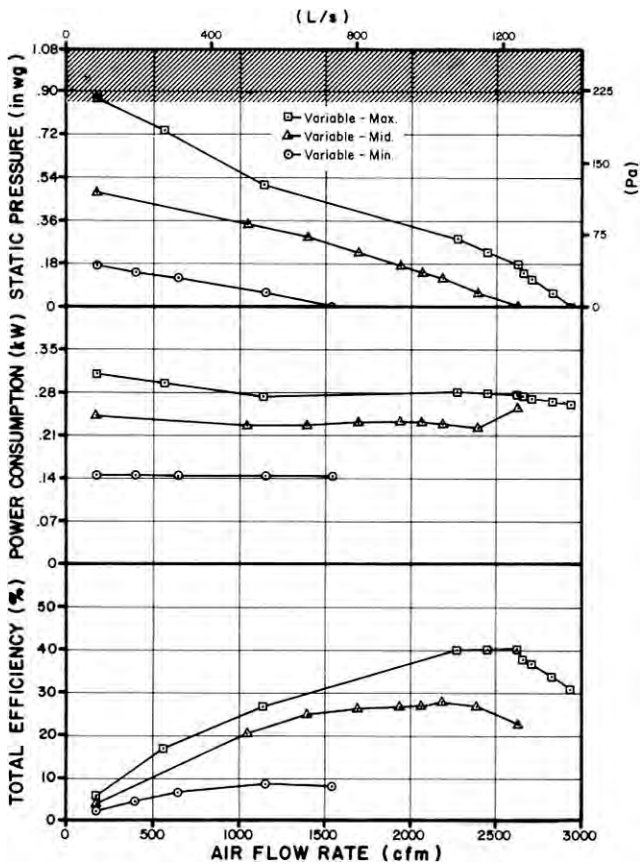


FIGURE 3. Agrifan 16" Fan Performance Curves.

**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

<sup>1</sup>Standard air is air with a density of 0.075 lbm/ft<sup>3</sup> (1.2 kg/m<sup>3</sup>) which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

<sup>2</sup>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).

varied from 0.248 to 0.270 kW in the single speed mode, from 0.262 to 0.281 kW at maximum speed, from 0.224 to 0.258 kW at mid-range and was 0.144 kW at minimum speed. The maximum amperage drawn by the motor was 1.27 amps, which was greater than the rated motor amperage of 1.1 amps plus the +/-10% allowable limit established by CSA Standards. The shaded zone in FIGURE 3 illustrates operation levels where the rated motor amperage was exceeded. 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 31 to 40% at maximum speed, 23 to 28% at mid-range and 6 to 9% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 38%.

**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 10 to 17% (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 2710 cfm (1280 L/s) to 2350 cfm (1110 L/s) (TABLE 1). The efficiency was in turn reduced from 39 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.

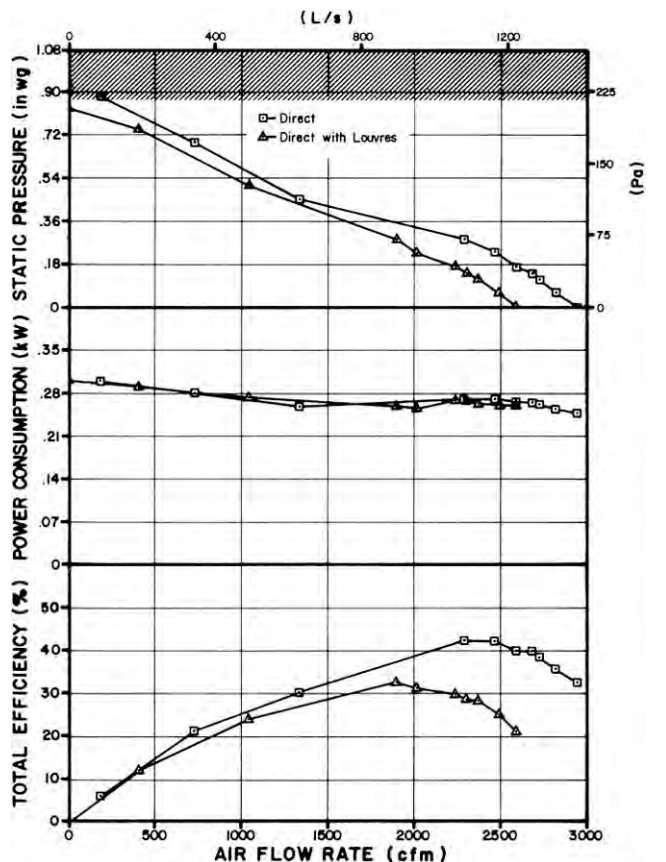


FIGURE 4. Effect of Louvres on Fan Performance.

### 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 16" was CSA approved.

The noise level of the Agrifan 16" 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 76 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Agrifan 16" 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 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.

APPENDIX I	
SPECIFICATIONS	
<b>MAKE:</b>	Agrifan
<b>MODEL:</b>	16"
<b>SERIAL NUMBER:</b>	8806
<b>MANUFACTURER:</b>	Godro Inc. C.P. 280 Roxton Pond, Quebec J0E 1Z0
<b>OVERALL DIMENSIONS:</b>	
- housing width	19.5 in (495 mm)
- housing depth (motor included)	25.3 in (643 mm)
- housing height	19.5 in (495 mm)
- discharge opening	16.6 in (422 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 pattern
<b>IMPELLER:</b>	
- diameter	16.5 in (419 mm)
- hub diameter	3.75 in (95 mm)
- number of blades	6
- blade angle	Hub 32°, Tip 19°
<b>WEIGHT:</b>	30.9 lb (14.0 kg)
<b>MOTOR NAMEPLATE DATA:</b>	
make	A. Vostermans BV Venlo Holland
model	4E40
rpm	1600
volts	220
amps	1.1
phase	Single
cycles	60
horsepower	0.31 hp (230 W)

#### SUMMARY CHART AGRIFAN 16" VENTILATION FAN

<b>RETAIL PRICE:</b>	<b>\$394.00</b> (October, 1989, f.o.b. Lethbridge)
<b>FAN DESCRIPTION:</b>	16.5 in (419 mm) propeller fan, variable speed, direct drive, 0.31 hp (230 W), 220 V electric motor.
<b>FAN PERFORMANCE:</b>	
<b>Air Flow Rate:</b>	
- range	583 to 2950 cfm (275 to 1390 L/s)
- at 0.125 in wg (31.1 Pa)	2710 cfm (1280 L/s) without louvres 2350 cfm (1110 L/s) with louvres
<b>Power Consumption:</b>	0.144 to 0.281 kW
<b>Efficiency Range:</b>	
- without louvres	33 to 42%
- with louvres	21 to 32%
<b>Efficiency at 0.125 in wg (31.1 Pa):</b>	
- without louvres	39%
- with louvres	28%
<b>OPERATOR SAFETY:</b>	Outlet guard provided CSA approved noise level - 76 dB(A) at 4.9 ft (1.5 m) from fan inlet
<b>OPERATOR'S MANUAL:</b>	None supplied

 <p><b>ALBERTA FARM MACHINERY RESEARCH CENTRE</b></p>	<p><b>Prairie Agricultural Machinery Institute</b> Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-2555</p>
<p>3000 College Drive South Lethbridge, Alberta, Canada T1K 1L6 Telephone: (403) 329-1212 FAX: (403) 329-5562 <a href="http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html">http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html</a></p>	<p>Test Stations: P.O. Box 1060 Portage la Prairie, Manitoba, Canada R1N 3C5 Telephone: (204) 239-5445 Fax: (204) 239-7124</p> <p>P.O. Box 1150 Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-5033 Fax: (306) 682-5080</p>