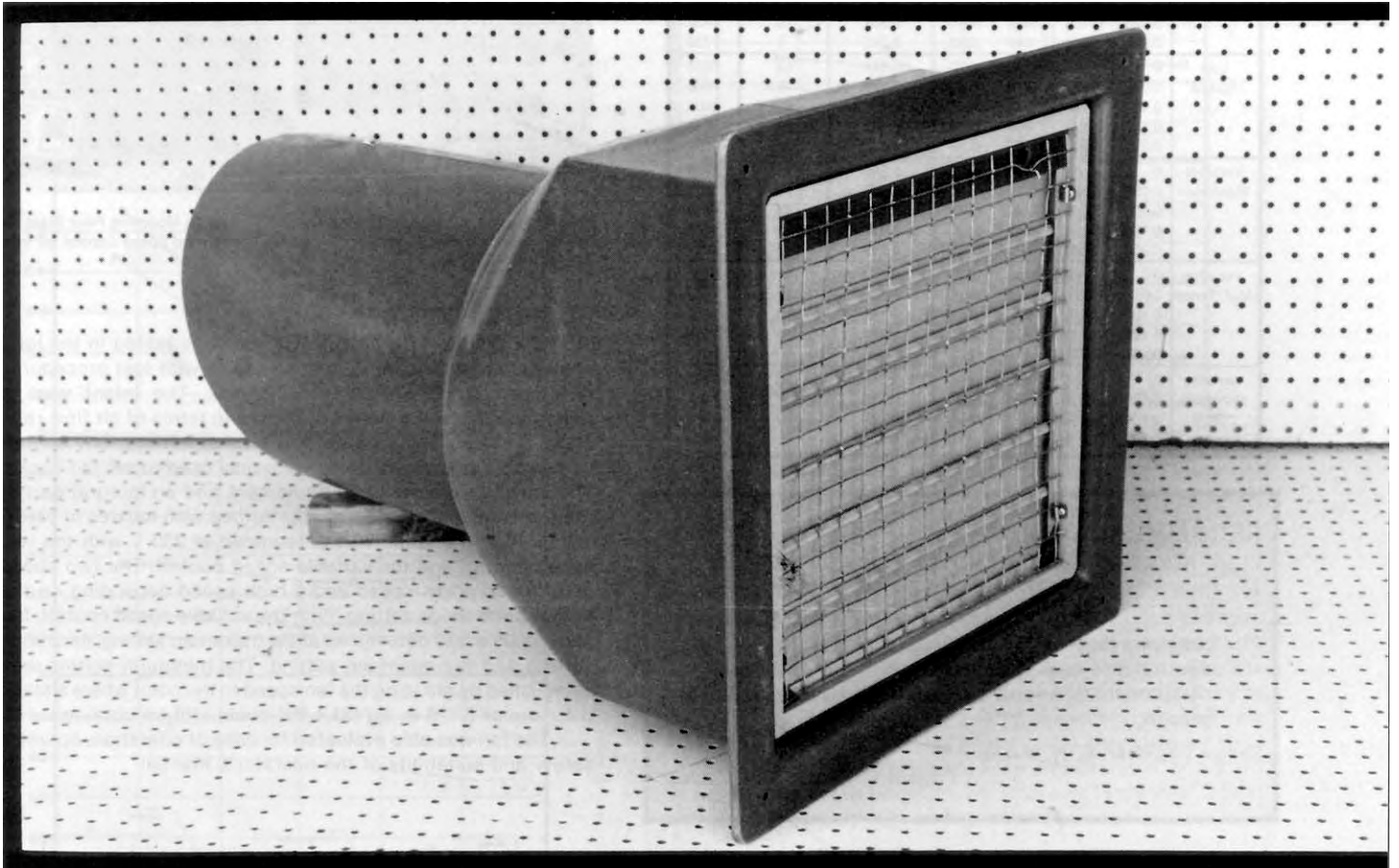


Evaluation Report

384



Prairie Pride Model TR12 Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE

PAMI

PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

PRAIRIE PRIDE MODEL TR12 VENTILATION FAN

MANUFACTURER & DISTRIBUTOR:

Prairie Pride Enterprises Ltd.
P.O. Box 25
Sanford, Manitoba
R0G 2J0

RETAIL PRICE:

\$395.00 (February, 1985, f.o.b. Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Prairie Pride Model TR12 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
High Speed	0 (0)	1450 (682)	0.255	11	1725
	0.05 (12.5)	1360 (644)	0.252	12	1727
	0.10 (24.9)	1180 (558)	0.242	12	1732
	0.125 (31.1)	1020 (481)	0.232	10	1739
	0.25 (62.3)	640 (302)	0.245	9	1733
Low Speed	0 (0)	1290 (607)	0.144	13	1553
	0.05 (12.5)	1210 (571)	0.141	16	1566
	0.10 (24.9)	970 (458)	0.126	16	1607
	0.125 (31.1)	806 (380)	0.122	13	1613
	0.25 (62.3)	522 (246)	0.139	12	1581
Variable Maximum	0 (0)	1450 (683)	0.240	11	1712
	0.05 (12.5)	1350 (638)	0.239	13	1714
	0.10 (24.9)	1140 (537)	0.228	12	1726
	0.125 (31.1)	942 (445)	0.217	10	1733
	0.25 (62.3)	642 (303)	0.229	9	1724
Variable Mid Range	0 (0)	1260 (595)	0.170	11	1505
	0.05 (12.5)	1170 (554)	0.168	12	1518
	0.10 (24.9)	907 (428)	0.149	12	1601
	0.125 (31.1)	750 (354)	0.148	10	1598
	0.25 (62.3)	476 (225)	0.166	9	1511
Variable Minimum	0 (0)	1000 (474)	0.140	5	1153
	0.05 (12.5)	864 (408)	0.135	8	1255
	0.10 (24.9)	560 (264)	0.129	6	1326
	0.125 (31.1)	432 (204)	0.133	6	1238

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.

Supplying more detailed operating instructions containing illustrations and information on general operation, installation, maintenance, safety aspects and trouble shooting.

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Fan performance data will be provided in the future.
2. A full set of wiring diagrams, service centre locations, and installation and maintenance data will be provided with each fan.

GENERAL DESCRIPTION

The Prairie Pride model TR12 ventilation fan is a 12.25 in (311 mm) diameter, two speed or 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 Prairie Pride fan is a flush mounted unit equipped with an inlet guard grill, inlet louvres, a mounting face plate, chromed outlet guard grill, optional two speed control and optional

modulating fan speed control. The six polypropylene blades and aluminum hub are mounted directly on the 0.25 hp (186 W), single phase, 115/230 V electric motor. The housing is constructed of molded polyethylene. The motor mount consists of a chromed wire cage.

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

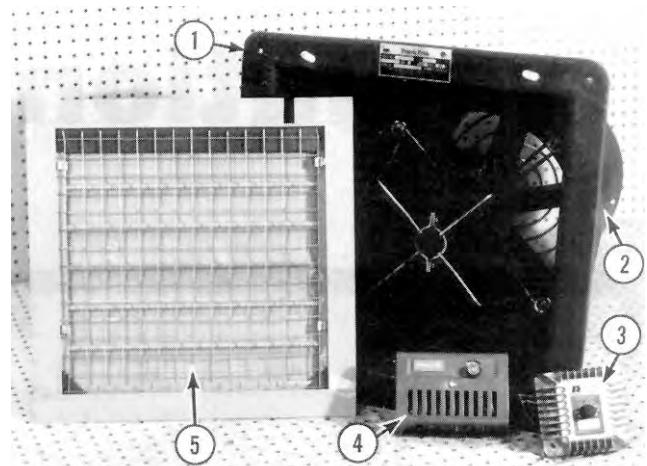


FIGURE 1. Prairie Pride Model TR12 Ventilation Fan: (1) Mounting Face Plate, (2) Polyethylene Housing, (3) Variable Speed Control, (4) Two Speed Control, (5) Inlet Guard Grill and Louvres.

SCOPE OF TEST

The Prairie Pride model TR12 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, input power and total efficiency. The control units were not evaluated and were only used to set fan speed. The louvres were standard equipment and an integral part of the fan unit, so all tests were performed with louvres in place.

Fan performance was determined at 230 V with the two speed control and the variable speed control. The two speed control had a low speed and a high speed depending on the temperature range setting. With the variable speed control, fan performance was determined at the maximum setting, mid-range setting and the minimum setting. The minimum setting was established by reducing the fan speed to the point where a static pressure of 0.125 in wg (31.1 Pa) could still be obtained.

The fan was also evaluated for ease of operation, operator safety and suitability of the operator's manual.

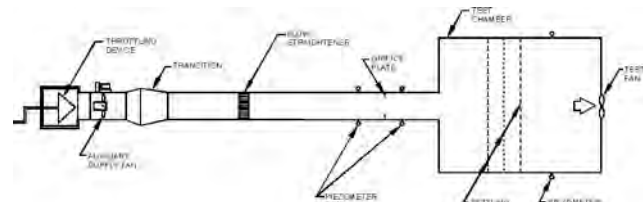


FIGURE 2. Schematic of Fan Test Apparatus Inlet Chamber Setup.

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

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).

10%, depending on such things as temperature, barometric pressure, humidity and elevation above sea level.

Air Flow Rate: Fan output in both the high speed mode and at the maximum setting on the variable speed control were similar (FIGURES 3 & 4). Reducing the fan speed, 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 high speed to low speed reduced the air flow rate from 1020 to 806 cfm (481 to 380 L/s). Similarly, at a static pressure of 0.125 in wg (31.1 Pa), reducing the speed from maximum to mid-range to minimum settings on the variable speed control, reduced the air flow rates from 942 cfm (445 L/s) to 750 cfm (354 L/s) to 432 cfm (204 L/s), respectively.

Air flow rates at typical levels of operation (i.e. static pressure) are given in TABLE 1. Livestock building ventilation fans are often rated on their output at a static pressure of 0.125 in wg (31.1 Pa). PAMI's measured flow rate at this condition in the high speed mode was 1020 cfm (481 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.

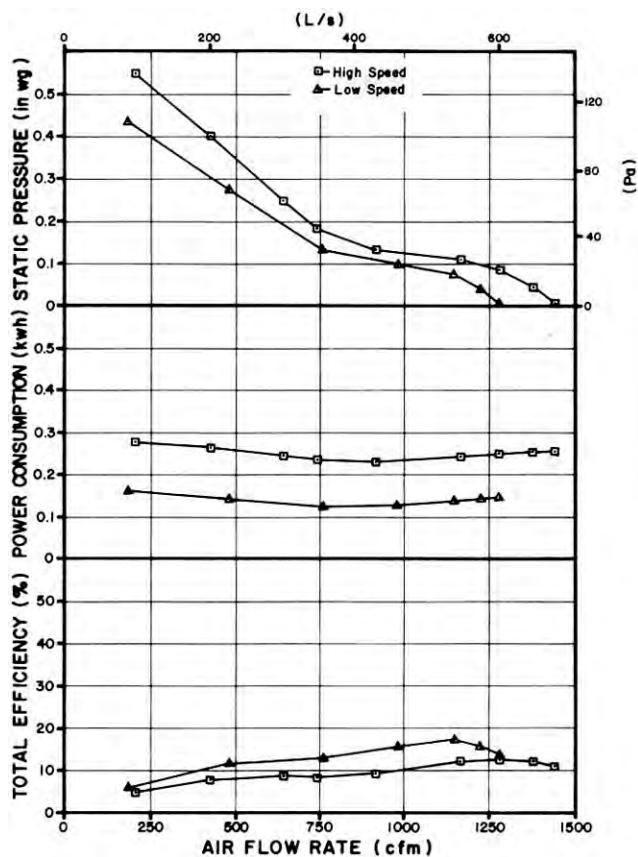


FIGURE 3. Prairie Pride Model TR12 Fan Performance Curves in the Two Speed Mode.

Power Consumption: The power consumption is the amount of energy (kWh) used by the fan motor. These numbers can be used directly to determine operating costs of the fan. For typical levels of static pressure (TABLE 1), the power consumption varied from 0.232 to 0.255 kWh at high speed, from 0.122 to 0.144 kWh at low speed, from 0.217 to 0.240 kWh at maximum speed, from 0.148 to 0.170 kWh at mid-range and from 0.129 to 0.140 kWh at minimum speed. The maximum amperage drawn by the

motor was 1.6 amps which was the same as the rated motor amperage. Prolonged operation in excess of the rated amperage could reduce motor life.

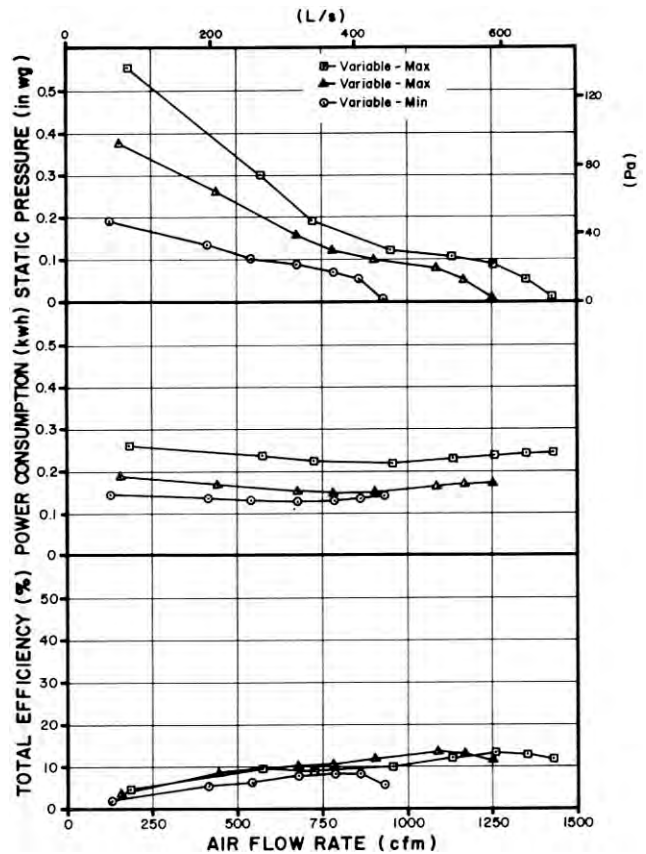


FIGURE 4. Prairie Pride Model TR12 Fan Performance Curves at Three Speed Settings in the Variable Speed Mode.

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) ranged from 9 to 12% at high speed, 12 to 16% at low speed, 9 to 13% at maximum speed, 9 to 12% at mid-range and from 5 to 8% at minimum speed. The motor was not well matched to the size and pitch of propeller used. This accounts for the low efficiencies and why the low speed mode had a higher total efficiency than the high speed mode. For example, at a 0.125 in wg (31.1 Pa) static pressure, the total efficiency was 13% at low speed and only 10% at high speed.

EASE OF OPERATION

Maintenance: No maintenance instructions were supplied. The inlet guard grill and louvers were easily removed which made easy access for cleaning the housing and fan blades. Regularly scheduled cleaning and maintenance will ensure longer motor life and optimum performance.

OPERATOR SAFETY

The inlet and outlet guard grills provided adequate protection from the fan blades. The Prairie Pride model TR12 was CSA approved.

The noise level of the Prairie Pride fan 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 71 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Prairie Pride fan 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

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).

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 few printed sheets on the installation and wiring of the two-speed and variable speed controls. It is recommended that the manufacturer supply a detailed manual containing illustrations and information on general operation, maintenance, rated performance, safety aspects and trouble shooting.

APPENDIX I

SPECIFICATIONS

MAKE:	Prairie Pride
MODEL:	TR12
MANUFACTURER:	Prairie Pride Enterprises Ltd. P.O. Box 25 Sanford, Manitoba ROG 2J0
OVERALL DIMENSIONS:	
- housing and flange width	20.5 in (521 mm)
- housing and flange height	20.5 in (521 mm)
- housing depth at bottom	27 in (686 mm)
- housing depth at top	31 in (787 mm)
- housing dimensions	16.8 in (425 mm) by 16.8 in (425 mm)
- inside tube diameter	12.8 in (324 mm)
- inlet guard grill dimensions	16.2 in (413 mm) by 16.2 in (413 mm)
- inlet grill opening	0.06 in (2 mm) diameter wire on 1 in (25 mm) grid
- outlet guard grill dimension	12.8 in (324 mm)
- outlet grill opening	0.19 in (5 mm) diameter wire spaced at 1.06 in (27 mm) in a circular pattern
PROPELLER:	
- diameter	12.25 in (311 mm)
- hub diameter	4 in (102 mm)
- number of blades	6
- blade angle	variable - 39 degrees at tip to 43 degrees at hub
WEIGHT:	40 lb (18 kg)
MOTOR NAMEPLATE DATA:	
- make	Leeson
- model	A4P17NBTB
- frame	148Y
- class	B
- code	E
- design	M
- type	PN
- duty	air over
- rpm	1625
- service factor	1
- ambient temperature rise	40 degrees
- volts	115/230 V
- amps	3.2/1.6
- phase	1
- cycles	60 Hz
- horsepower	0.25 hp (186 W)

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.

SUMMARY CHART PRAIRIE PRIDE MODEL TR12 VENTILATION FAN

RETAIL PRICE:	\$395.00 (February, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION:	12.25 in (311 mm) propeller fan, two speed or variable speed, direct drive, 0.25 hp (186 W) electric motor.
FAN SPEED:	
- two speed	1553 to 1613 rpm or 1725 to 1739 rpm
- variable speed	1153 to 1733 rpm
EFFICIENCY RANGE:	
- two speed	9 to 16 percent
- variable speed	5 to 13 percent
EFFICIENCY AT 0.125 in wg (31.1 Pa):	
- high speed	10 percent
- low speed	13 percent
AIR FLOW RATE:	
- range	432 to 1450 cfm (204 to 682 L/s)
- at 0.125 in wg (31.1 Pa)	1020 cfm (481 L/s) at high speed
POWER CONSUMPTION:	0.122 to 0.255 kWh
OPERATOR SAFETY:	inlet and outlet guard grill provided CSA approved noise level = 71 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	more details required



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