

Evaluation Report

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Westeel Crop Dryer In-Line Centrifugal Fan Model WVA-24-5-1

A Co-operative Program Between



WESTEEL CROP DRYER IN-LINE CENTRIFUGAL FAN MODEL WVA-24-5-1

MANUFACTURER:

Emerson South Agronomics Inc.
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DISTRIBUTOR:

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RETAIL PRICE:

\$1,400.00 (May, 1989 f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Westeel Model WVA-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
0.826	(206)	5430	(2560)	5.23	12	3514
1.0	(249)	5400	(2550)	5.29	14	3512
1.5	(374)	5320	(2510)	5.46	18	3507
2.0	(498)	5230	(2470)	5.62	23	3502
2.5	(623)	5140	(2430)	5.78	27	3497
3.0	(747)	5040	(2380)	5.93	31	3492
3.5	(872)	4920	(2320)	6.09	34	3487
4.0	(996)	4780	(2260)	6.24	37	3482
4.5	(1120)	4630	(2190)	6.36	39	3479
5.0	(1250)	4480	(2110)	6.46	41	3479
5.5	(1370)	4320	(2040)	6.51	43	3479
6.0	(1490)	4160	(1960)	6.54	45	3479
6.5	(1620)	3940	(1860)	6.51	47	3479
7.0	(1740)	3630	(1710)	6.38	47	3478
7.5	(1870)	3200	(1510)	6.05	46	3475
8.0	(1990)	1850	(873)	4.59	37	3514
8.5	(2110)	860	(406)	3.41	25	3541
9.0	(2240)	400	(189)	2.65	14	3558
9.2	(2290)	220	(104)	2.28	10	3564

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 Westeel Model WVA-24-5-1 fan is a 15 in (381 mm) diameter, single speed, direct drive, inline centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Westeel Model WVA-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, flange 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.

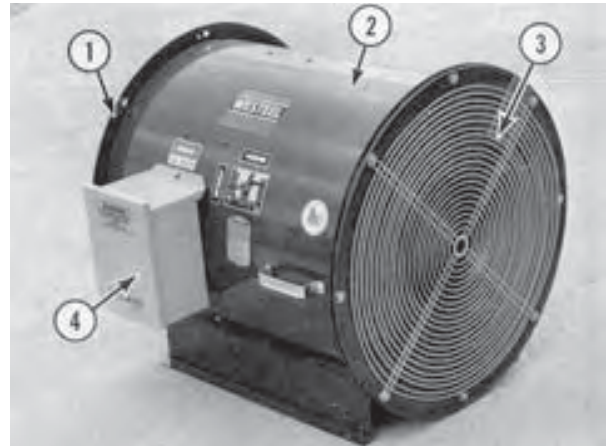


FIGURE 1. Westeel Model WVA-24-5-1 Fan: (1) Mounting Flange, (2) Fan Housing, (3) Guard Grill and Inlet Bell, (4) Motor Control.

SCOPE OF TEST

The Westeel Model WVA-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.

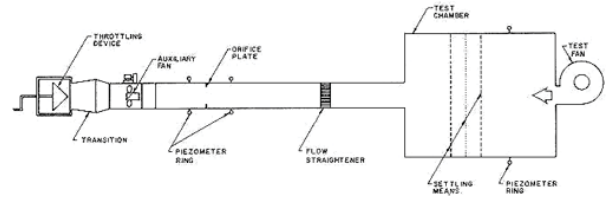


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard 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 typical levels of operation (i.e. static pressure²) are given in TABLE 1. The air flow rate ranged from 220 cfm (104 L/s) at 9.2 in wg (2290 Pa) to 5430 cfm (2560 L/s) at 0.8 in wg (206 Pa). FIGURE 3 illustrates the fan performance curves for the Westeel Model WVA-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 2.28 kW at maximum static pressure and minimum air flow rate to 6.54 kW at 6.0 in wg (1490 Pa) static pressure and an air flowrate of 4160 cfm (1960 L/s). The maximum amperage drawn by the motor was 28.4 amps, which was less than the rated motor amperage of 32 amps.

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).

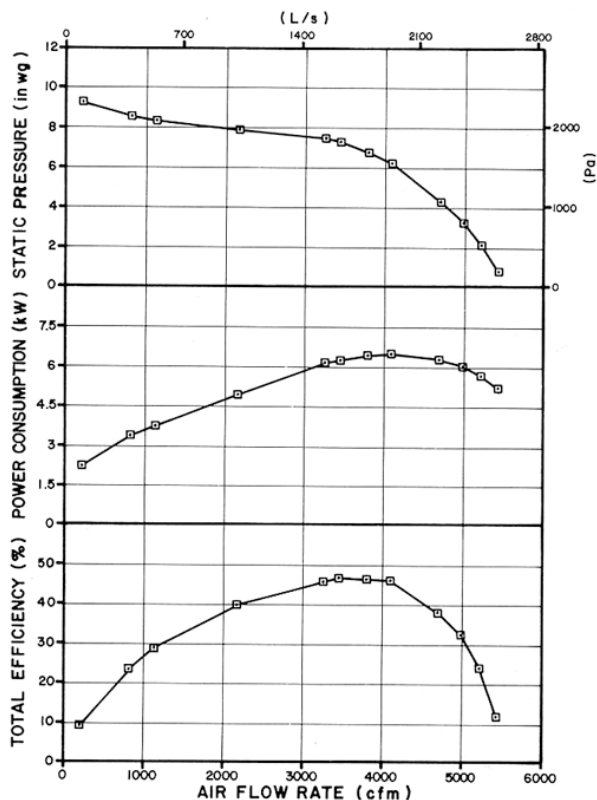


FIGURE 3. Westeel Model WVA-24-5-1 Fan Performance Curves.

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 10 to 47%. The maximum total efficiency of 47% occurred at 3940 cfm (1860 L/s) at a static pressure of 6.5 in wg (1620 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-lubricated and sealed bearings.

OPERATOR SAFETY

The guard grill provided adequate protection from the fan blades. The motor was a drip proof unit and presented no safety hazards. The Westeel Model WVA-24-5-1 was CSA approved. The noise level of the Westeel Model WVA-24-5-1 fan, 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 92 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Westeel Model WVA-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:	Westeel
MODEL:	WVA-24-5-1
SERIAL NUMBER:	V 75054
MANUFACTURER:	Emerson South Agronomics Inc. 63 Beghin Avenue St. Boniface Industrial Park Winnipeg, Manitoba R2J 3S8
OVERALL DIMENSIONS:	
-- housing width	31.0 in (787 mm)
-- housing depth	27.5 in (699 mm)
-- housing height 27.6 in (702 mm)	
-- inlet bell diameter	9.0 in (229 mm)
-- guard grill diameter	24.25 in (616 mm)
-- grill opening	0.125 in (3 mm) diameter wire spaced at 0.5 in (13 mm) discharge opening 24.25 in (616 mm) diameter
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		
SOUND LEVEL		
Range	(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 WESTEEL CROP DRYER IN-LINE CENTRIFUGAL FAN MODEL WVA-24-5-1

RETAIL PRICE:	\$1400.00 (May, 1989, f.o.b. Lethbridge)
FAN DESCRIPTION:	15 in (381 mm) single speed, direct drive, 5.0 hp (3.73 W) 230 V electric motor
FAN PERFORMANCE:	
Air Flow Rate:	
-- range	220 to 5430 cfm (104 to 2560 L/s)
-- at maximum efficiency	3940 cfm (1860 L/s) at a 6.5 in wg (1620 Pa) static pressure
Power Consumption:	2.28 to 6.54 kW
Total Efficiency:	maximum 47%
OPERATOR SAFETY:	guard grill provided, CSA approved noise level = 92 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	adequate



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