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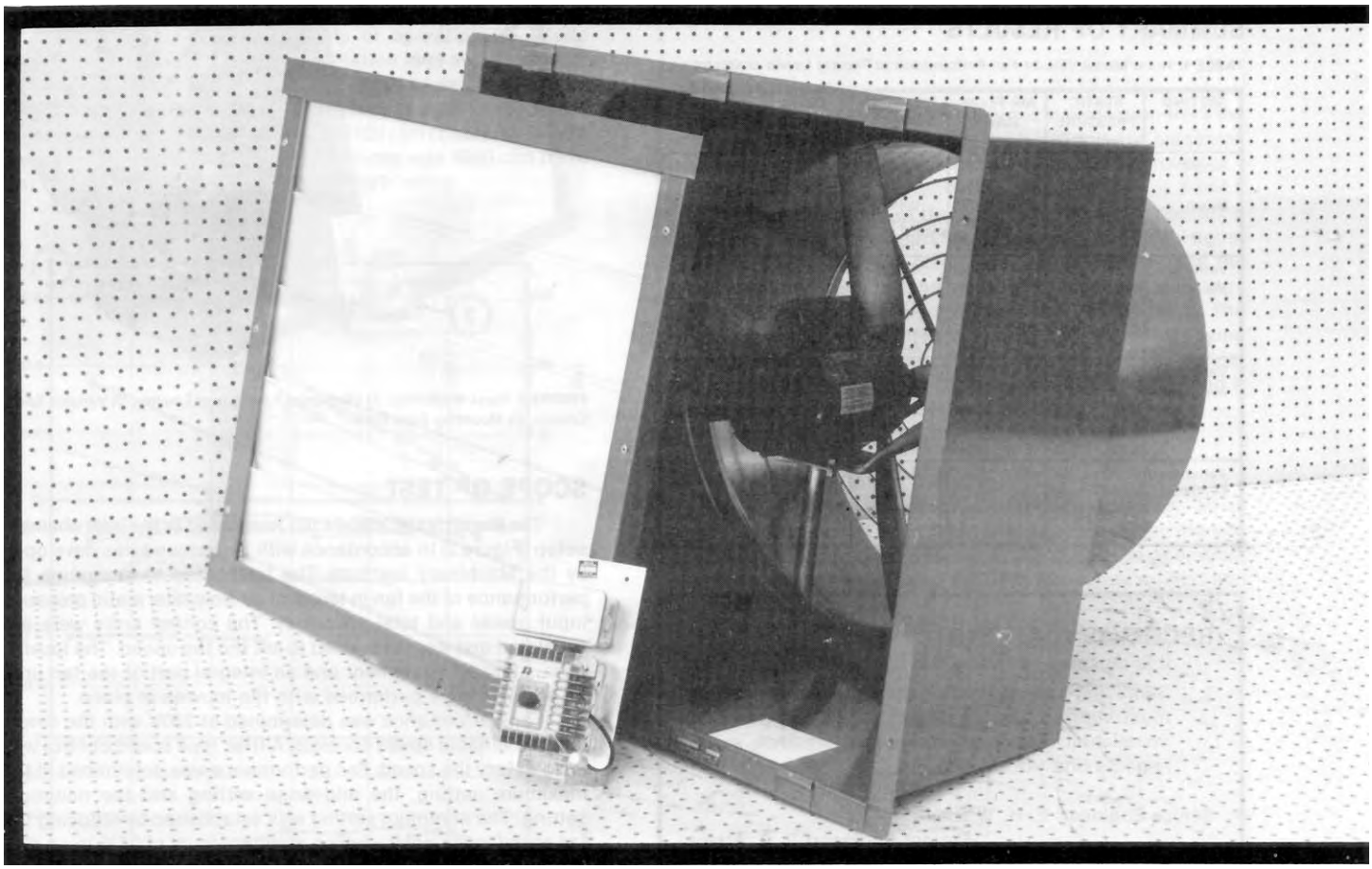

Hurst Model VSIL-24 Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

HURST MODEL VSIL-24 VENTILATION FAN

MANUFACTURER:

Hurst Equipment Ltd.
75 Archibald St.
Winnipeg, Manitoba R2J 0V7

DISTRIBUTOR:

1. U.F.A. Co-op Limited -- Calgary, Alta.
2. Eastman Feeds -- Lethbridge, Alta.
   -- Winnipeg, Man.
3. Feed Rite Limited -- Linden, Alta.
   -- Humboldt, Sask.
   -- Winnipeg, Man.
4. Prairie Poultry and Dairy Service -- Regina, Sask.
5. Western Feed Mills -- Regina, Sask.

RETAIL PRICE:

$549.40 (June, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Hurst Model VSIL-24 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)	5160	(2440)	0.410	23	1650
	0.05	(12.5)	4890	(2310)	0.410	27	1641
	0.10	(24.9)	4610	(2180)	0.417	29	1637
	0.125	(31.1)	4450	(2100)	0.418	30	1634
	0.25	(62.3)	3580	(1690)	0.425	32	1625
Variable Maximum	0	(0)	4870	(2300)	0.382	21	1561
	0.05	(12.5)	4550	(2150)	0.388	23	1552
	0.10	(24.9)	4220	(1990)	0.393	26	1539
	0.125	(31.1)	4060	(1920)	0.394	27	1535
	0.25	(62.3)	3050	(1440)	0.400	27	1529
Variable Mid Range	0	(0)	3650	(1720)	0.313	11	1216
	0.05	(12.5)	3170	(1500)	0.316	12	1186
	0.10	(24.9)	2550	(1200)	0.317	13	1179
	0.125	(31.1)	2200	(1040)	0.317	12	1177
	0.25	(62.3)	1020	(484)	0.315	10	1198
Variable Minimum	0	(0)	1650	(779)	0.208	2	744
	0.05	(12.5)	947	(447)	0.209	3	742
	0.10	(24.9)	404	(191)	0.207	2	772
	0.125	(31.1)	265	(125)	0.207	2	806

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a detailed operator's manual containing illustrations and information on general operation, installation, maintenance, rated performance, 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. We are in the process of producing an operator's manual (pamphlet) that will be included with each fan that is sold. Our deadline for completion of the pamphlet is November, 1985.

GENERAL DESCRIPTION

The Hurst model VSIL-24 ventilation fan is a 24 in (610 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 Hurst model VSIL-24 is a flush mounted unit equipped with an outlet guard grill, aluminum inlet louvres, a single speed Honeywell model T631-A control and a variable speed Ranco model E31 control. A stainless steel housing is available as an option but was not supplied with the fan. The 4 blade propeller and hub are made of cast aluminum and are mounted directly on the 1/3 hp (249 W), single phase, 115/230 V electric motor. The motor mount consists of a stainless steel cage. The galvanized sheet metal housing and inlet louvres are painted for corrosion protection.

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

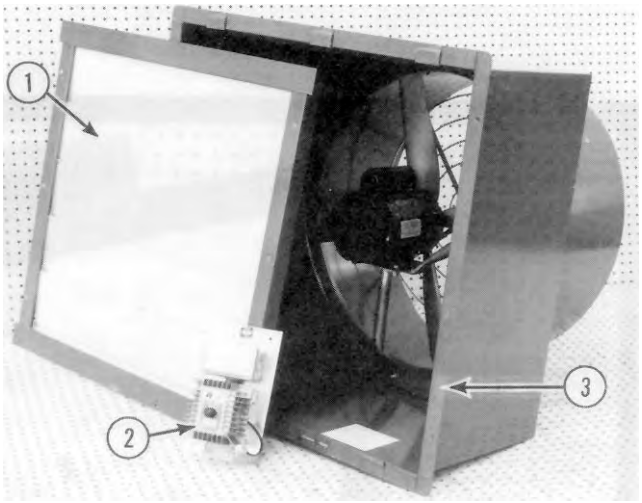

FIGURE 1. Hurst Model VSIL-24 Ventilation Fan: (1) Inlet Louvres, (2) Variable Speed Control, (3) Mounting Face Plate.

SCOPE OF TEST

The Hurst model VSIL-24 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 evaulated and were only used to set the fan speed. The louvres were standard equipment and an integral part of the fan unit, so all tests were performed with the louvres in place.

Fan performance was determined at 230V with the single and the variable speed controls. A triac type speed control was used to vary the speed. 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 fan was also evaluated for ease of operation, operator safety and suitability of the operator's manual.

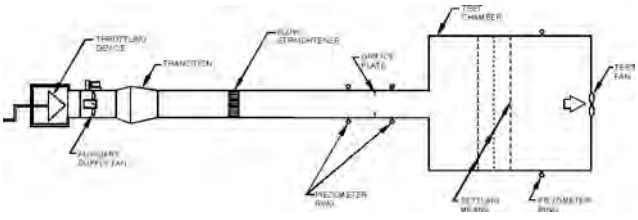

FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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 for a given static pressure[2]. 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 4060 cfm (1920 L/s) to 2200 cfm (1040 L/s) to 265 cfm (125 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 manufacturer's rated air flow rate at 0.125 in wg (31.1 Pa), in the maximum variable speed mode, was 4700 cfm (2220 L/s). PAMI's measured flow rate at the same conditions was 4060 cfm (1920 L/s) or 14% less than the manufacturer's rating.

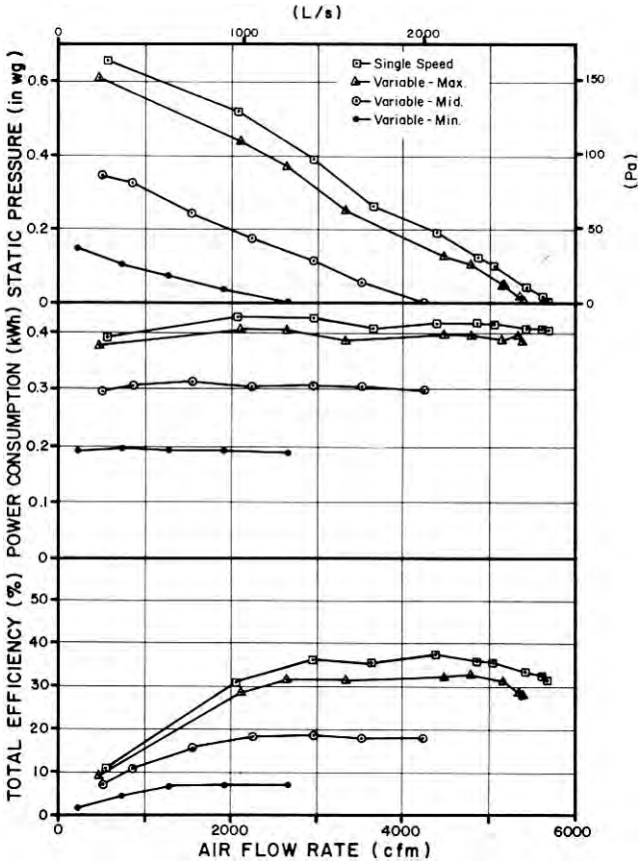

FIGURE 3. Hurst Model VSIL-24 Fan Performance Curves in the Single Speed Mode and at Three Speed Settings in the Variable Speed Mode.

Power Consumption: Power consumption is the amount of energy (kWh) used by the fan motor. These numbers can be used directly to determine fan operating costs. For typical levels of static pressure (TABLE 1), the power consumption varied from 0.410 to 0.425 kWh in the single speed direct mode, from 0.32 to 0.400 kWh at maximum speed, from 0.313 to 0.317 kWh at mid range and from 0.207 to 0.209 kWh at minimum speed. The maximum amperage drawn by the motor was 1.9 amps, which was the same as the rated motor amperage.

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 27% at maximum speed, 10 to 13% at mid range and 2 to 3% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 27%.

EASE OF OPERATION

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

The noise level of the model VSIL-24, 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 77 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The model VSIL-24 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

There was no operator's manual supplied. It is recommended that the manufacturer supply a detailed manual containing illustrations and information on general operation, installation, maintenance, rated performance, safety aspects and trouble shooting.

[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).

[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).

APPENDIX I

SPECIFICATIONS

MAKE:	Hurst
MODEL:	VSIL-24
SERIAL NUMBER:	B-02-85
MANUFACTURER:	Hurst Equipment Ltd. 75 Archibald St. Winnipeg, Man. R2J 0V7
OVERALL DIMENSIONS:	
- housing and flange width	30.9 in (784 mm)
- housing and flange height	30.9 in (784 mm)
- housing dimensions	28.4 by 28.4 in (721 by 721 mm)
- housing depth (at bottom)	24.6 in (625 mm)
- housing depth (at top)	28.6 in (727 mm)
- discharge diameter	24.5 in (622 mm)
- guard grill diameter	20.6 in (524 mm)
- grill opening	0.19 in (5 mm) diameter wire spaced at 1.75 in (44 mm) in a circular pattern
IMPELLERS:	
- diameter	24.0 in (610 mm)
- number of blades	4
- blade angle	variable 15 degrees at the tip to 35 degrees at the hub
WEIGHT:	73 lb (33 kg)
MOTOR NAMEPLATE DATA:	
make	LEESON
model	A4 P17 NV14C
frame	N48Z
class	B*
type	PN
code	D
duty	air over
rpm	1625
service factor	1
ambient temperature rise	40°C
volts	115/230 V
amps	3.8/1.9A
phase	single
cycles	60 Hz
horsepower	1/3 h p (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.

APPENDIX III

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 gauge (in wg) x 249.1	= pascals (Pa)
pounds (lb) x 0.45	= kilograms (kg)

SUMMARY CHART
HURST MODEL VSIL-24 VENTILATION FAN

RETAIL PRICE:	$549.40 (June, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION	24 in (610 mm) propeller fan, single or variable speed, direct drive, 1/3 hp (249 W) 115/230 V electric motor.
FAN SPEED:	
- single speed	1625 to 1650 rpm
- variable speed	742 to 1561 rpm
EFFICIENCY RANGE:	
- single speed direct	23 to 32%
- variable speed	2 to 27%
EFFICIENCY AT 0.125 in wg (31.1 Pa):	30%
AIR FLOW RATE:	
- range	265 to 5160 cfm (125 to 2440 L/s)
- at 0.125 in wg (31.1 Pa)	4450 cfm (2100 L/s) at single speed
POWER CONSUMPTION:	0.207 to 0.425 kWh
OPERATOR SAFETY:	inlet guard grill provided CSA approved noise level = 77 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	None supplied

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