

Evaluation Report

546



Westeel Crop Dryer In-Line Centrifugal Fan Model WVA-24-7-1

A Co-operative Program Between



WESTEEL CROP DRYER IN.LINE CENTRIFUGAL FAN MODEL WVA-24-7-1

MANUFACTURER:

Emerson South Agronomics Inc.
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Winnipeg, Manitoba
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DISTRIBUTOR:

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RETAIL PRICE:

\$1,689.00 (May, 1989 f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Westeel Model WVA-24-7-1 Aeration Fan 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
1.3	(324)	6810	(3210)	7.27	17	3506
1.5	(374)	6750	(3190)	7.32	19	3505
2.0	(498)	6510	(3070)	7.55	27	3499
2.5	(623)	6450	(3040)	7.61	29	3497
3.0	(747)	6370	(3010)	7.68	30	3495
3.5	(872)	6250	(2950)	7.79	33	3492
4.0	(996)	6060	(2660)	7.95	37	3488
4.5	(1120)	5840	(2760)	8.12	40	3484
5.0	(1250)	6620	(2650)	8.26	42	3481
5.5	(1370)	5420	(2560)	8.36	44	3479
6.6	(1490)	5250	(2480)	8.42	45	3477
6.5	(1620)	6110	(2410)	8.46	46	3477
7.0	(1740)	4960	(2340)	8.47	47	3476
8.0	(1990)	4460	(2100)	8.40	49	3477
9.0	(2240)	3340	(1580)	7.57	49	3491
10.0	(2490)	1570	(741)	5.14	28	3534
11.3	(2820)	210	(99)	2.63	8	3572

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-24-7-1 is a 16.5 in (419 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-24-7-1 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 7.0 hp (5.2 kW) single phase, 230 V electric motor. The fan housing, motor mounts, straightening vanes, flanges and supports are of

steel construction with a painted finish for corrosion protection.

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

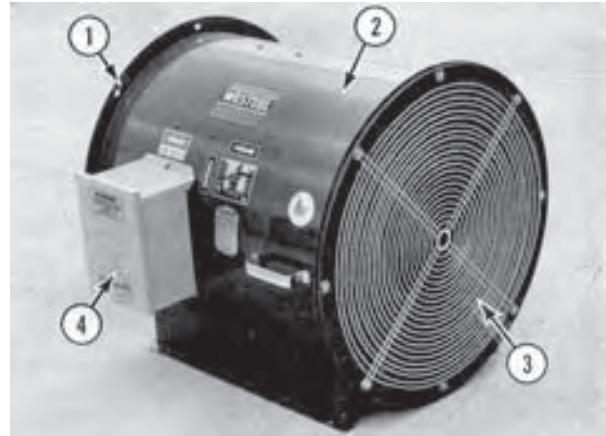


FIGURE 1. Westeel Model WVA-24-7-1 Fan: (1) Mounting Flange, (2) Fan Housing, (3) Guard Grill and Inlet Bell, (4) Motor Control.

SCOPE OF TEST

The Westeel Model WVA-24-7-1 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.

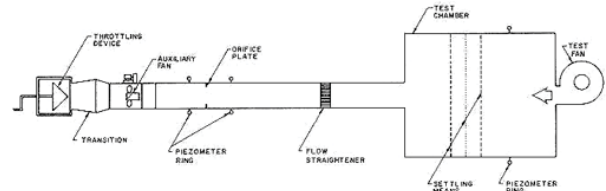


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

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 210 cfm (99 L/s) at 11.3 in wg (2820 Pa) to 6810 cfm (3210 L/s) at 1.3 in wg (324 Pa). FIGURE 3 illustrates the fan performance curves for the Westeel Model WVA-24-7-1.

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 2.63 kW at maximum static pressure and minimum air flow rate to 8.47 kW at 7.0 in wg (1740 Pa) static pressure and an air flowrate of 4960 cfm (2340 L/s). The maximum amperage drawn by the motor was 35.8 amps, which was greater than the rated motor amperage of 35 amps, but well within the 10% allowable actual amperage draw to rated nameplate amperage as established by CSA Standards.

Total Efficiency: Total efficiency is the ratio of air horsepower

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).

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 8 to 49%. The maximum total efficiency of 49% occurred at 4460 cfm (2100 L/s) at a static pressure of 8.0 in wg (1990 Pa).

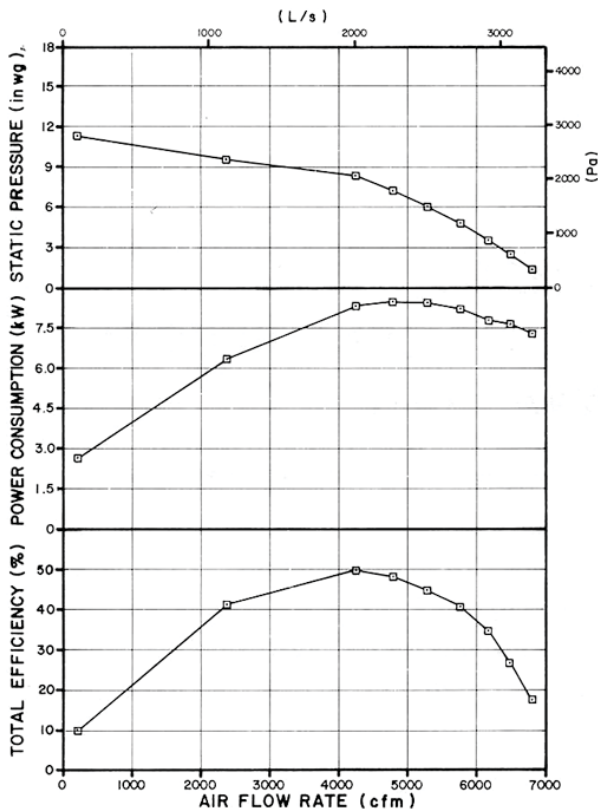


FIGURE 3. Westeel Model WVA-24-7-1 Fan Performance Curves.

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 totally enclosed unit and presented no safety hazards. The Westeel Model WVA-24-7-1 was CSA approved.

The noise level of the Westeel Model WVA-24-7-1 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 Westeel Model WVA-24-7-1 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-24-7-1
SERIAL NUMBER: V 77001
MANUFACTURER: Emerson South Agronomics Inc. 63 Beghin Avenue St. Boniface Industrial Park Winnipeg, Manitoba R2J 3S8

OVERALL DIMENSIONS:
 -- housing width: 31.5 in (826 mm)
 -- housing depth: 27.5 in (699 mm)
 -- housing height: 27.5 in (699 mm)
 -- inlet bell diameter: 11.31 in (287 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)

IMPELLER:
 -- diameter: 16.5 in (419 mm)
 -- inside flange diameter: 11.37 in (289 mm)
 -- number of blades: 9
 -- blade angle: 53 degrees

WEIGHT: 214 lb (97 kg)

MOTOR NAMEPLATE DATA:
 -- make: Baldor
 -- model: 36F532W41
 -- frame: 184Z
 -- class: B
 -- code: F
 -- design: L
 -- duty: Continuous
 -- rpm: 3450
 -- service factor: 1
 -- ambient temperature rise: 40°C
 -- volts: 230
 -- amps: 35
 -- phase: 1
 -- cycles: 60
 -- horsepower: 7 hp (5.2 kW)

APPENDIX II NOISE LEVEL RANGES

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

WEESTEEL CROP DRYER IN-LINE CENTRIFUGAL FAN MODEL WVA-24-7-1

RETAIL PRICE: \$1,689.00 (May, 1989, f.o.b. Lethbridge)

FAN DESCRIPTION: 16.5 in (419 mm) single speed, direct drive, 7.0 hp (5.2 kW), single phase, 230 V electric motor

FAN PERFORMANCE:
Air Flow Rate:
 -range: 210 to 6810 cfm (99 to 3210 L/s)
 -at maximum efficiency: 4460 cfm (2100 L/s) at 8.0 in wg (1990 Pa) static pressure

Power Consumption: 2.63 to 8.47 kW
Total Efficiency: maximum 49%

OPERATOR SAFETY: guard grill provided
 CSA approved noise level = 91 dB(A) at 4.9 ft (1.5 m) from fan inlet

OPERATOR'S MANUAL: adequate



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