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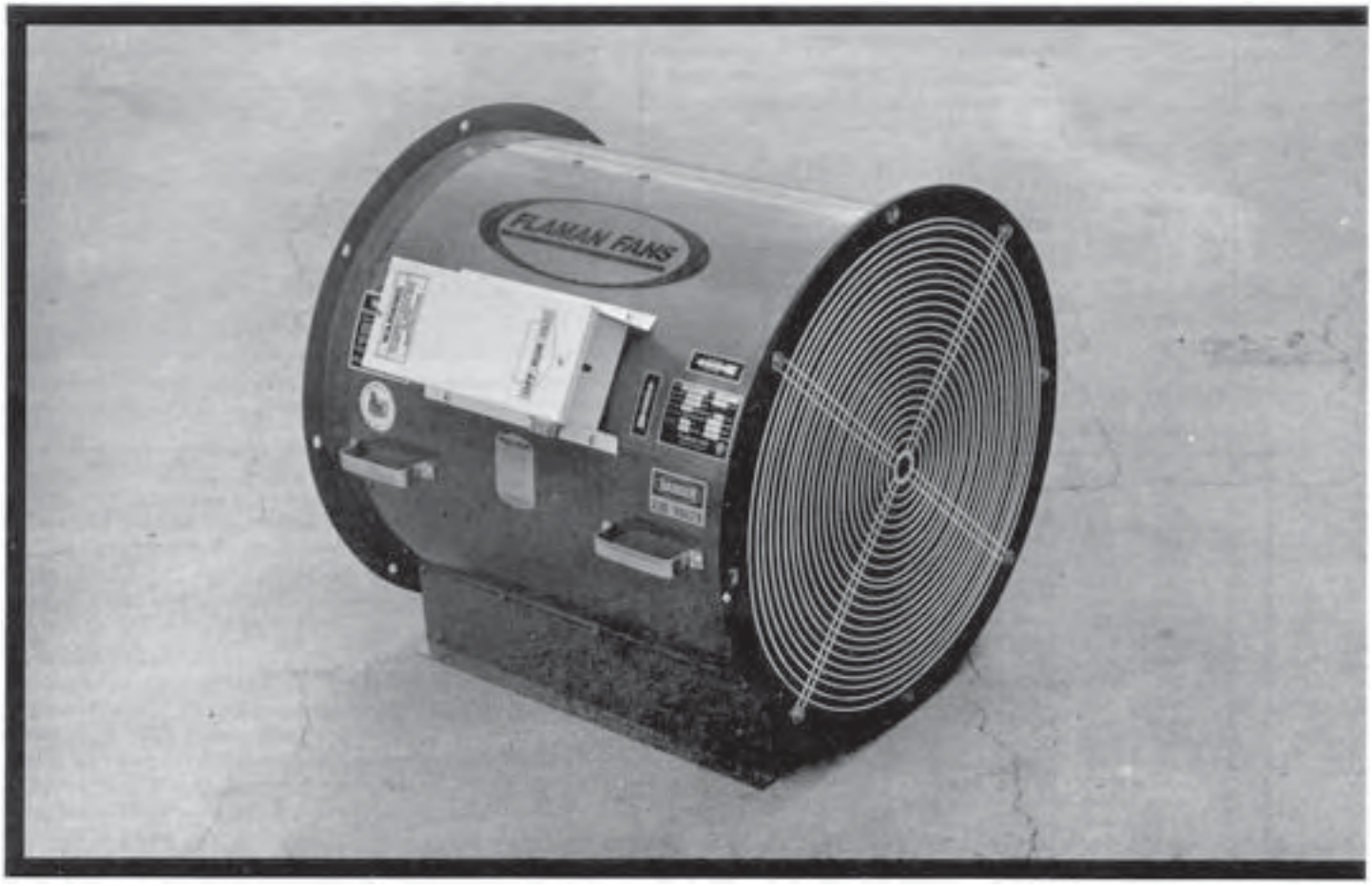

Flaman Crop Dryer In-Line Centrifugal Fan Model FCJ-24-5-1

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

FLAMAN CROP DRYER IN-LINE CENTRIFUGAL FAN MODEL FCJ-24-5-1

MANUFACTURER:

Emerson South Agronomics Inc.
63 Beghin Avenue
St. Boniface Industrial Park
Winnipeg, Manitoba
R2J 3S8

DISTRIBUTOR:

Flaman Sales Ltd.
Agri-Products Division
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Frank Flaman Store Inc. P.A.
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Frank Flaman Sales Ltd.
Box 1536
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(403) 986-0608

RETAIL PRICE:

$1410.00 (May, 1989 f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Flaman Model FCJ-24-5-1 Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Input Power	Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kW	%	rpm
0.9	(224)	5750	(2710)	5.62	13	3509
1.0	(249)	5730	(2700)	5.64	14	3508
1.5	(374)	5580	(2630)	5.76	19	3504
2.0	(496)	5430	(2560)	5.89	23	3500
2.5	(623)	5280	(2490)	6.03	27	3496
3.0	(747)	5130	(2420)	6.16	30	3476
3.5	(872)	4960	(2340)	6.29	34	3455
4.0	(996)	4790	(2260)	6.40	36	3450
4.5	(1120)	4620	(2150)	6.49	39	3446
5.0	(1250)	4420	(2070)	6.55	41	3443
5.5	(1370)	4230	(2000)	6.57	42	3445
6.0	(1490)	4050	(1910)	6.55	43	3475
6.5	(1620)	3780	(1780)	6.46	44	3474
7.0	(1740)	3340	(1580)	6.18	45	3477
7.5	(1870)	2620	(1240)	5.50	42	3489
8.0	(1990)	1600	(755)	4.43	33	3517
8.5	(2120)	634	(299)	3.24	18	3544
9.0	(2240)	323	(152)	2.61	12	3559
9.3	(2320)	211	(100)	2.31	9	3565

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying a table or curve of air flow rates over a complete range of static pressures.

Station Manager: R. P. Atkins

Project Engineer: K. Shimek

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Air flow information will be available with each fan.

GENERAL DESCRIPTION

The Flaman Model FCJ-24-5-1 fan is a 15.0 in (381 mm) diameter, single speed, direct drive, inline centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Flaman Model FCJ-24-5-1 is equipped with a wire mesh guard grill, an inlet bell, duct mounting flange and motor control. The welded steel impeller consists of a hub backplate, 9 backward curved blades and a flange. The impeller is directly mounted on the 5 hp (3.73 kW) single phase, 230 V electric motor. The fan housing, motor mounts, straightening vanes, flanges and supports are of steel construction with an enamel finish for corrosion protection.

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

SCOPE OF TEST

The Flaman Model FCJ-24-5-1 fan was tested in the outlet chamber setup (FIGURE 2) in accordance with test procedures developed by the Prairie Agricultural 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.

Fan performance was determined at 230 V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

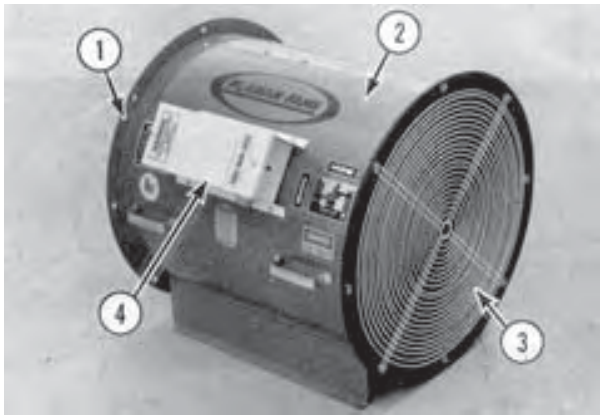

FIGURE 1. Flaman Model FCJ-24-5-1 Fan: (1) Mounting Flange, (2) Fan Housing, (3) Guard Grill and Inlet Bell, (4) Motor Control.

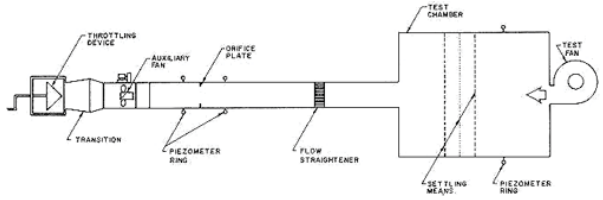

FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

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 typical levels of operation (i.e. static pressure[2]) are given in TABLE 1. The air flow rate ranged from 211 cfm (100 L/s) at 9.3 in wg (2320 Pa) to 5750 cfm (2710 L/s) at 0.9 in wg (224 Pa). FIGURE 3 illustrates the fan performance curves for the Flaman Model FCJ-24-5-1 fan.

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 upon the point of operation of the fan. The power consumption varied from 2.31 kW at maximum static pressure and minimum air flow rate to 6.57 kW at 5.5 in wg (1370 Pa) static pressure and an air flowrate of 4230 cfm (2000 L/s). The maximum amperage drawn by the motor was 28.4 amps, which was less than the rated motor amperage of 32 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 9 to 45%. The maximum total efficiency of 45% occurred at 3340 cfm (1580 L/s) at a static pressure of 7.0 in wg (1740 Pa).

EASE OF OPERATION

Maintenance: The inlet guard grill and inlet bell could be easily removed which allowed for periodic cleaning of the fan wheel and housing. Other maintenance was not required as the motor had pre-

[1]Standard 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).

[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).

lubricated and sealed bearings.

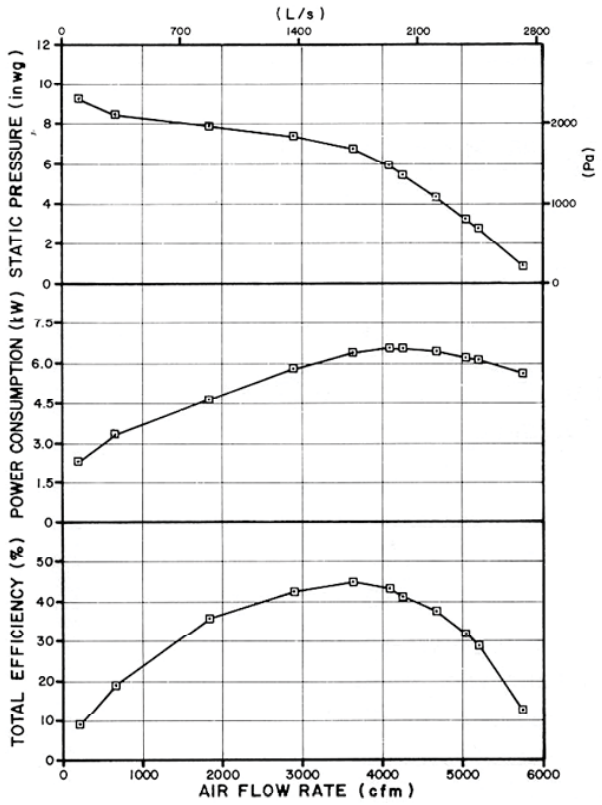

FIGURE 3. Flaman Model FCJ-24-5-1 Fan Performance Curves.

OPERATOR SAFETY

The guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Flaman Model FCJ-24-5-1 was CSA approved. The noise level of the Flaman Model FCJ-24-5-1, at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 1 in wg (249 Pa) static pressure, was 90 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Flaman Model FCJ-24-5-1 falls within range 4 of the noise level range classification (APPENDIX II). The noise level produced could damage hearing, depending on exposure time. Ear protection is definitely recommended.

OPERATOR'S MANUAL

The operator's manual included information on installation, wiring, maintenance, service and trouble shooting.

APPENDIX I
SPECIFICATIONS

MAKE:	Flaman
MODEL:	FCJ-24-5-1
SERIAL NUMBER:	F 75288
MANUFACTURER:	Emerson South Agronomics Inc. 63 Beghin Avenue St. Boniface Industrial Park Winnipeg, Manitoba R2J 3S8
OVERALL DIMENSIONS:	
-- housing width	29.0 in (737 mm)
-- housing depth	27.5 in (699 mm)
-- housing height	27.5 in (699 mm)
-- inlet bell diameter	9.0 in (229 mm)
-- guard grill diameter	24.2 in (616 mm)
-- grill opening	0.125 in (3 mm) diameter wire spaced at 0.5 in (13 mm)
-- discharge opening	24.1 in (613 mm)
IMPELLER:	
-- diameter	15.0 in (381 mm)
-- inside flange diameter	10.4 in (264 mm)
-- number of blades	9
-- blade angle	60 degrees
WEIGHT:	207 lb (94 kg)
MOTOR NAMEPLATE DATA:	
-- make	Baldor
-- model	36F447W751
-- frame	184Z
-- class	F
-- code	H
-- design	L
-- duty	continuous
-- rpm	3450
-- service factor	1.0
-- ambient temperature rise	40°C
-- volts	230 V
-- amps	32
-- phase	1
-- cycles	60 Hz
-- horsepower	5 hp (3.73 kW)

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
FLAMAN CROP DRYER IN-LINE CENTRIFUGAL FAN MODEL FCJ-24-5-1

RETAIL PRICE:	$1,410.00 (May, 1989, f.o.b. Lethbridge)
FAN DESCRIPTION:	15.0 in (381 mm) single speed, direct drive, 5.0 hp (3.73 kW) 230 V electric motor
FAN PERFORMANCE:	
Air Flow Rate:	
-range	211 to 5750 cfm (100 to 2710 L/s)
-at maximum efficiency	3340 cfm (1580 L/s) at a 7.0 in wg (1740 Pa) static pressure
Power Consumption:	2.31 to 6.57 kwh
Total Efficiency:	
-maximum	45%
OPERATOR SAFETY:	guard grill provided CSA approved noise level = 90 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	adequate

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