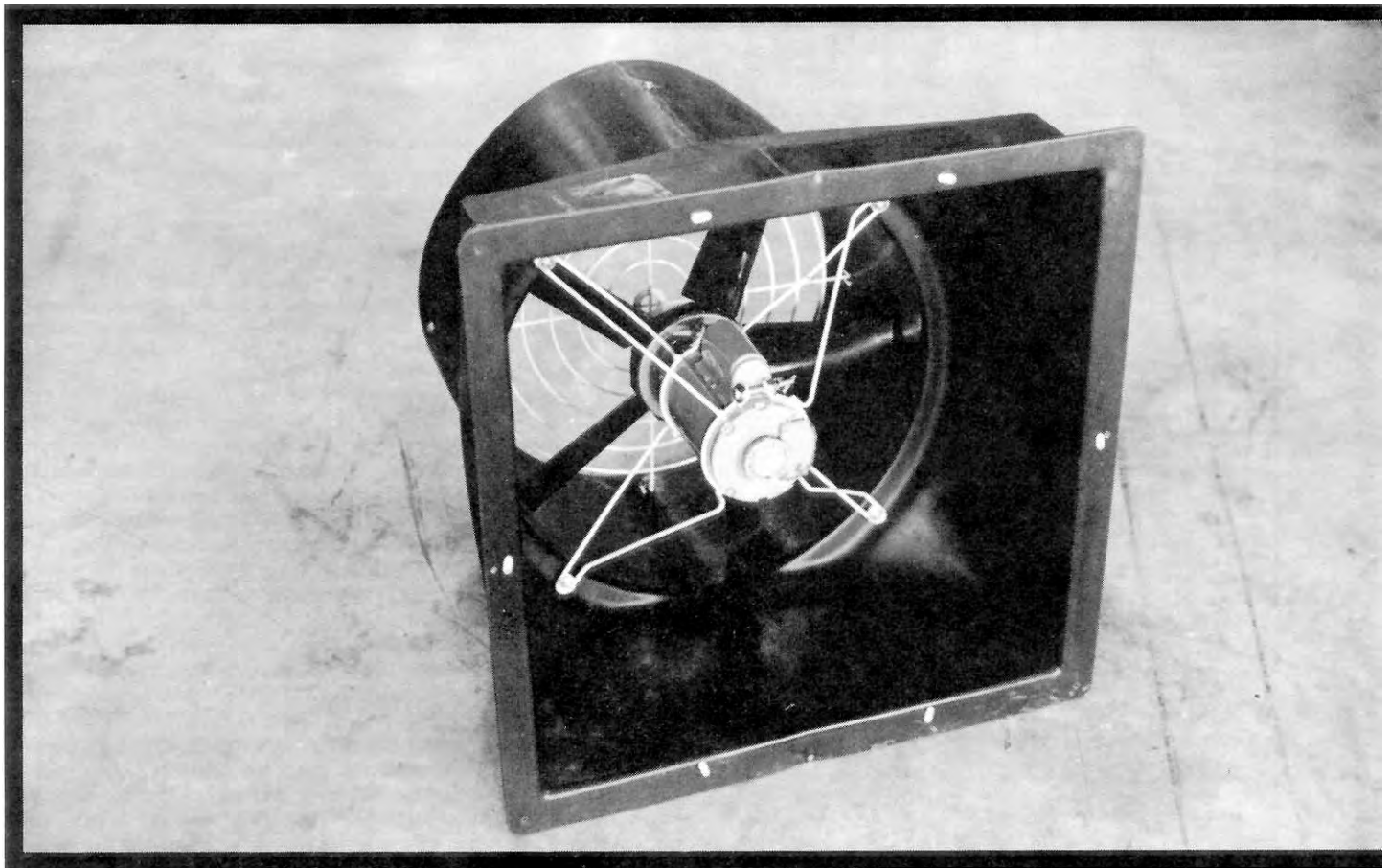


# Evaluation Report

# 667



## Prairie Pride Model TR24HS Polyfan Ventilation Fan

A Co-operative Program Between



# PRAIRIE PRIDE MODEL TR24HS POLYFAN VENTILATION FAN

## MANUFACTURER AND DISTRIBUTOR:

Westland Plastics  
12 Rothwell Road  
Winnipeg, Manitoba  
R3P 2H7

**RETAIL PRICE:** \$635 (\$40 Freight Allowance) (April 1992, f.o.b., Lethbridge, Alberta)

## SUMMARY OF RESULTS

**TABLE 1.** Prairie Pride Model TR24HS Polyfan 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)	7420	(3500)	0.740	36	1470
	0.050	(12.5)	7060	(3330)	0.739	37	1450
	0.100	(24.9)	6730	(3180)	0.743	37	1430
	0.125	(31.1)	6550	(3090)	0.747	37	1430
	0.250	(62.3)	5600	(2640)	0.752	38	1410
Variable Speed Maximum (225 V)	0.000	( 0.0)	7390	(3490)	0.744	35	1470
	0.050	(12.5)	7100	(3350)	0.749	37	1460
	0.100	(24.9)	6780	(3200)	0.755	37	1440
	0.125	(31.1)	6610	(3120)	0.758	38	1440
	0.250	(62.3)	5680	(2680)	0.770	38	1410
Variable Speed Mid-Range (132 V)	0.000	( 0.0)	5460	(2580)	0.568	19	1090
	0.050	(12.5)	4920	(2320)	0.563	18	1050
	0.100	(24.9)	4400	(2080)	0.555	18	1010
	0.125	(31.1)	4100	(1940)	0.551	18	1000
	0.250	(62.3)	2210	(1040)	0.535	15	1010
Variable Speed Minimum (92 V)	0.000	( 0.0)	3540	(1670)	0.350	8	710
	0.050	(12.5)	2700	(1274)	0.347	8	670
	0.100	(24.9)	1790	( 840)	0.343	7	680
Single Speed Optional Louvres	0.125	(31.1)	1140	( 540)	0.342	5	670
	0.250	(62.3)	5080	(2400)	0.744	32	1410
Single Speed Direct With Production Louvres	0.000	( 0.0)	6870	(3240)	0.726	29	1440
	0.050	(12.5)	6530	(3080)	0.724	30	1420
	0.100	(24.9)	6190	(2920)	0.733	31	1410
	0.125	(31.1)	6010	(2840)	0.738	32	1410
	0.250	(62.3)	5080	(2400)	0.744	32	1410

## RECOMMENDATIONS

AFMRC recommends the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.
2. Supplying a detailed operator's manual containing illustrations and information on general operation and installation, maintenance, rated performance, safety aspects and troubleshooting.

**Manager: R.R Atkins**

**Project Engineer: R.C. Maze**

## THE MANUFACTURER STATES THAT

With regard to recommendation number:

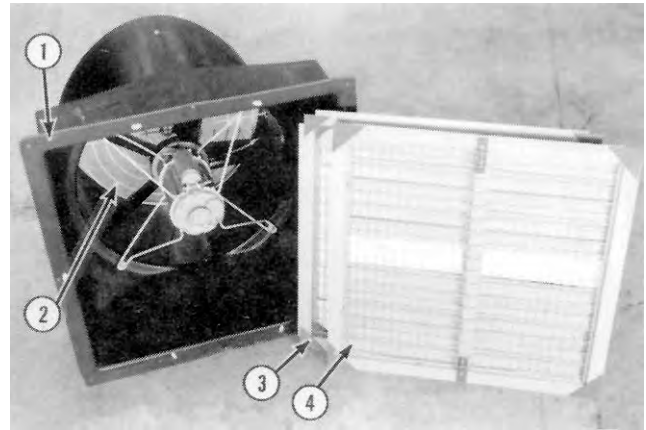
- 1-2. Data sheets and brochures are printed to AFMRC/PAMI report specifications.

## GENERAL DESCRIPTION

The Prairie Pride TR24HS ventilation fan is a 24.25 in (616 mm) diameter, variable speed, direct drive, propeller type axial flow fan. This type of ventilation fan is primarily used in livestock and poultry barns as an exhaust fan located in the building wall.

The Prairie Pride TR24HS ventilation fan is a flush-mounted unit equipped with an outlet guard grill, mounting face plate and optional louvres with integral inlet guard grill. The 5 blade polypropylene propeller and aluminum hub are mounted directly on a 0.5 hp (373 kW), single phase, 115/230 V electric motor. The wire cage motor mount is bolted to the motor and fan housing.

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



**FIGURE 1.** Prairie Pride TR24HS Ventilation Fan: (1) Mounting Face Plate, (2) Outlet Guard Grill, (3) Production Inlet Louvres with Guard Grill, (4) Optional Inlet Louvres with Guard Grill.

## SCOPE OF TEST

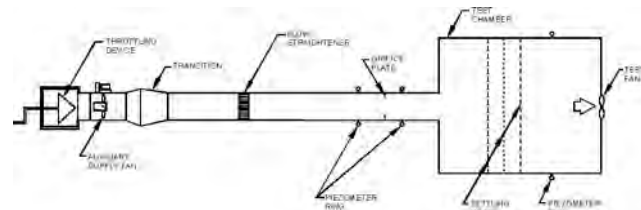
The fan evaluated by AFMRC was configured as described in the General Description, FIGURE 1, and the Specifications section of this report. The manufacturer may have built different configurations of this fan before or after AFMRC tests. Therefore, when using this report check that the fan under consideration is the same as the one reported here. If differences exist, assistance can be obtained from AFMRC or the manufacturer to determine changes in performance.

The Prairie Pride TR24HS was tested in the inlet chamber set-up (FIGURE 2) in accordance with Canadian Standards Association's ventilation fan test standard no. CAN/CSA C320-M86. 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. Fan performance was determined at a maximum setting, a mid-range setting and a minimum setting with the variable speed mode. Voltages supplied to the fan at maximum, mid-range and minimum settings in the variable speed mode are recorded in TABLE 1. 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 the 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 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 (TABLE 1). 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 6610 cfm (3120 L/s) to 4100 cfm (1940 L/s) to 1140 cfm (540 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). The Alberta Farm Machinery Research Centre's measured flow rate in a single speed direct mode was 6550 cfm (3090 L/s). There was no manufacturer's information provided on air flow rates. Since building ventilation design is possible over a range of static pressures, AFMRC recommends that, for fan selection purposes, the manufacturer include a table or curve of air flow rates over a complete range of static pressures.

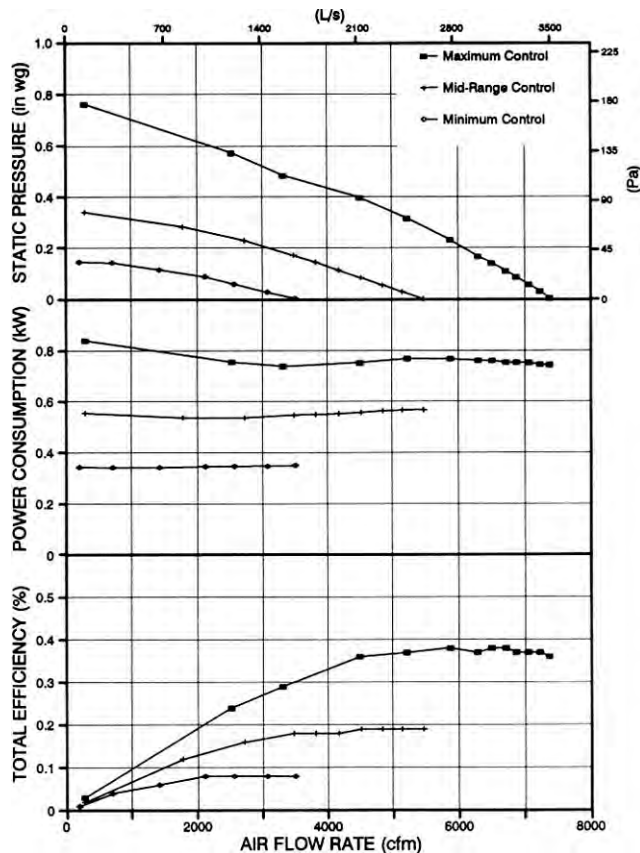


FIGURE 3. Prairie Pride TR24HS Fan Performance Curves.

**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 0.739 to 0.752 kW in the single speed mode, from 0.744 to 0.770 kW at maximum speed, from 0.535 to 0.568 kW at mid-range and from 0.342 to 0.350 kW at minimum speed. The maximum amperage drawn by the motor was 3.1 amperes, which was less than the rated motor

amperage of 3.0 amperes plus the +/-10% allowable limit established by CSA Standards.

**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 35 to 38% at maximum speed, 15 to 19% at mid-range and 5 to 8% 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 two optional louvres were installed on the inlet side of the fan (FIGURE 4) to determine their effect on fan output. The fan was tested under these conditions in the single speed mode only. Using the optional louvres reduced the air flow rate (FIGURE 4) by 7 to 9% over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the louvres decreased the air flow by 8%, from 6550 cfm (3090 L/s) to 6010 cfm (2840 L/s) (TABLE 1). The fan's total efficiency was reduced from 37 to 32%. Using the production louvres reduced the air flow rate (FIGURE 4) by 8% over a typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the louvres decreased the air flow by 8%, from 6550 cfm (3090 L/s) to 6020 cfm (2840 L/s) (TABLE 1). The fan total efficiency was reduced from 37 to 31%.

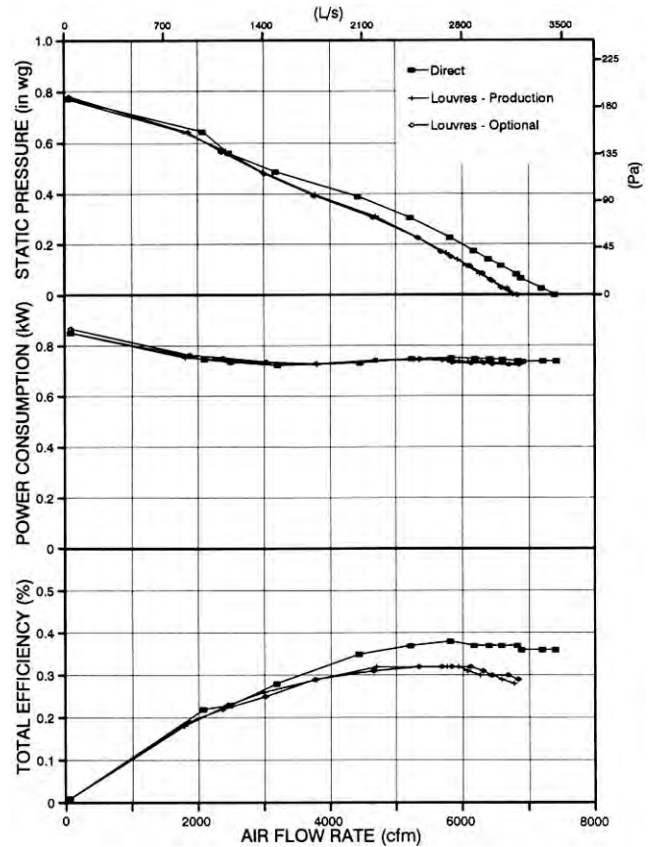


FIGURE 4. Effect of Louvres on Fan Performance.

## 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.

<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).

## OPERATOR SAFETY

The inlet guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Prairie Pride TR24HS ventilation fan was CSA approved.

The noise level of the Prairie Pride TR24HS 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 Prairie Pride TR24HS ventilation fan 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

No operator's manual was supplied. AFMRC recommends the manufacturer supply a detailed operator's manual containing information on maintenance, installation, rated performance, safety aspects and troubleshooting.

### APPENDIX I SPECIFICATIONS

<b>MAKE:</b>	Polyfan
<b>MODEL:</b>	Prairie Pride TR24HS
<b>MANUFACTURER:</b>	Westland Plastics 12 Rothwell Road Winnipeg, Manitoba R3P 2H7
<b>OVERALL DIMENSIONS:</b>	
- housing width	32.4 in (820 mm)
- housing depth (motor included)	32.6 in (830 mm)
- housing height	32.4 (820 mm)
- discharge opening	24.8 in (630 mm)
- outlet guard grill diameter	22.3 in (570 mm)
- grill opening	0.2 in (5 mm) dia. wire spaced at 1.8 in (44 mm)
<b>IMPELLER:</b>	
- diameter	24.3 in (620 mm)
- hub diameter	6.9 in (170 mm)
- number of blades	5
- blade angle	Hub 35°, Tip 13°
- maximum blade width	3.4 in (85 mm)
- base blade width	3.4 in (85 mm)
- minimum tip clearance	0.2 in (5 mm)
- maximum tip clearance	0.9 in (22 mm)
<b>WEIGHT:</b>	57 lb (26 kg)
<b>MOTOR NAMEPLATE DATA:</b>	
- make	Leeson
- model	A4P17NJ8
- cat. no.	101567-00
- serial no.	TENV
- frame	RS56
- class	B
- design code	C
- type	PN
- rpm	1625
- rot	Either Direction
- volts	115/230
- amps	6.0/3.0
- power factor	86.0
- cycles	60
- phase	1
- horsepower	0.50 hp (373 W)
- service factor	1
- ambient temperature rise	40°
- motor efficiency	65%

### 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 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 TR24HS VENTILATION FAN

<b>RETAIL PRICE:</b>	\$635 (\$40 Freight Allowance) (April 1992, f.o.b. Lethbridge)
<b>FAN DESCRIPTION:</b>	24.3 in (620 mm) propeller fan, variable speed, direct drive, 0.5 hp (373 W), 115/230 V electric motor.
<b>FAN PERFORMANCE:</b>	
<b>Air Flow Rate:</b>	
- range	1140 to 7420 (540 to 3500 L/s)
- at 0.125 in wg (31.1 Pa)	6550 cfm (3090 L/s) 6010 cfm (2840 L/s) with Optional Louvres 6020 (2840 L/s) with Production Louvres
<b>Power Consumption:</b>	0.342 to 0.770 kW
<b>Efficiency Range:</b>	
- without louvres	36 to 38%
- with Optional Louvres	29 to 32%
- with Production Louvres	28 to 32%
<b>Efficiency at 0.125 in wg (31.1 Pa):</b>	
- without louvres	37%
- with Optional Louvres	32%
- with Production Louvres	31%
<b>OPERATOR SAFETY:</b>	Inlet guard provided CSA approved noise level = 79 dB(A) at 4.9 ft (1.5 m) from fan inlet
<b>OPERATOR'S MANUAL:</b>	None supplied



**ALBERTA  
FARM  
MACHINERY  
RESEARCH  
CENTRE**

3000 College Drive South  
Lethbridge, Alberta, Canada T1K 1L6  
Telephone: (403) 329-1212  
FAX: (403) 329-5562  
<http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html>

## Prairie Agricultural Machinery Institute

Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0  
Telephone: (306) 682-2555

Test Stations:  
P.O. Box 1060  
Portage la Prairie, Manitoba, Canada R1N 3C5  
Telephone: (204) 239-5445  
Fax: (204) 239-7124

P.O. Box 1150  
Humboldt, Saskatchewan, Canada S0K 2A0  
Telephone: (306) 682-5033  
Fax: (306) 682-5080