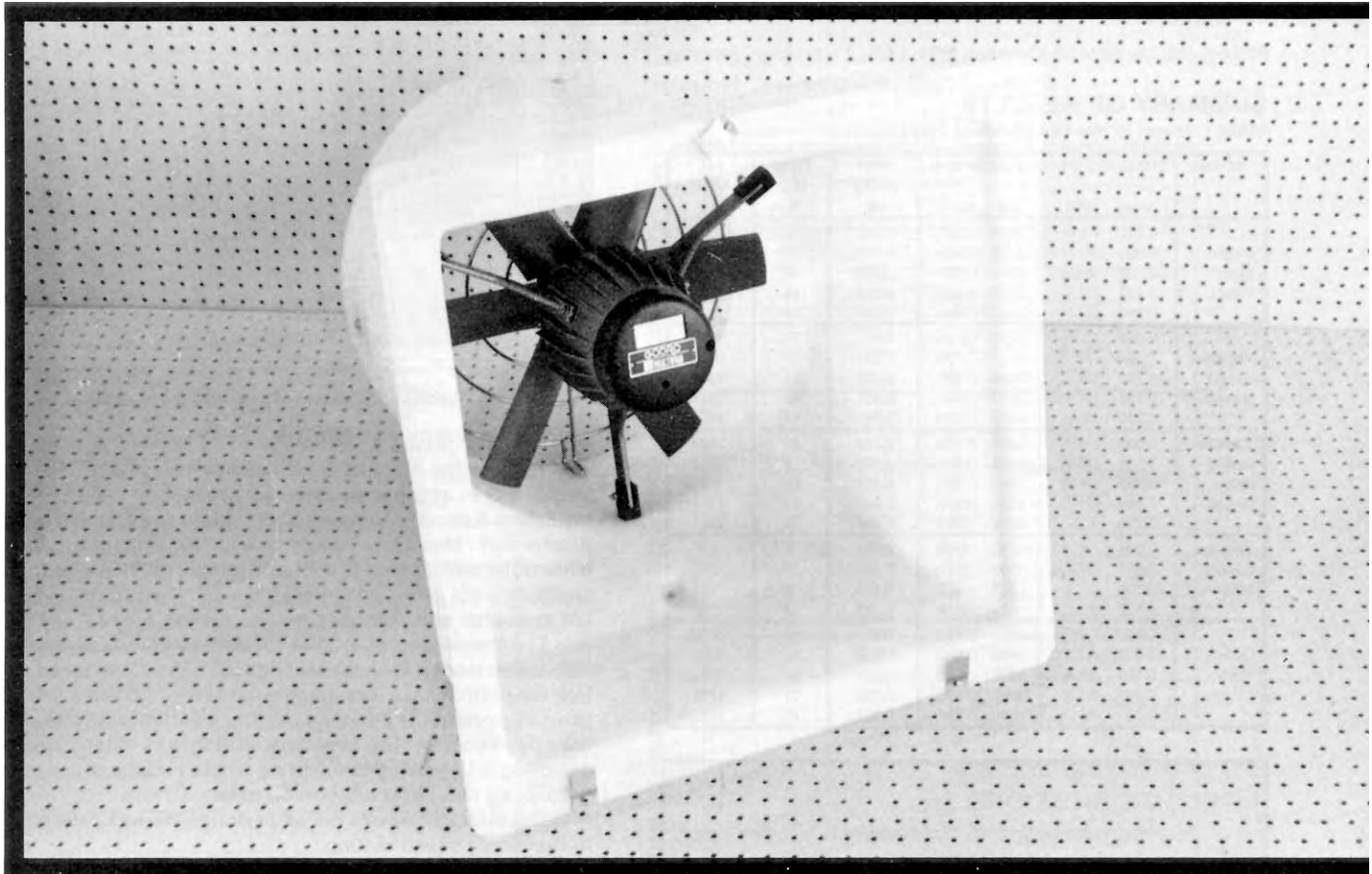


Evaluation Report

615



Agrifan 18" Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

AGRIFAN 18" VENTILATION FAN

MANUFACTURER:

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

DISTRIBUTORS:

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

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

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

RETAIL PRICE: \$424.65 (October, 1989, f.o.b., Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Agrifan 18" 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 | 0.000 | (0.0) | 3860 | (1820) | 0.305 | 38 | 1670 |
| | 0.050 | (12.5) | 3730 | (1760) | 0.311* | 39 | 1662 |
| | 0.100 | (24.9) | 3590 | (1690) | 0.317 | 44 | 1656 |
| | 0.125 | (31.1) | 3510 | (1660) | 0.319 | 44 | 1653 |
| Direct | 0.250 | (62.3) | 3080 | (1460) | 0.330 | 44 | 1638 |
| | 0.000 | (0.0) | 3840 | (1810) | 0.311 | 37 | 1665 |
| | 0.050 | (12.5) | 3710 | (1750) | 0.321 | 39 | 1654 |
| | 0.100 | (24.9) | 3580 | (1690) | 0.328 | 41 | 1646 |
| Variable Speed Maximum | 0.125 | (31.1) | 3510 | (1660) | 0.331 | 42 | 1643 |
| | 0.250 | (62.3) | 3110 | (1470) | 0.342 | 44 | 1636 |
| | 0.000 | (0.0) | 3400 | (1600) | 0.274 | 29 | 1468 |
| | 0.050 | (12.5) | 3190 | (1500) | 0.279 | 30 | 1432 |
| Variable Speed Mid Range | 0.100 | (24.9) | 2950 | (1390) | 0.287 | 30 | 1386 |
| | 0.125 | (31.1) | 2830 | (1330) | 0.290 | 30 | 1364 |
| | 0.250 | (62.3) | 2030 | (959) | 0.292 | 26 | 1301 |
| | 0.000 | (0.0) | 1740 | (819) | 0.183 | 6 | 780 |
| Variable Speed Minimum | 0.050 | (12.5) | 1310 | (617) | 0.183 | 7 | 730 |
| | 0.100 | (24.9) | 742 | (350) | 0.183 | 5 | 730 |
| | 0.125 | (31.1) | 465 | (219) | 0.183 | 4 | 732 |
| | 0.000 | (0.0) | 3600 | (1700) | 0.307 | 31 | 1654 |
| Direct With Louvres | 0.050 | (12.5) | 3460 | (1630) | 0.312 | 34 | 1647 |
| | 0.100 | (24.9) | 3330 | (1570) | 0.317 | 36 | 1642 |
| | 0.125 | (31.1) | 3260 | (1540) | 0.319 | 37 | 1640 |
| | 0.250 | (62.3) | 2860 | (1350) | 0.327 | 40 | 1633 |

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 18" ventilation fan is a 18.5 in (470 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 18" 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 0.46 hp (0.34 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.

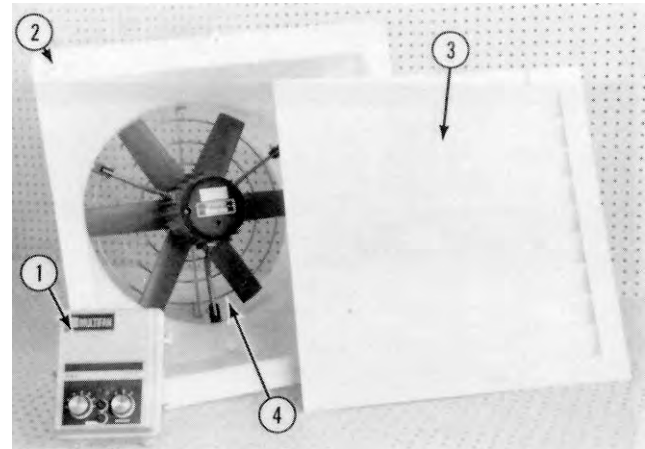


FIGURE 1. Agrifan 18" Ventilation Fan: (1) Five-Speed Control, (2) Mounting Face Plate, (3) Inlet Louvres, (4) Outlet Guard Grill.

SCOPE OF TEST

The Agrifan 18" 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.

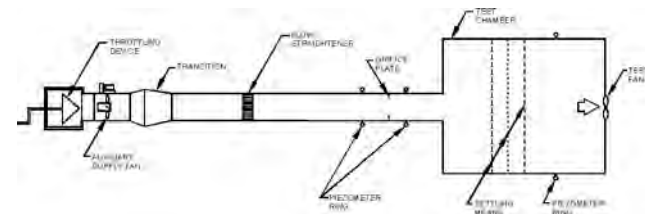


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Set-Up.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air¹ conditions so that direct comparisons can be made

¹ Standard 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).

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 pressure². 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 3510 cfm (1660 L/s) to 2830 cfm (1330 L/s) to 465 cfm (219 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 3510 cfm (1660 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.

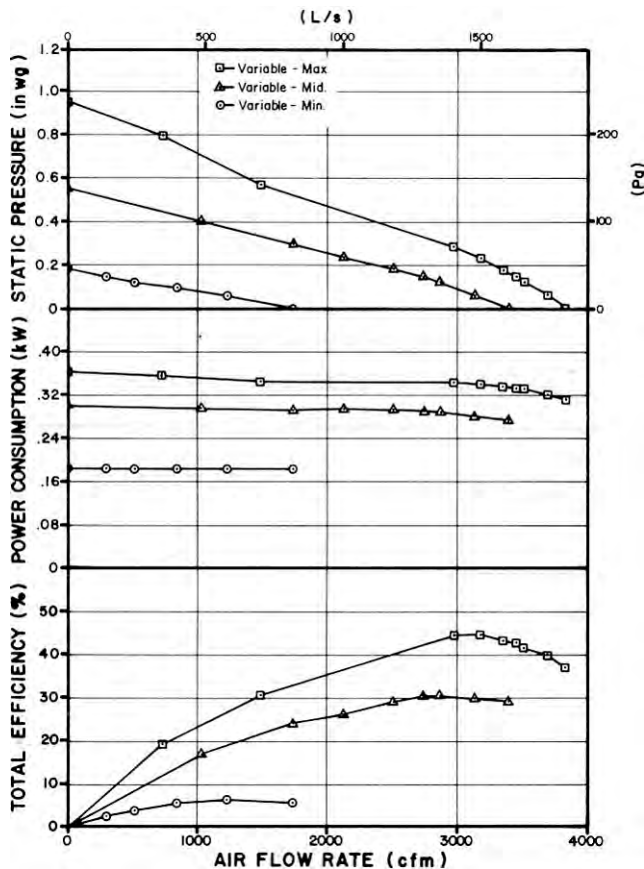


FIGURE 3. Agrifan 18" Fan Performance Curves.

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 0.305 to 0.330 kW in the single speed mode, from 0.311 to 0.342 kW at maximum speed, from 0.274 to 0.292 kW at mid-range and was 0.183 kW at minimum speed. The maximum amperage drawn by the motor was 1.46 amps, which was

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 pressure is usually expressed in inches of water gauge (in wg) or Pascals (Pa).

less than the rated motor amperage of 1.5 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 37 to 44% at maximum speed, 26 to 30% at mid-range and 4 to 7% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 42%.

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 7% (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 3510 cfm (1660 L/s) to 3260 cfm (1540 L/s) (TABLE 1). The efficiency was in turn reduced from 44 to 37%. 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.

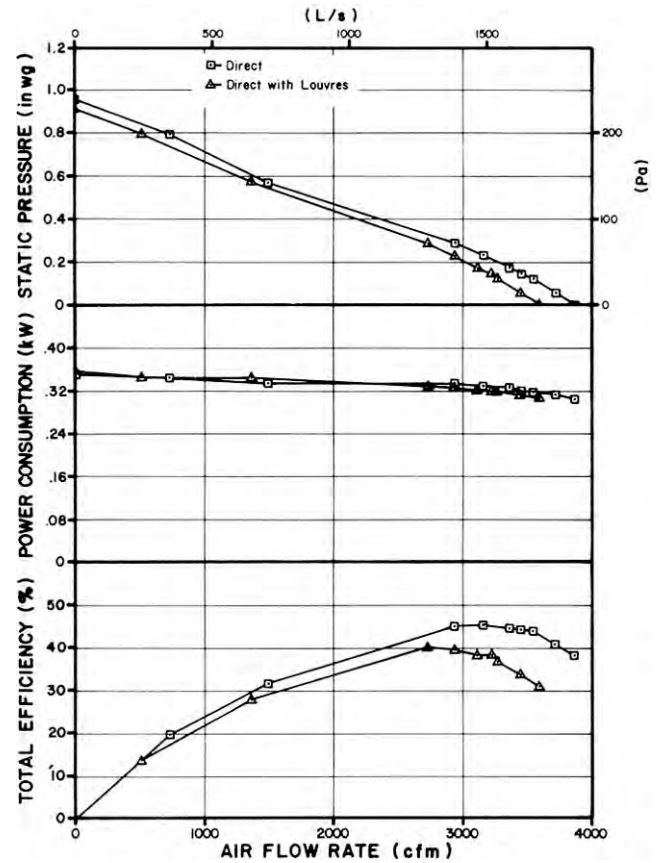


FIGURE 4. Effect of Louvres on Fan Performance.

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 18" was CSA approved.

The noise level of the Agrifan 18" 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 79 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other

buildings. The Agrifan 18" 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 | |
| MAKE: | Agrifan |
| MODEL: | 18" |
| SERIAL NUMBER: | 3810 |
| MANUFACTURER: | Godro Inc. C.P. 280 Roxton Pond, Quebec J0E 1Z0 |
| OVERALL DIMENSIONS: | |
| - housing width | 21.5 in (546 mm) |
| - housing depth (motor included) | 25.0 in (635 mm) |
| - housing height | 21.5 in (546 mm) |
| - discharge opening | 18.8 in (478 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 | 18.5 in (470 mm) |
| - hub diameter | 3.75 in (95 mm) |
| - number of blades | 6 |
| -blade angle | Hub 32°, Tip 13° |
| WEIGHT: | 36.8 lb (16.7 kg) |
| MOTOR NAMEPLATE DATA: | |
| make | A. Vostermans BV Venlo Holland |
| model | 4E45 |
| rpm | 1600 |
| volts | 220 |
| amps | 15 |
| phase | Single |
| cycles | 60 |
| horsepower | 0.46 hp (0.34 kW) |

**SUMMARY CHART
AGRIFAN 18" VENTILATION FAN**

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|---|--|
| RETAIL PRICE: | \$424.65 (October, 1989, f.o.b. Lethbridge) |
| FAN DESCRIPTION: | 18.5 in (470 mm) propeller fan, variable speed, direct drive, 0.46 hp (0.34 kW), 220 V electric motor. |
| FAN PERFORMANCE: | |
| Air Flow Rate: | |
| - range | 465 to 3860 cfm (219 to 1820 L/s) |
| - at 0.125 in wg (31.1 Pa) | 3510 cfm (1660 L/s) without louvres 3260 cfm (1540 L/s) with louvres |
| Power Consumption: | 0.183 to 0.342 kW |
| Efficiency Range: | |
| - without louvres | 38 to 44% |
| - with louvres | 31 to 40% |
| Efficiency at 0.125 in wg (31.1 Pa): | |
| - without louvres | 44% |
| - with louvres | 37% |
| OPERATOR SAFETY: | Outlet guard provided CSA approved noise level = 79 dB(A) at 4.9 ft (1.5 m) from fan inlet |
| OPERATOR'S MANUAL: | None supplied |



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|---|---|