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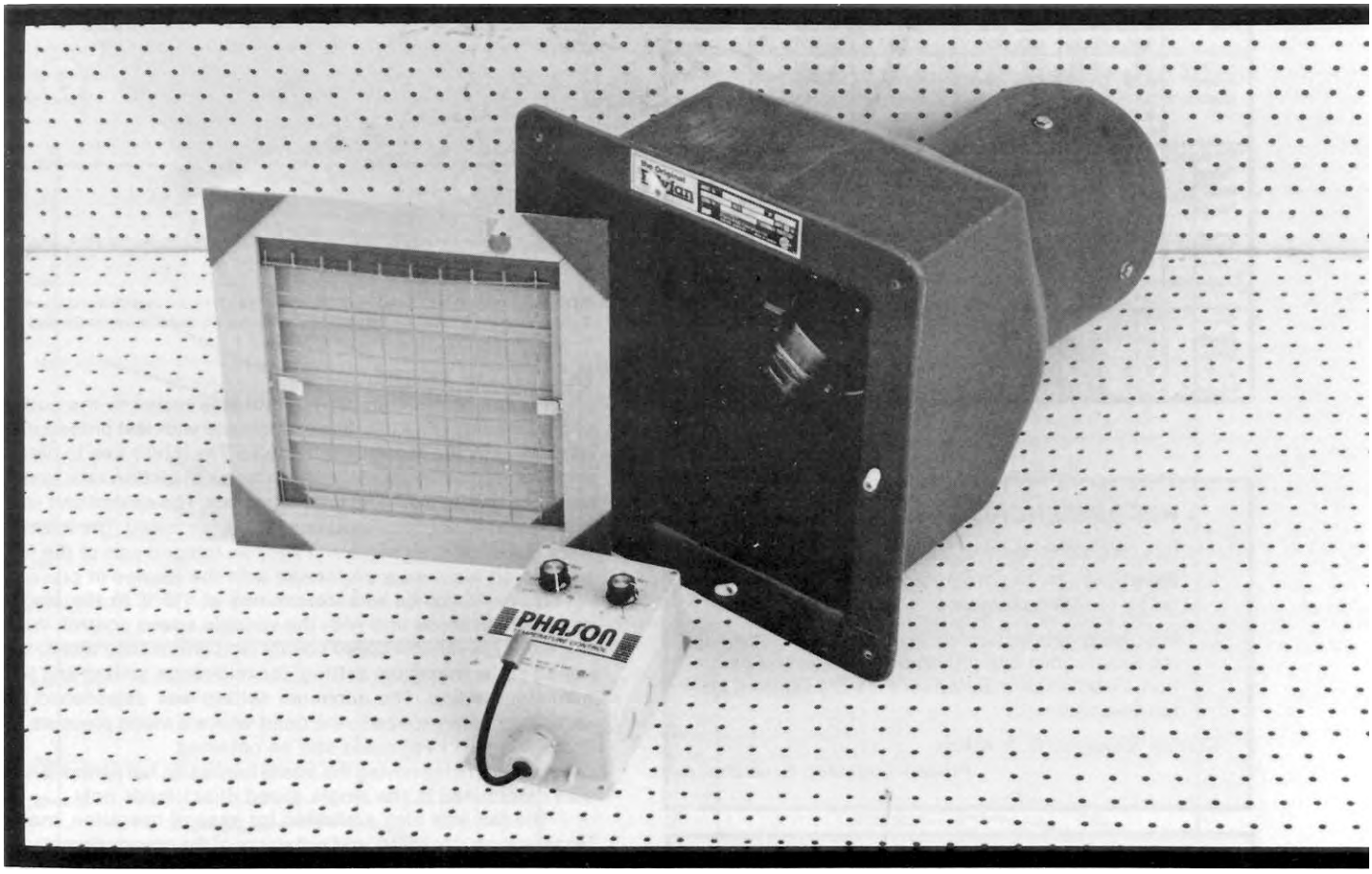
Evaluation Report 479



Prairie Pride Model TR8 Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

PRAIRIE PRIDE MODEL TR8 VENTILATION FAN

MANUFACTURER AND DISTRIBUTOR:

Prairie Pride Enterprises Limited
217 - 79 Eagle Drive
Winnipeg, Manitoba
R2R 1V4

RETAIL PRICE: $335.00 (May, 1987, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Prairie Pride Model TR$ Ventilation Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE in wg (Pa)	AIR FLOW RATE cfm (L/s)	POWER CONSUMPTION kW	TOTAL EFFICIENCY %	FAN SPEED rpm
Single Speed Direct	0.0 (0.0)	610 (288)	0.119	10	3355
	0.05 (12.5)	580 (274)	0.118	11	3340
	0.1 (24.9)	560 (264)	0.121	13	3333
	0.125 (31.1)	540 (255)	0.123	13	3327
	0.25 (62.3)	460 (217)	0.123	15	3326
Variable Speed Maximum	0.0 (0.0)	590 (278)	0.113	10	3292
	0.05 (12.5)	580 (274)	0.115	12	3277
	0.1 (24.9)	550 (260)	0.117	13	3261
	0.125 (31.1)	540 (255)	0.118	14	3254
	0.25 (62.3)	460 (217)	0.120	16	3246
Variable Speed Mid-Range	0.0 (0.0)	470 (222)	0.095	6	2665
	0.05 (12.5)	430 (203)	0.096	7	2538
	0.1 (24.9)	380 (179)	0.099	7	2477
	0.125 (31.1)	350 (165)	0.098	8	2506
	0.25 (62.3)	230 (109)	0.097	8	2539
Variable Speed Minimum	0.0 (0.0)	280 (132)	0.078	2	1711
	0.05 (12.5)	230 (109)	0.078	2	1794
	0.1 (24.9)	150 (71)	0.078	3	1788
	0.125 (31.1)	110 (52)	0.085	2	1617
Single Speed Direct with no Louvres	0.0 (0.0)	650 (307)	0.114	13	3364
	0.05 (12.5)	630 (297)	0.117	14	3360
	0.1 (24.9)	600 (283)	0.117	16	3350
	0.125 (31.1)	600 (283)	0.118	17	3345
	0.25 (62.3)	540 (255)	0.123	19	3324

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.

Station Manager: R. P. Atkins
Project Engineer: K. Shimek

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. We provide data for three static pressures (i.e. 0, 0.1 and 0.125 in wg). If more information is required then we refer to the complete PAMI report.
2. Wiring diagrams, service centre locations, installation and maintenance data will be supplied with each unit.

GENERAL DESCRIPTION

The Prairie Pride Model TR8 ventilation fan is a 8.0 in (203 mm) diameter, single 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 is a flush mounted unit equipped with an inlet guard grill, inlet louvres, a mounting face plate, and plastic coated wire outlet guard grill. The 6 polypropylene blades and aluminum hub are mounted directly on a 0.10 hp (75 W), single phase, 110 V electric motor. The housing is constructed of molded polyethylene. The motor mount consists of a plastic coated wire cage.

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

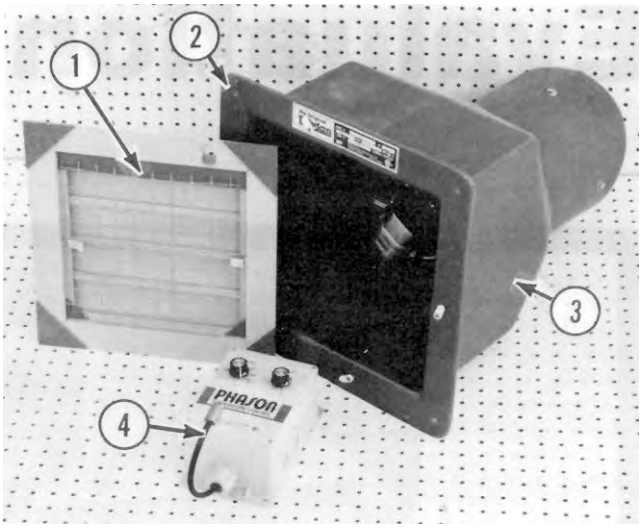


FIGURE 1. Prairie Pride Model TR8 Ventilation Fan: (1) Inlet Guard Grill and Louvres, (2) Mounting Face Plate, (3) Polyethylene Housing, (4) Variable Speed Control.

SCOPE OF TEST

The Prairie Pride Model TR8 fan was tested n the outlet 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 unit was not evaluated and was used only to set fan speed. The louvres were standard equipment and were an integral part of the fan unit, so all tests were performed with the louvres in place.

Fan performance was determined at 115 V, in the single speed direct mode and with the variable speed control. With the Triac type 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 reducing the fan speed to the point where a static pressure of 0.125 in wg (31.1 Pa) could still be obtained.

The effect of removing the intake louvres on fan performance was determined in the single speed direct mode only.

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

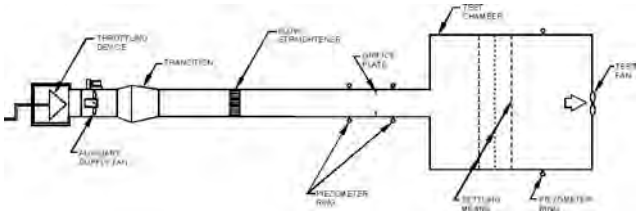


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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 direct mode and the maximum setting on the variable speed control were similar (FIGURE 3). Reducing the fan speed 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 maximum to mid-range to minimum settings on the variable speed control reduced the air flow rates from 540 cfm (255 L/s) to 350 cfm (165 L/s) to 110 cfm (52 L/s), respectively. At higher static pressures the reductions were even higher.

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). PAMI's measured flow rate at this condition in the single speed mode was 540 cfm (255 Us). 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.

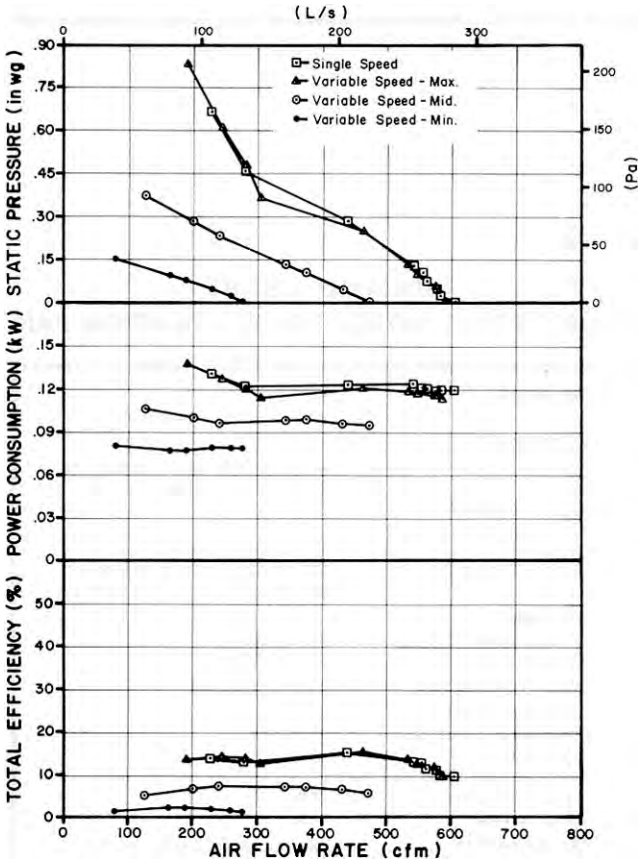


FIGURE 3. Prairie Pride Model TR8 Ventilation Fan Performance Curves in the Single Speed Direct Mode and at Three Speed Settings in the Variable Speed Mode.

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 comsumption (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 0.118 to 0.123 kW in the single speed direct mode, from 0.113 to 0.120 kW at maximum speed, from 0.095 to 0.099 kW at mid-range and from 0.078 to 0.085 kW at minimum speed.

[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).

The maximum amperage drawn by the motor was 1.31 amps, which was greater than the rated motor amperage of 1.25 amps, but with the +-10% allowable limit established.

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 10 to 16% at maximum speed, 6 to 8% at mid-range and 2 to 3% at minimum speed. The total efficiency in the single speed direct mode at a static pressure of 0.125 in wg (31.1 Pa) was 13%.

Effect of Louvres: The louvres are normally installed on the inlet side of the fan. The louvres were removed to determine their effect on fan output. Removing the louvres increased the air flow rate by 7 to 17% (FIGURE 4) over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), removing the louvres increased the air flow rate by 11%, from 540 cfm (255 L/s) to 600 cfm (283 L/s) (TABLE 1). The efficiency increased from 13 to 17%. The addition of other control devices such as shutters, dampers, and screens 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.

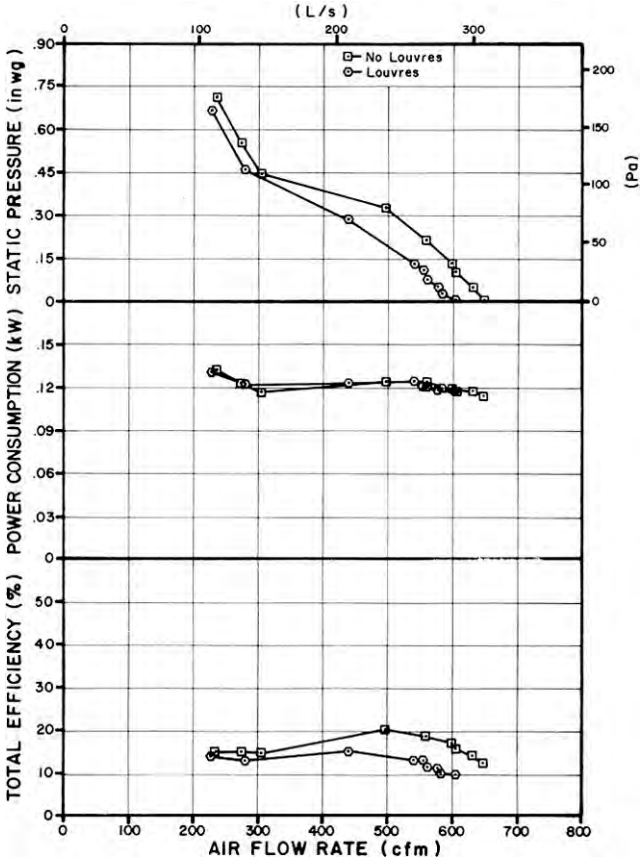


FIGURE 4. Effect of Louvres on Fan Performance.

EASE OF OPERATION

Maintenance: No maintenance instructions were supplied. The inlet guard grill and louvres were easily removed which made for 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 motor was a totally enclosed unit and presented no safety hazards. The Prairie Pride Model TR8 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 inlet, while operating at a

0.125 in wg (31.1 Pa) static pressure, was 72 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 continuous exposure. Ear protection should be considered if working near the fan for prolonged periods.

OPERATOR'S MANUAL

No operator's manual was supplied. 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:	Prairie Pride
MODEL:	TR8
SERIAL NUMBER:	128687
MANUFACTURER:	Prairie Pride Enterprises Ltd. 217 - 79 Eagle Drive Winnipeg, Manitoba R2R 1V4
OVERALL DIMENSIONS:	
- housing and flange width	15.75 in (400 mm)
- housing and flange height	15.75 in (400 mm)
- housing depth at bottom	23.0 in (584 mm)
- housing depth at top	19.25 in (489 mm)
- housing dimensions	12.0 in (305 mm) by 12.0 in (305 mm)
- inside tube diameter	8.25 in (210 mm)
- inlet guard grill dimensions	8.375 in (213 mm) by 9 in (229 mm)
- inlet grill opening	0.062 in (2 mm) wire on a I in (25 mm) grid
- outlet guard grill diameter	6.25 in (159 mm)
- outlet grill opening	0.25 in (6 mm) dia. wire spaced at 1.25 in (32 mm)
IMPELLERS:	
- diameter	8.0 in (203 mm)
- hub diameter	3.75 in (95 mm)
- number of blades	6
- blade angle	62.4°.
WEIGHT:	15 lb (7 kg)
MOTOR NAMEPLATE DATA:	
make	Fasco
model	7162-1842
class	B
type	U6281
rpm	3200
volts	115 V
amps	1.25 A
cycles	60 Hz
horsepower	0.10 hp (75 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.

APPENDIX III
CONVERSION TABLE

cubic feet/minute (cfm) x 0.472	= litres/second (L/s)
horsepower (hp) x 745.7	= watts (W)
inches (in) x 25.4	= millimeters (mm)
inches water guage (in wg) x 249.1	= pascals (Pa)
pounds (lb) x 0.45	= kilograms (kg)

SUMMARY CHART
PRAIRIE PRIDE MODEL TR8 VENTILATION FAN

RETAIL PRICE:	$335.00 (May, 1987, f.o.b. Lethbridge)
FAN DESCRIPTION:	8.0 in (203 mm) propeller fan, variable speed, direct drive, 0.1 hp (75 W), 115 V electric motor.
FAN PERFORMANCE:	
Air Flow Rate:	
- range	110 to 650 cfm (52 to 307 L/s)
- at 0.125 in wg (31.1 Pa)	540 cfm (255 L/s) with louvres and 600 cfm (283 L/s) without louvres
Fan Speed:	
- single speed direct	3326 to 3355 rpm
- variable speed	1617 to 3292 rpm
Power Consumption:	0.078 to 0.123 kW
Efficiency Range:	
- without louvres	13 to 19%
- with louvres	2 to 16%
Efficiency at 0.125 in wg (31.1 Pa):	
-without louvres	17%
-with louvres	14%
OPERATOR SAFETY:	inlet and outlet guards provided CSA approved
	noise level = 72 dB(A) at 4.9 ft
OPERATOR'S MANUAL:	(1.5 m) from fan inlet none supplied

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