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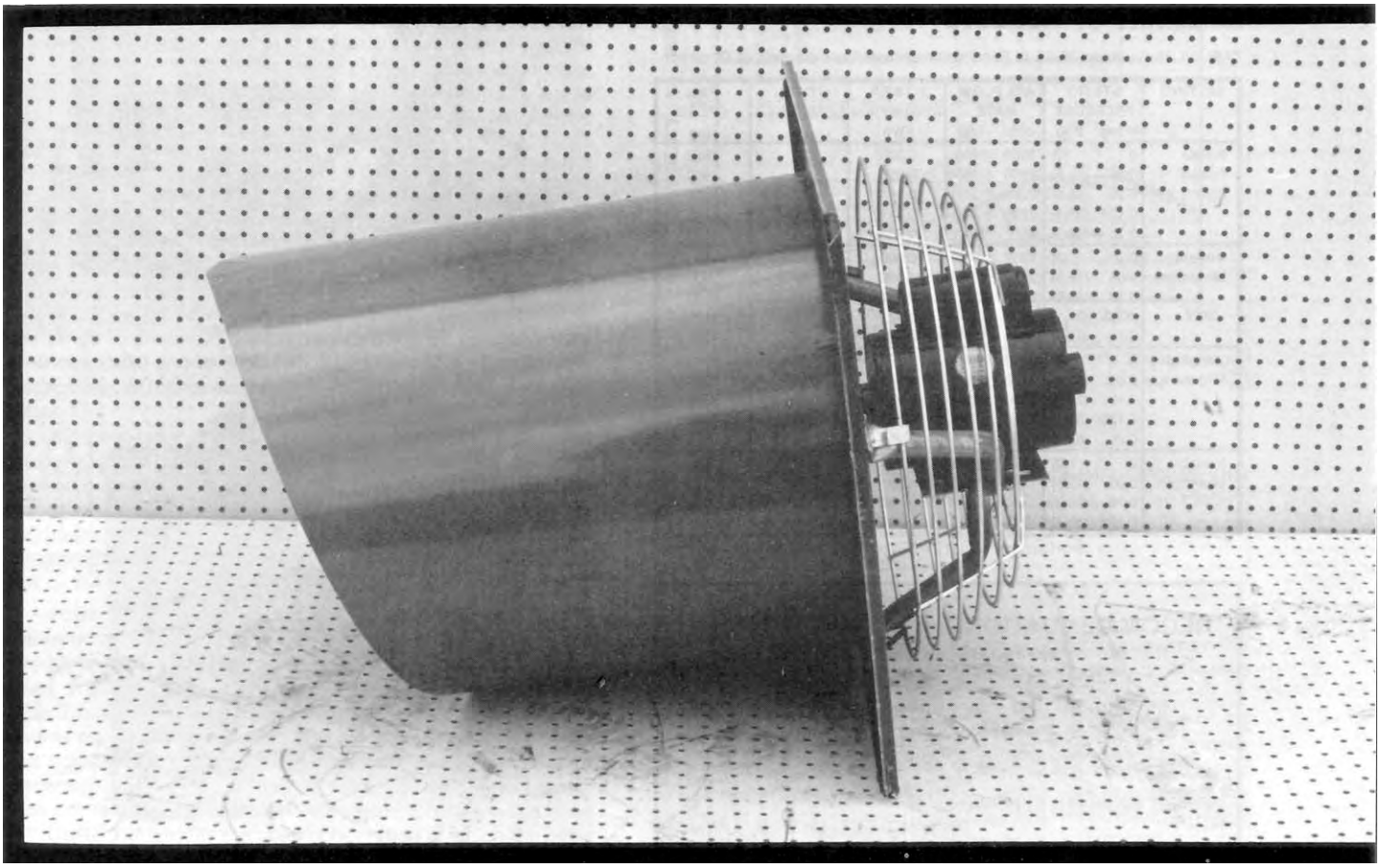

Hurst Model VSBF-16 Ventilation Fan

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

HURST MODEL VSBF-16 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:

$348.15 (June, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Hurst Model VSBF-16 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)	2960	(1400)	0.328	23	1668
	0.05	(12.5)	2860	(1350)	0.335	25	1660
	0.10	(24.9)	2780	(1310)	0.345	27	1651
	0.125	(31.1)	2730	(1290)	0.351	28	1647
	0.25	(62.3)	2500	(1180)	0.379	31	1627
Variable Maximum	0	(0)	2930	(1380)	0.302	25	1633
	0.05	(12.5)	2820	(1330)	0.309	26	1610
	0.10	(24.9)	2710	(1280)	0.322	28	1592
	0.125	(31.1)	2640	(1250)	0.327	28	1581
	0.25	(62.3)	2330	(1100)	0.356	29	1525
Variable Mid Range	0	(0)	2410	(1140)	0.238	17	1310
	0.05	(12.5)	2110	(998)	0.244	16	1200
	0.10	(24.9)	1800	(851)	0.255	15	1106
	0.125	(31.1)	1610	(759)	0.257	14	1044
	0.25	(62.3)	460	(217)	0.273	5	756
Variable Minimum	0	(0)	1730	(815)	0.185	8	933
	0.05	(12.5)	1070	(507)	0.191	5	771
	0.10	(24.9)	460	(216)	0.196	3	621
	0.125	(31.1)	274	(129)	0.196	2	541

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 VSBF-16 ventilation fan is a 16.1 in (410 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 VSBF-16 is a flush mounted unit equipped with an inlet guard grill, butterfly outlet shutters, a single speed Honeywell model T631-A contrfol and a variable speed Ranco model E31 control. The 4 blade propeller and hub are made of stainless steel and are mounted directly on a 1/4 hp (187 W), single phase, 115/230 V electric m otor. The motor mour 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.

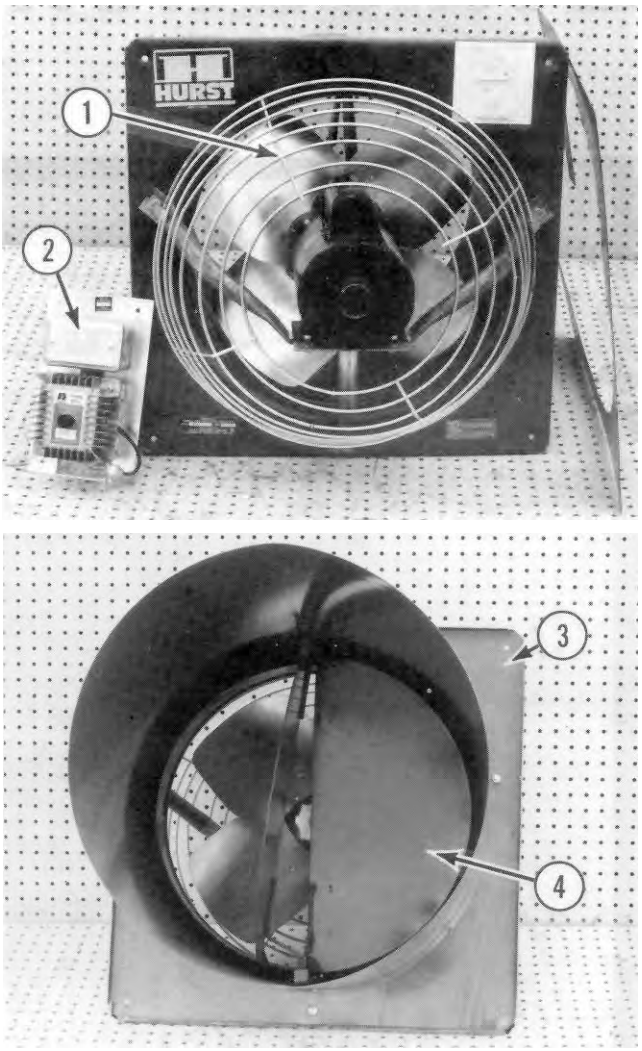

FIGURE 1. Hurst Model VSBF-16 Ventilation Fan: (1) Inlet Guard Grill, (2) Variable Speed Control, (3) Mounting Face Plate, (4) Outlet Butterfly Shutters.

SCOPE OF TEST

The Hurst model VSBF-16 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 butterfly shutters were standard equipment and an integral part of the fan unit, so all tests were performed with the shutters 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.

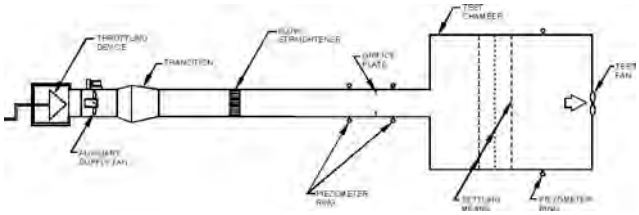

FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

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 2640 cfm (1250 L/s) to 1610 cfm (759 L/s) to 274 cfm (129 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 2500 cfm (1180 L/s). PAMI's measured flow rate at the same conditions was 2640 cfm (1250 L/s) or 6% higher than the manufacturer's rating.

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 0.328 to 0.379 kWh at the single speed setting, from 0.302 to 0.356 kWh at maximum speed, from 0.238 to 0.273 kWh at mid range and from 0.185 to 0.196 kWh at minimum speed. The maximum amperage drawn by the motor was 2.3 amps, which was greater than the rated motor amperage of 1.6 amps. The shaded zone in FIGURE 3 illustrates the point of operation at which the rated amperage was exceeded. Motor amperage was not exceeded at static pressures below 0.30 in wg (76 Pa). Ventilation fans are not normally operated at static pressures higher than this. Prolonged operation in excess of the rated amperage could reduce motor life.

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 24 to 29% at maximum speed, 5 to 17% at mid range and 2 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 28%.

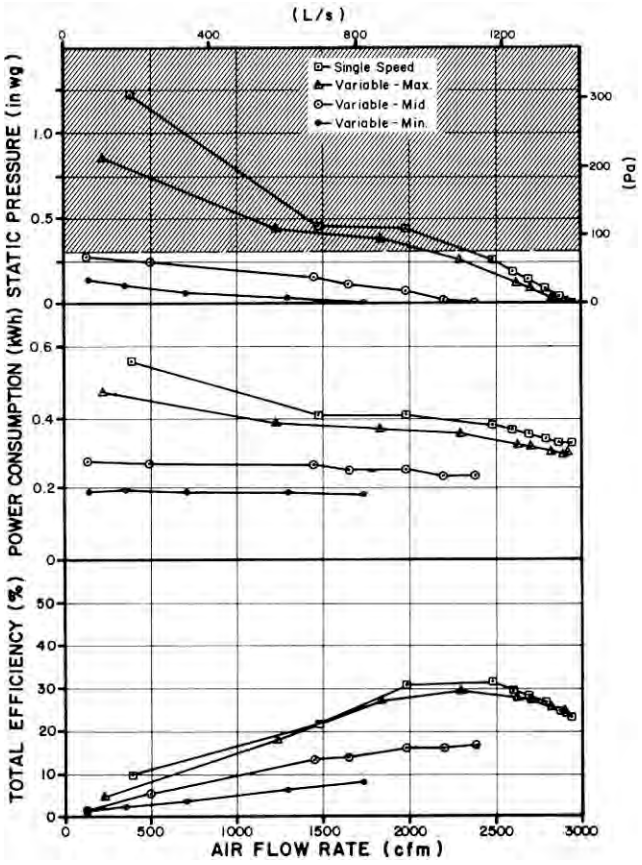

FIGURE 3. Hurst Model VSBF-16 Fan Performance Curves in the Single Speed and Variable Speed Modes.

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 model VSBF-16 was CSA approved.

The noise level of the model VSBF-16, 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 80 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The model VSBF-16 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:	VSBF-16
SERIAL NUMBER:	B-09-84
MANUFACTURER:	Hurst Equipment Ltd. 75 Archibald St. Winnipeg, Man. R2J 0VT
OVERALL DIMENSIONS:	
- housing and flange width	23.1 in (587 mm)
- housing and flange height	23.1 in (587 mm)
- housing depth at bottom (motor included)	25.6 in (651 mm)
- housing depth at top (motor included)	33.25 in (845 mm)
- discharge diameter	18.75 in (476 mm)
- guard grill diameter	20.0 in (508 mm)
- grill opening	0.19 in (5 mm) diameter wire spaced at 0.63 to 2.5 in (16 to 64 mm) in a circular pattern
IMPELLERS:	
- diameter	16.1 in (410 mm)
- number of blades	4
- blade angle	25 degrees
WEIGHT:	50 lb (23 kg)
MOTOR NAMEPLATE DATA:	
make	LEESON
model	A4 P17 NB13A
cat. no.	HFM-25
frame	L48
class	B*
type	PN
code	E
design	M
duty	air over
rpm	1625
service factor	1.0
ambient temperature rise	40°C
volts	115/230V
amps	3.2/1.6 A
phase	single
cycles	60 Hz
horsepower	1/4 hp (187 W)

APPENDIX II

NOISE LEVEL RANGES

RANGE	SOUND LEVEL (dBA)	COMMENTS
1	up to 45	Tolerable, low levet 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 VSBF-16 VENTILATION FAN

RETAIL PRICE:	$348.15 (June, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION	16.1 in (410 mm) propeller fan, single or variable speed, direct drive, 1/4 hp (187 W) 115/230 V electric motor.
FAN SPEED:	
- single speed	1627 to 1668 rpm
- variable speed	541 to 1633 rpm
EFFICIENCY RANGE:	
- single speed	23 to 31%
- variable speed	2 to 29%
EFFICIENCY AT 0.125 in wg (31.1 Pa):	28%
AIR FLOW RATE:	
- range	274 to 2960 cfm (129 to 1400 L/s)
- at 0.125 in wg (31.1 Pa)	2730 cfm (1290 Lis at single speed
POWER CONSUMPTION:	0.185 to 0.379 kWh
OPERATOR SAFETY:	inlet guard grill provided CSA approved noise level -- 80 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	None supplied

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