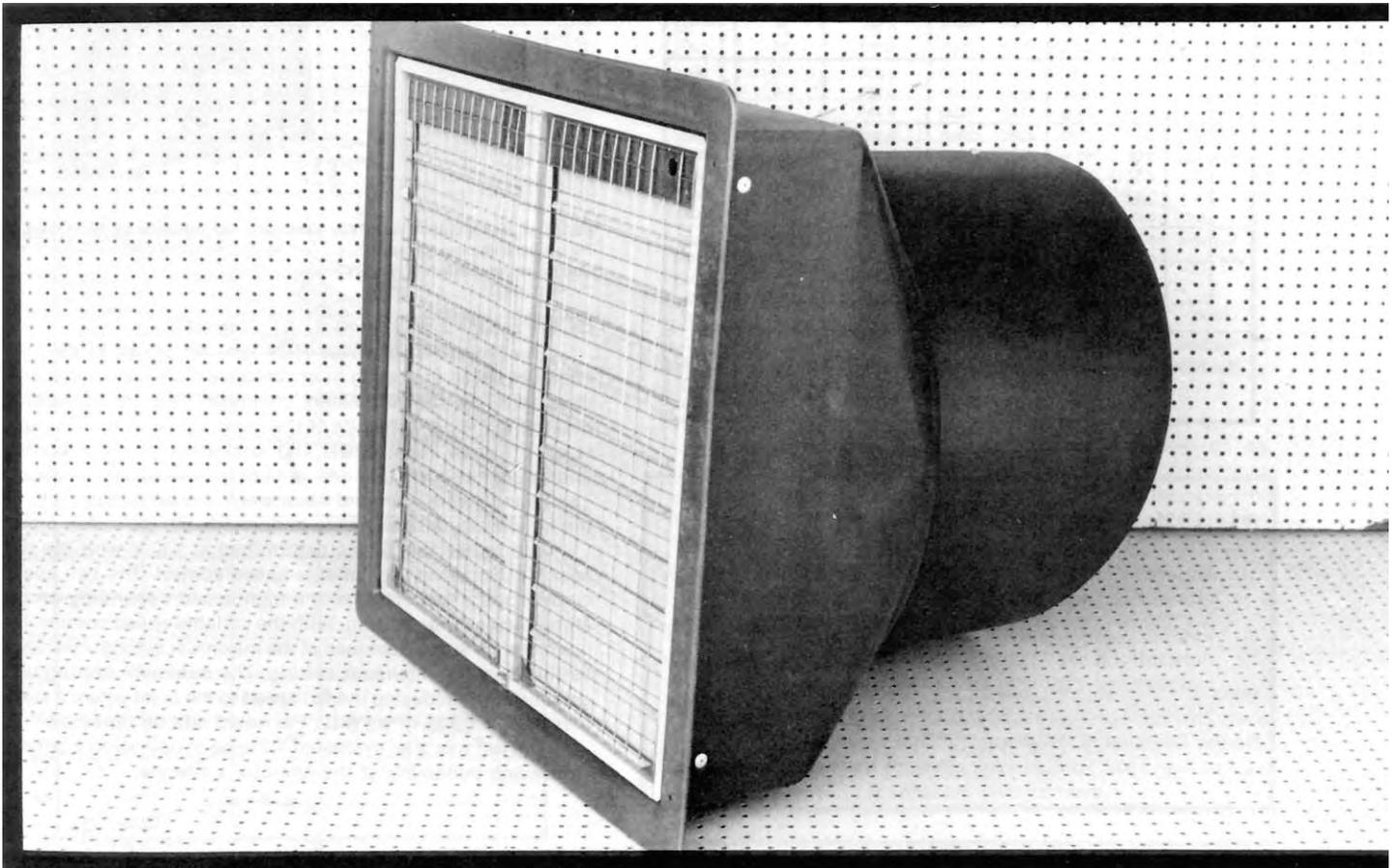


Evaluation Report

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Prairie Pride Model TR24 Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

PRAIRIE PRIDE MODEL TR24 VENTILATION FAN

MANUFACTURER & DISTRIBUTOR:

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

RETAIL PRICE:

\$565.00 (February, 1985, f.o.b. Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Prairie Pride Model TR24 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)	5100	(2410)	0.390	21	1121
	0.05	(12.5)	4730	(2230)	0.391	25	1118
	0.10	(24.9)	4440	(2100)	0.391	27	1118
	0.125	(31.1)	4250	(2000)	0.391	28	1119
Low Speed	0	(0)	3000	(1420)	0.238	7	680
	0.05	(12.5)	2490	(1180)	0.239	9	698
	0.10	(24.9)	1120	(528)	0.241	6	660
	Variable Maximum	0	(0)	4950	(2340)	0.380	20
Variable Mid Range	0.05	(12.5)	4530	(2140)	0.382	23	1083
	0.10	(24.9)	4220	(1990)	0.374	26	1082
	0.125	(31.1)	4010	(1890)	0.372	27	1082
	0.25	(62.3)	2630	(1240)	0.370	24	1082
Variable Minimum	0	(0)	4320	(2040)	0.341	16	963
	0.05	(12.5)	3960	(1870)	0.349	18	962
	0.10	(24.9)	3510	(1660)	0.347	20	964
	0.125	(31.1)	3250	(1530)	0.343	21	964
Variable Mid Range	0.25	(62.3)	1410	(667)	0.370	13	929
	0	(0)	3350	(1580)	0.307	8	765
	0.05	(12.5)	2790	(1320)	0.305	10	759
	0.10	(24.9)	1920	(907)	0.300	9	763
Variable Minimum	0.125	(31.1)	1283	(606)	0.309	7	734

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.
2. 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 TR24 ventilation fan is a 24.25 in (616 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 five polypropylene blades and aluminum hub are mounted directly on the 0.33 hp (246 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.

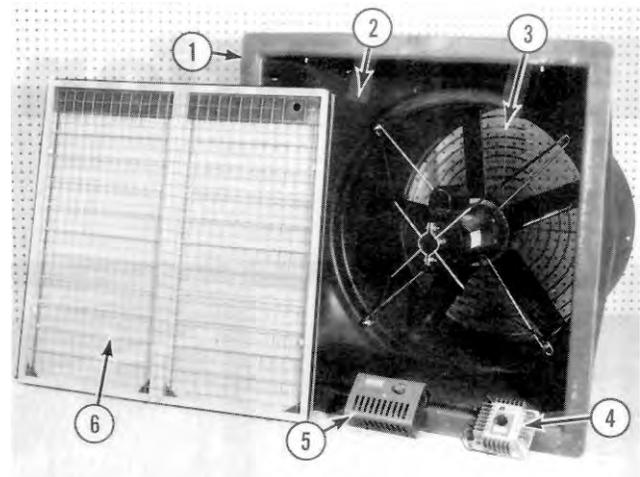


FIGURE 1. Prairie Pride Model TR24 Ventilation Fan: (1) Mounting Face Plate, (2) Polyethylene Housing, (3) Outlet Guard Grill, (4) Variable Speed Control, (5) Two Speed Control, (6) Inlet Guard Grill and Louvres.

SCOPE OF TEST

The Prairie Pride model TR24 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.

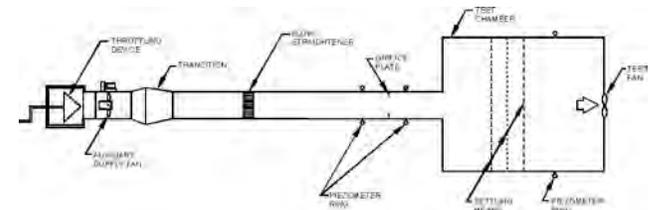


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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 maximum to mid-range to minimum settings on the variable speed control, reduced the air flow rates from 4010 cfm (1890 L/s) to 3250 cfm (1530 L/s) to 1920 cfm (907 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 4250 cfm (2000 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.

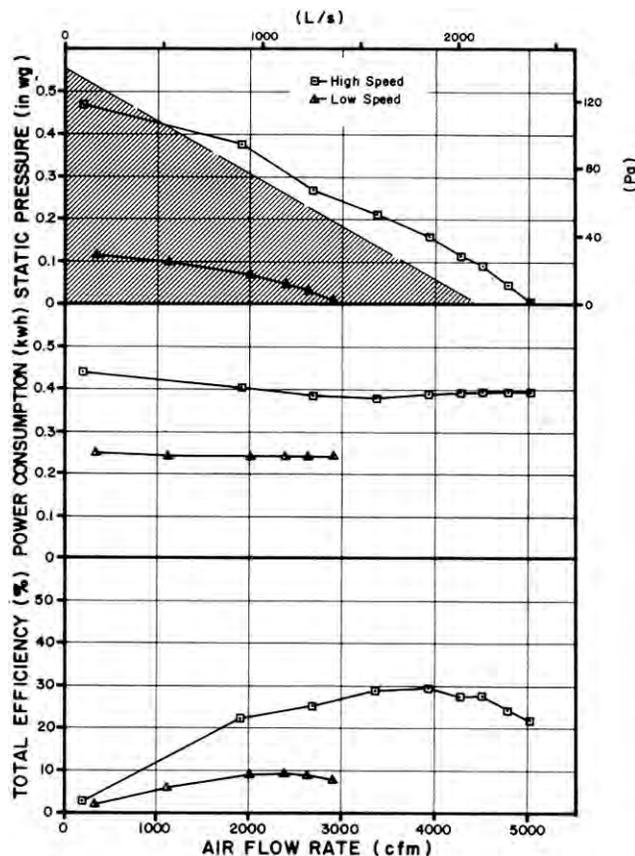


FIGURE 3. Prairie Pride Model TR24 Fan Performance Curves in the Two Speed Mode.

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 0.381 to 0.391 kWh at high speed, from 0.238 to 0.241 kWh at low speed, from 0.370 to 0.382 kWh at maximum speed, from 0.341 to 0.370 kWh at mid-range and from 0.3 to 0.309 kWh at minimum speed. The rated amperage of the motor was 1.8 amps. The shaded zones in FIGURES 3 and 4 illustrate operating levels where the rated motor amperage was exceeded. Current draw up to 2.4 amps occurred at reduced speeds. Prolonged operation in excess of the rated amperage could reduce motor life.

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).

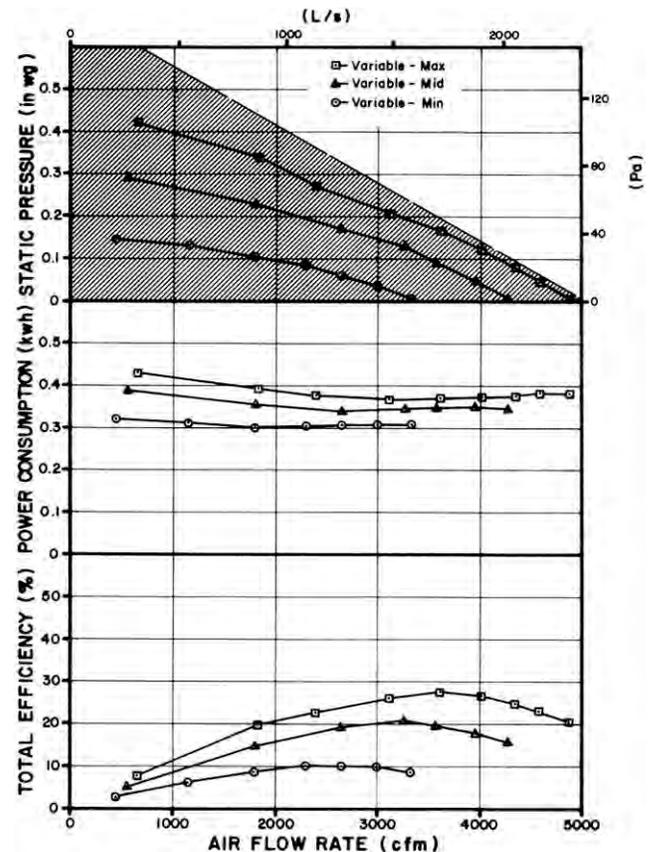


FIGURE 4. Prairie Pride Model TR24 Fan Performance Curves at Three Speed Settings in the Variable Speed Mode.

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 21 to 28% at high speed, 6 to 9% at low speed, 20 to 27% at maximum speed, 13 to 21% at mid-range and from 7 to 10% at minimum speed. The total efficiency at high speed and a static pressure of 0.125 in wg (31.1 Pa) was 28%.

EASE OF OPERATION

Maintenance: No maintenance instructions were supplied. The inlet guard grill and louvers were easily removed. This 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 Prairie Pride model TR24 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 76 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

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:	TR24
MANUFACTURER:	Prairie Pride Enterprises Ltd. P.O. Box 25 Sanford, Manitoba R0G 2J0
OVERALL DIMENSIONS:	
housing and flange width	32.5 in (826 mm)
housing and flange height	32.5 in (826 mm)
housing depth at bottom	27.5 in (699 mm)
housing depth at top	31.5 in (800 mm)
housing dimensions	28.8 in (730 mm) by 28.8 in (730 mm)
inside tube diameter	25 in (635 mm)
inlet guard grill dimensions	28 in (711 mm) by 28 in (711 mm)
inlet grill opening	0.06 in (2 mm) diameter wire on 1 in (25 mm) grid
outlet guard grill dimensions	25 in (635 mm)
outlet grill opening	0.19 in (5 mm) diameter wire spaced at 1.06 in (27 mm) in a circular pattern
PROPELLER:	
diameter	24.25 in (616 mm)
hub diameter	6.5 in (165 mm)
number of blades	5
blade angle	variable - 19 degrees at tip to 33 degrees at hub
WEIGHT:	65.5 lb (29.7 kg)
MOTOR NAMEPLATE DATA:	
make	Leeson
model	A4P11NZ11A
frame	RS56Y
class	B*
code	C
type	FN
duty	air over
rpm	1140
service factor	1
ambient temperature rise	40°0
volts	115/230 V
amps	3.8/1.9
phase	1
cycles	60 Hz
horsepower	0.33 hp (246 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 TR24 VENTILATION FAN

RETAIL PRICE:	\$565.00 (February, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION:	24.25 in (616 mm) propeller fan, two speed or variable speed, direct drive, 0.33 hp (246 W) electric motor.
FAN SPEED:	
- two speed	660 to 698 rpm or 1118 to 1121 rpm
- variable speed	734 to 1092 rpm
EFFICIENCY RANGE:	
- two speed	6 to 28 percent
- variable speed	7 to 27 percent
EFFICIENCY AT 0.125 in wg (31.1 Pa):	
- high speed	28 percent
AIR FLOW RATE:	
- range	1120 to 5100 cfm (528 to 2410 L/s)
- at 0.125 in wg (31.1 Pa)	4250 cfm (2000 L/s) at high speed
POWER CONSUMPTION:	0.238 to 0.391 kWh
OPERATOR SAFETY:	inlet and outlet guard grill provided CSA approved noise level = 76 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	more details required



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