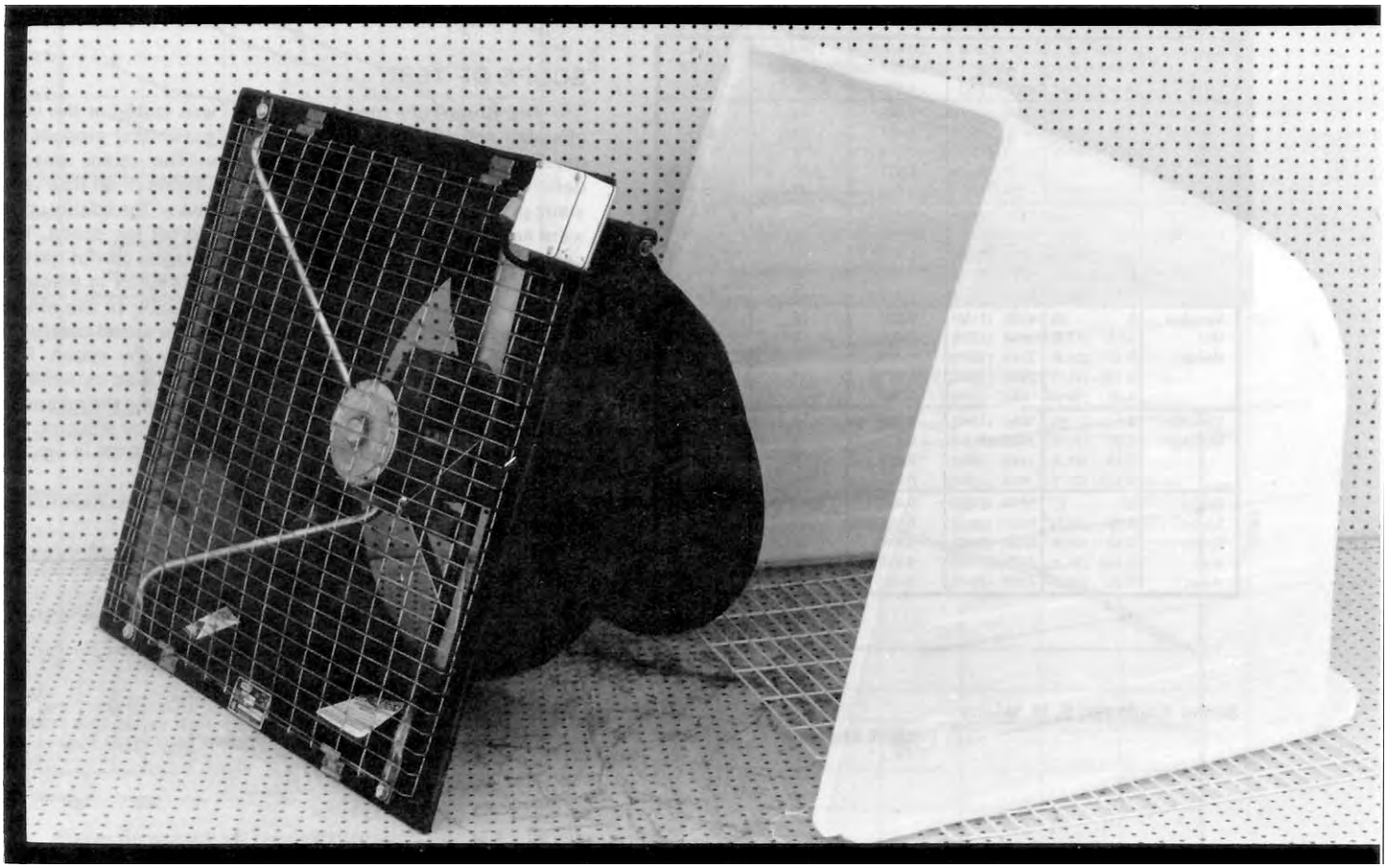
Printed: April 1985
Tested at: Lethbridge
ISSN 0383-3445
Group 5i

Evaluation Report 429



Chore-Time Model 24RLX Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

CHORE-TIME MODEL 24RLX VENTILATION FAN

MANUFACTURER:

Chore-Time Equipment, Inc.
P. O. Box 518
Milford, Indiana 46542

DISTRIBUTOR:

Leebe Agri Feeders Ltd.
Box 277
Leduc, Alberta
T9E 2Y1

RETAIL PRICE:

$844.00 (April, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Chore-Time Model 24RLX 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
Single Speed Direct	0	(0)	5740	(2710)	0.402	35	1620
	0.05	(12.5)	5410	(2550)	0.412	37	1613
	0.10	(24.9)	5160	(2430)	0.416	39	1610
	0.125	(31.1)	5030	(2380)	0.417	40	1608
	0.25	(62.3)	4180	(1970)	0.420	42	1605
Variable Maximum	0	(0)	5470	(2580)	0.414	29	1540
	0.05	(12.5)	5100	(2410)	0.420	31	1527
	0.10	(24.9)	4830	(2280)	0.423	33	1519
	0.125	(31.1)	4690	(2210)	0.424	34	1516
	0.25	(62.3)	3550	(1670)	0.422	33	1512
Variable Mid Range	0	(0)	4520	(2130)	0.351	20	1250
	0.05	(12.5)	3850	(1820)	0.355	18	1190
	0.10	(24.9)	3220	(1520)	0.355	18	1183
	0.125	(31.1)	2940	(1390)	0.351	17	1188
	0.25	(62.3)	664	(313)	0.352	6	1166
Variable Minimum	0	(0)	3050	(1440)	0.297	7	950
	0.05	(12.5)	2420	(1140)	0.299	8	963
	0.10	(24.9)	1440	(680)	0.298	6	980
	0.125	(31.1)	813	(384)	0.301	4	956
Single Speed Direct with Hood	0	(0)	5830	(2750)	0.405	37	1622
	0.05	(12.5)	5530	(2610)	0.412	39	1618
	0.10	(24.9)	5280	(2490)	0.417	41	1612
	0.125	(31.1)	5170	(2440)	0.418	42	1611
	0.25	(62.3)	4380	(2070)	0.421	45	1611

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Chore-Time model 24RLX ventilation fan is a 23.7 in (602 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 Chore-Time fan is a flush mounted unit equipped with an inlet guard grill, a mounting face plate, a shutter, a fan hood, an outlet guard grill and two optional variable speed controls (i.e. Model 7300 and Model 7500). The four blade propeller and hub are made of cast aluminum and are mounted directly on the 0.33 hp (249 W), single phase, 230 V electric motor. The housing is constructed of molded ABS plastic and the fan hood of molded polyethylene. The motor mount consists of a stainless steel cage and mounting plate. The inlet guard grill is galvanized and the outlet guard grill is vinyl coated.

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

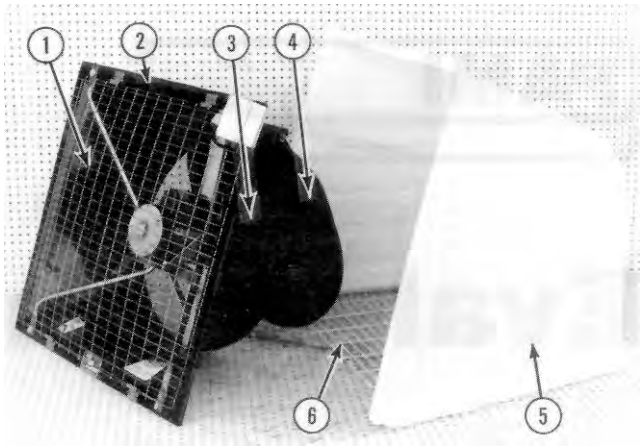


FIGURE 1. Chore-Time Model 24RLX Ventilation Fan: (1) Inlet Guard Grill, (2) Mounting Face Plate, (3) ABS Plastic Housing, (4) Shutter, (5) Fan Hood, (6) Outlet Guard Grill.

SCOPE OF TEST

The Chore-Time model 24RLX 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 shutter was standard equipment and an integral part of the fan unit, so all tests were performed with the shutter in place.

Fan performance was determined at 230V in the single speed direct mode and also with the variable speed control. A triac type speed control was used to vary the speed. Fan performance, with the variable speed control, 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 the hood on fan performance was determined in the single speed direct mode only.

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

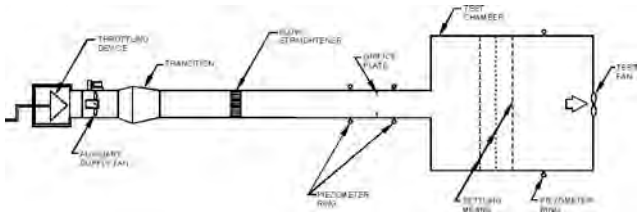


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air[1] 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 10%, depending on such things as temperature, barometric pressure, humidity and elevation above sea level.

Air Flow Rate: Fan output, at the maximum setting on the variable speed control, was less than in the single speed direct mode (FIGURE 3), due to the voltage drop created by the variable speed control. This resulted in a corresponding reduction in fan speed. Reducing the fan speed, greatly reduced the air flow rate

[1]Standard air is air with a density of 0.075 lb/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).

for a given static pressure[2]. For example, at a static pressure of 0.125 in wg (31.1 Pa), reducing the speed from the single speed direct mode to maximum to mid range to minimum setting, reduced the air flow rate from 5030 cfm (2380 L/s) to 4690 cfm (2210 L/s) to 2940 cfm (1390 L/s) to 813 cfm (384 Lis 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 manufacturer's rated air flow rate at 0.125 in wg (31.1 Pa), in the single speed direct mode, was 4620 cfm (2180 L/s). PAMI's measured flow rate at the same conditions was 5030 cfm (2380 L/s) or 9% higher than the manufacturer's rating.

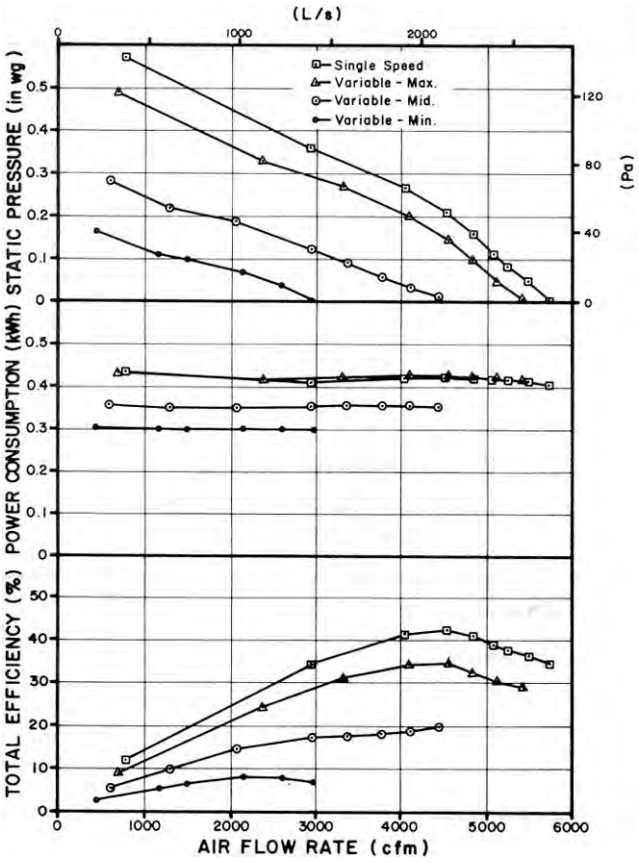


FIGURE 3. Chore-Time Model 24RLX Fan Performance Curves in the Single Speed Direct Mode and at Three Speed Settings in the Variable Speed Mode.

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 cost of the fan. For typical levels of static pressure (TABLE 1), the power consumption varied from 0.402 to. 0.420 kWh in the single speed direct mode, from 0.414 to 0.424 kWh at maximum speed, from 0.351 to 0.355 kWh at mid range and from 0.297 to 0.301 kWh at minimum speed. The maximum amperage drawn by the motor was 1.7 amps, which was less than the rated motor amperage of 1.9 amps.

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 29 to 34% at maximum speed, 6 to 20% at mid range and 4 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 40%.

[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).

Effect of Fan Hood: The fan hood was installed on the outlet side of the fan (FIGURE 4) to determine its effect on fan output. The fan was tested under these conditions in the single speed direct mode only. Using the fan hood had little effect on air flow rates (FIGURE 5).

The use of other control devices such as louvres, dampers and screens could change air flow rates by varying amounts. The use of such control devices have to be taken into consideration when designing a ventilation system.

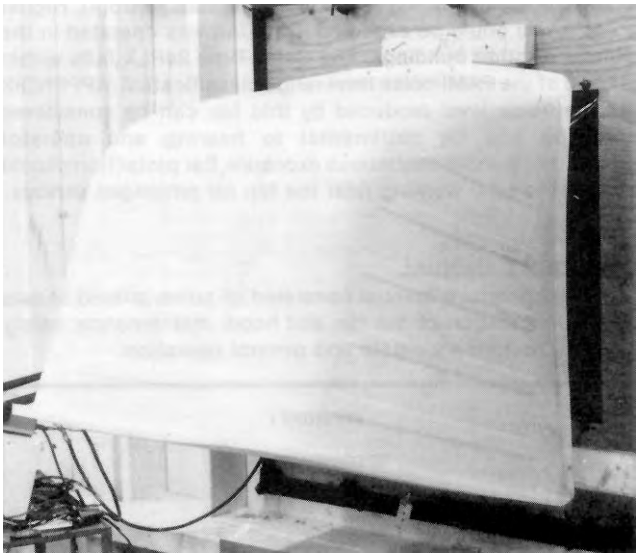


FIGURE 4. Hood on Fan Discharge.

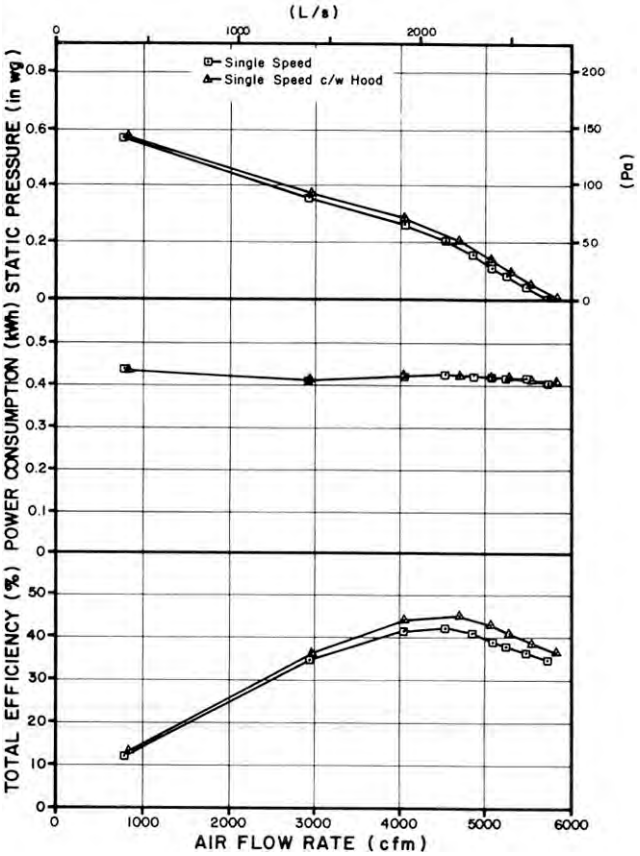


FIGURE 5. Effect of Hood on Fan Performance.

EASE OF OPERATION

Maintenance: The inlet guard grill was 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 guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Chore-Time 24RLX was CSA approved.

The noise level of the Chore-Time 24RLX, 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 78 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Chore-Time 24RLX 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 some printed sheets on the installation of the fan and hood, maintenance, safety aspects, performance data and general operation.

APPENDIX I

SPECIFICATIONS

MAKE:	Chore-Time
MODEL:	24RLX
SERIAL NUMBER:	8409
MANUFACTURER:	Chore-Time Equipment, Inc. P. O. Box 518 Milford, Indiana 46542
OVERALL DIMENSIONS:	
housing and flange width	31.75 in (806 mm)
housing and flange height	31.75 in (806 mm)
housing depth	19.5 in (495 mm)
housing dimensions	28.5 x 28.5 in (724 x 724 mm)
inside tube diameter	24 in (610 mm)
guard grill dimensions	29 x 29 in (737 x 737 mm)
grill opening	0.09 in (2.4 mm) diameter wire on a 1 x 2 in (25.5 x 51 mm) grid
IMPELLER:	
- diameter	23.7 in (602 mm)
- hub diameter	5.5 in (140 mm)
- number of blades	4
- blade angle	variable - 15 degrees at tip to 32 degrees at hub
WEIGHT:	45 lb (20 kg)
MOTOR NAMEPLATE DATA:	
make	Emerson
model	K55HXRTS-8133
frame	48Y
class	B
duty	air over
rpm	1625
ambient temperature rise	°C
volts	230 V
amps	1.9 A
phase	1
cycles	60 Hz
horsepower	0.33 hp (249 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
CHORE-TIME MODEL 24RLX
VENTILATION FAN

RETAIL PRICE:	$844.00 (April, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION	23.7 in (602 mm) propeller fan, single or variable speed, direct drive, 0.33 hp (249 W) 230 V electric motor.
FAN SPEED:	
- single speed direct	1605 to 1620 rpm
- variable speed	950 to 1540 rpm
EFFICIENCY RANGE:	
- single speed direct	35 to 42%
- variable speed	4 to 34%
EFFICIENCY AT 0.125 in wg (31.1 Pa):	
- without fan hood	40%
- with fan hood	42%
AIR FLOW RATE:	
- range	664 to 5740 cfm (313 to 2710 L/s)
- at 0.125 in wg (31.1 Pa)	5030 cfm (2380 L/s) without fan hood and 5170 cfm (2440 L/s) with fan hood
POWER CONSUMPTION:	0.297 to 0.424 kWh
OPERATOR SAFETY:	inlet and outlet guard grill provided CSA approved noise level = 78 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	adequate

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