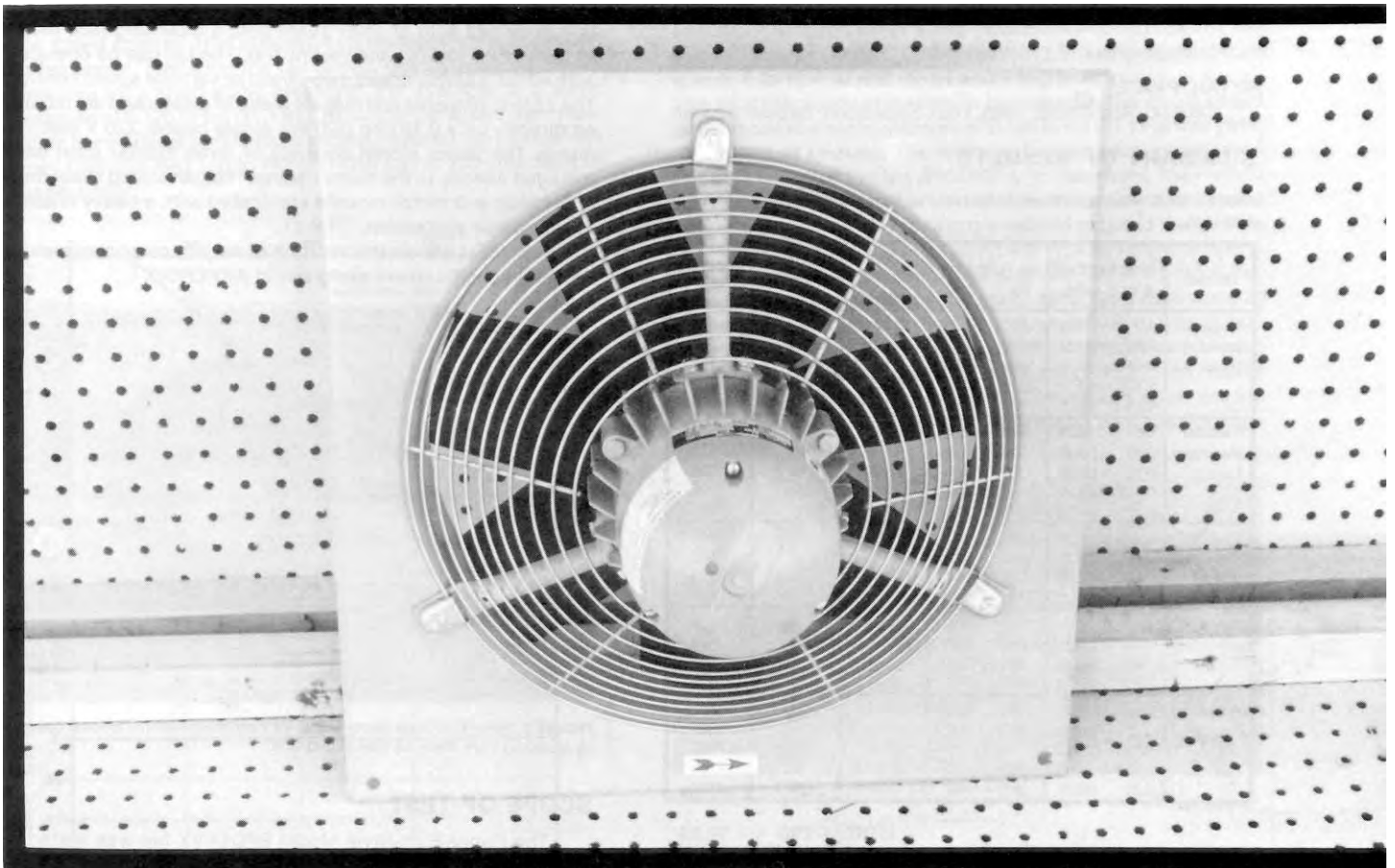


Evaluation Report

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Danor Euro-Style Model EPD14-VX Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

DANOR EURO-STYLE MODEL EPD14-VX VENTILATION FAN

MANUFACTURER:

Canarm Limited
2157 Parkedale Avenue
Brockville, Ontario
K6V 5V6

DISTRIBUTORS:

1. Peavey Mart
2420 - 50 Avenue
Red Deer, Alberta T4R 1M3
2. Federated Cooperatives Ltd.
Box 1050, 401 - 22nd St. E.
Saskatoon, Saskatchewan S7K 3M9
3. Steinbach Mills
P.O. Box 1089
Steinbach, Manitoba R0A 2A0
4. Peacock Equipment Ltd.
26311 - 30A Ave., Box 190
Aldergrove, B.C. V0X 1A0

RETAIL PRICE:

\$209.00 (September, 1985, f.o.b. Saskatoon, Saskatchewan).

SUMMARY OF RESULTS

TABLE 1. Danor Euro-Style Model EPD14-VX Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE		AIR FLOW RATE		POWER CONSUMPTION	TOTAL EFFICIENCY	FAN SPEED
	in wg	(Pa)	cfm	(L/s)	kWh	%	rpm
Single Speed Direct	0.0	(0.0)	1680	(792)	0.154	19	1729
	0.05	(12.5)	1640	(774)	0.160	23	1725
	0.10	(24.9)	1580	(746)	0.165	26	1722
	0.125	(31.1)	1530	(720)	0.168	26	1720
	0.25	(62.3)	1380	(652)	0.172	33	1705
Variable Maximum Range	0.0	(0.0)	1600	(757)	0.150	17	1654
	0.05	(12.5)	1510	(714)	0.156	19	1626
	0.10	(24.9)	1420	(670)	0.160	22	1593
	0.125	(31.1)	1360	(643)	0.163	22	1566
	0.25	(62.3)	937	(442)	0.177	18	1480
Variable Mid Range	0.0	(0.0)	1350	(640)	0.150	10	698
	0.05	(12.5)	1070	(503)	0.160	9	595
	0.10	(24.9)	814	(384)	0.160	8	520
	0.125	(31.1)	741	(350)	0.159	8	517
Variable Minimum Range	0.0	(0.0)	1010	(475)	0.133	5	525
	0.05	(12.5)	752	(355)	0.136	5	450
	0.10	(24.9)	495	(234)	0.136	5	469
	0.125	(31.1)	230	(109)	0.140	2	370
Single Speed with Louvres	0.0	(0.0)	1460	(688)	0.173	11	1711
	0.05	(12.5)	1400	(660)	0.174	14	1708
	0.10	(24.9)	1330	(629)	0.176	17	1702
	0.125	(31.1)	1300	(615)	0.177	19	1701
	0.25	(62.3)	915	(432)	0.168	19	1712

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a detailed operator's manual containing illustrations and information on general operation and 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. Due to high quality fabrication, this piece of equip-

ment is maintenance free. Because of in-stream air cooled design, our motor has long life at very low noise levels. The only care that must be given our fan is to keep it clean. In case of motor failure, the owner should contact the nearest service depot as outlined in the warranty card provided with each unit. Installation framing dimensions and power requirements are supplied on all sales literature. Detailed wiring and hook-up instructions are packed with every fan and control.

GENERAL DESCRIPTION

The Danor Euro-Style Model EPD14-VX ventilation fan is a 13.75 in (349 mm) diameter 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 or ceiling.

The Danor Euro-Style Model EPD14-VX is a flush mounted unit equipped with an inlet guard grill, a mounting face plate, optional PVC louvres and thermostat. The fan can be operated with either a single speed, two speed or variable speed control. The 7 blade propeller and hub are made of plastic and are mounted directly on a 0.161 hp (120 W), single phase, 220 V electric motor. The motor mount consists of three tubular steel bars mounted directly to the motor casing. The galvanized sheet metal housing and motor mounts are coated with a heavy enamel for corrosion protection.

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

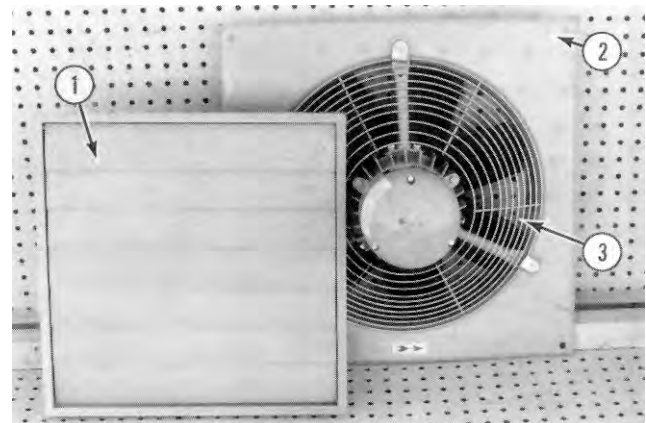


FIGURE 1. Danor Euro-Style Model EPD14-VX Ventilation Fan: (1) Optional Louvres, (2) Mounting Face Plate, (3) Inlet Guard Grill.

SCOPE OF TEST

The Danor Euro-Style Model EPD14-VX 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.

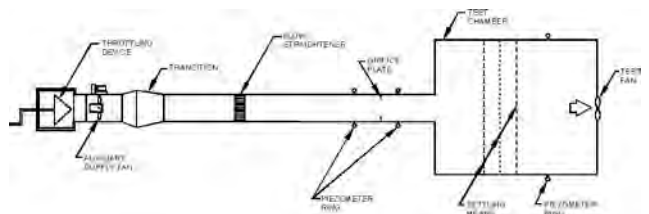


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

Fan performance was determined at 230 V with the single and variable speed controls. With the Triac type variable speed control, fan performance was determined at the maximum set-

ting, 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 louvres on fan performance was determined in the single speed mode.

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

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 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 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 setting, reduced the air flow rate from 1360 cfm (643 L/s) to 741 cfm (350 L/s) to 230 cfm (109 L/s) respectively.

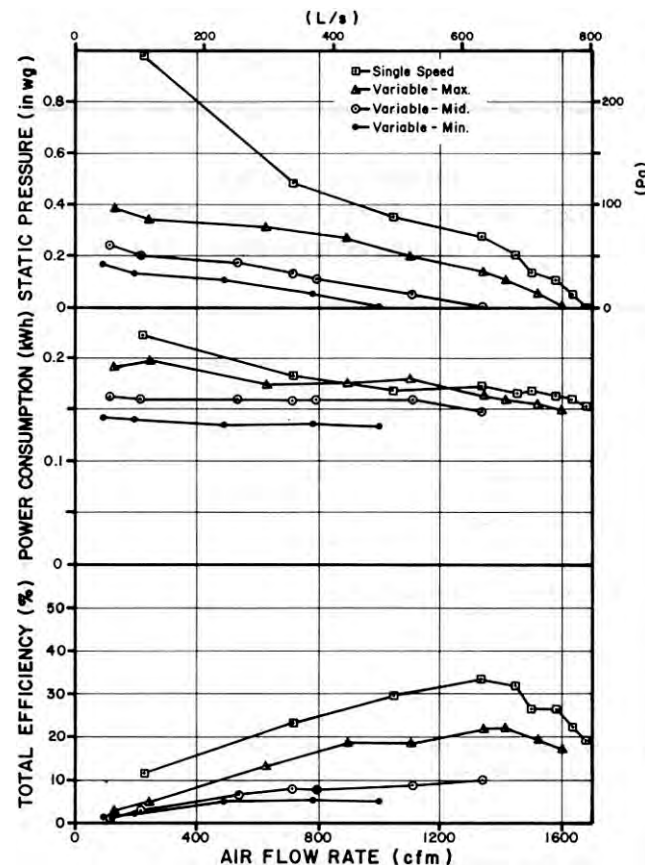


FIGURE 3. Danor Euro-Style Model EPD14-VX Fan Performance Curves in the Single Speed Mode and at Three Speed Settings in the Variable Speed Mode.

Air flow rates at typical levels of operation (i.e. static pressure) are given in TABLE 1. The manufacturer provided fan performance results at 0, 0.10, 0.125 and 0.25 in wg (0, 24.9, 31.1

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).

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).

and 62.3 Pa) static pressure for the single speed mode. 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 mode, was 1689 cfm (797 L/s). PAMI's measured flow rate at the same conditions was 1530 cfm (720 L/s) or 9% lower 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 0.154 to 0.172 kWh in the single speed direct mode, from 0.150 to 0.177 kWh at maximum speed, from 0.150 to 0.160 kWh at mid range and from 0.133 to 0.140 kWh at minimum speed. The maximum rated amperage for the motor was not given so it was impossible to determine whether the motor was overloaded. 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 when using the variable speed control, the total efficiency (TABLE 1) ranged from 17 to 22% at maximum speed, 8 to 10% at mid range and 2 to 5% at minimum speed. The total efficiency at maximum fan speed in the single speed direct mode at a static pressure of 0.125 in wg (31.1 Pa) was 26%.

Effect of Louvres: The optional louvres were installed on the outlet 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 louvres reduced the air flow rate by 13 to 33% (FIGURE 5) over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the louvres reduced the air flow rate by 15%, from 1530 cfm (720 L/s) to 1300 cfm (615 L/s) (TABLE 1). The efficiency was in turn reduced from 26 to 19%. The use of other control devices such as shutters, dampers, screens, and hoods would also reduce air flow rates by varying amounts. The use of such control devices have to be taken into consideration when designing a ventilation system.

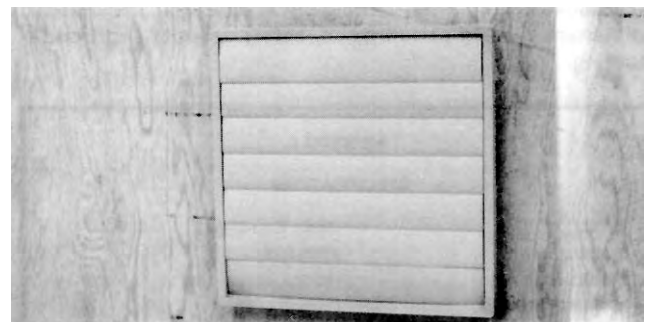


FIGURE 4. Louvres Located on Fan Discharge.

EASE OF OPERATION

Maintenance: The inlet guard grill was easily removed. This made for easy access to clean 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 EPD14-VX was CSA approved.

The noise level of the model EPD14-VX, 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 67 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The model EPD14-VX 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.

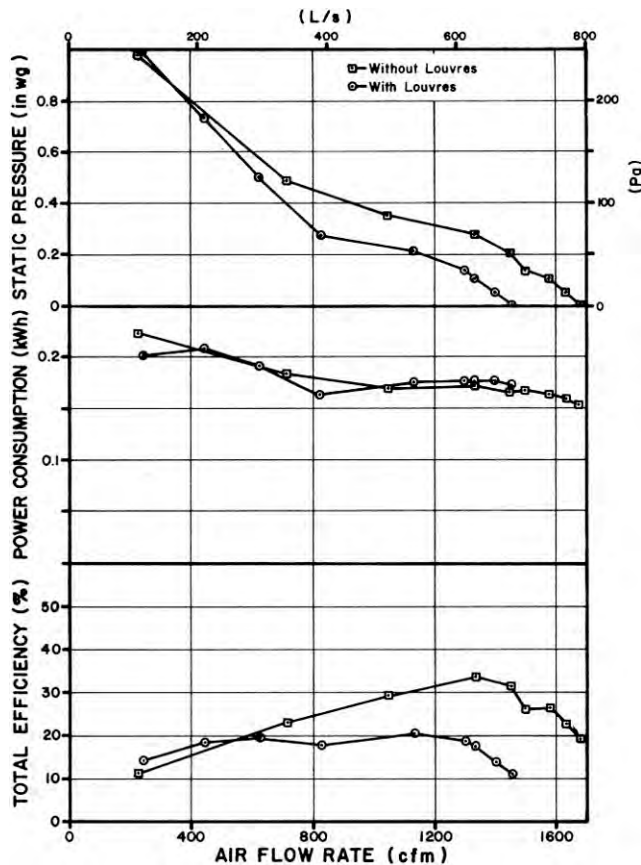


FIGURE 5. Effect of Louvres on Fan Performance.

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.

APPENDIX I

SPECIFICATIONS

MAKE:	Danor Euro-Style
MODEL:	EPD14-VX
SERIAL NUMBER:	HQ-35
MANUFACTURER:	Canarm Limited 2157 Parkedale Avenue Brockville, Ontario K6V 5V6
OVERALL DIMENSIONS:	
- housing width	18.75 in (467 mm)
- housing height	18.75 in (467 mm)
- housing depth (motor included)	10.75 in (273 mm)
- housing diameter	14.13 in (359 mm)
- guard grill diameter	14.75 in (375 mm)
- grill opening	0.13 in (3 mm) diameter wire spaced at 0.5 in (13 mm) in a circular pattern

PROPELLER:	
- diameter	13.75 in (349 mm)
- number of blades	7
- blade angle	variable - 31° at the tip, 40° at the hub
WEIGHT:	20 lb (9 kg)
MOTOR NAMEPLATE DATA:	
class	B
type	4E 35 TK
rpm	1725
ambient temperature rise	40°C
volts	220 V
phase	single
cycles	60 Hz
horsepower	0.161 hp (120W)

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 DANOR EURO-STYLE MODEL EPD14-VX VENTILATION FAN

RETAIL PRICE:	\$209.00 (September, 1985, f.o.b. Saskatoon)
FAN DESCRIPTION:	13.75 in (349 mm) propeller fan, variable speed, direct drive, 0.161 hp (120 W) 220 V electric motor.
FAN SPEED:	
- single speed	1705 to 1729 rpm
- variable speed	370 to 1654 rpm
EFFICIENCY RANGE:	
- without louvres	19 to 33%
- with louvres	11 to 19%
EFFICIENCY AT 0.125 in wg (31.1 Pa):	
- without louvres	26%
- with louvres	19%
AIR FLOW RATE:	
- range	230 to 1680 cfm (109 to 792 L/s)
- at 0.125 in wg (31.1 Pa)	1530 cfm (720 L/s) without louvres & 1300 cfm (615 L/s) with louvres
POWER CONSUMPTION:	0.133 to 0.177 kWh
OPERATOR SAFETY:	inlet guard provided noise level = 67 dB(A) at 4.9 ft (1.5 m) from fan discharge
OPERATOR'S MANUAL:	None provided



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