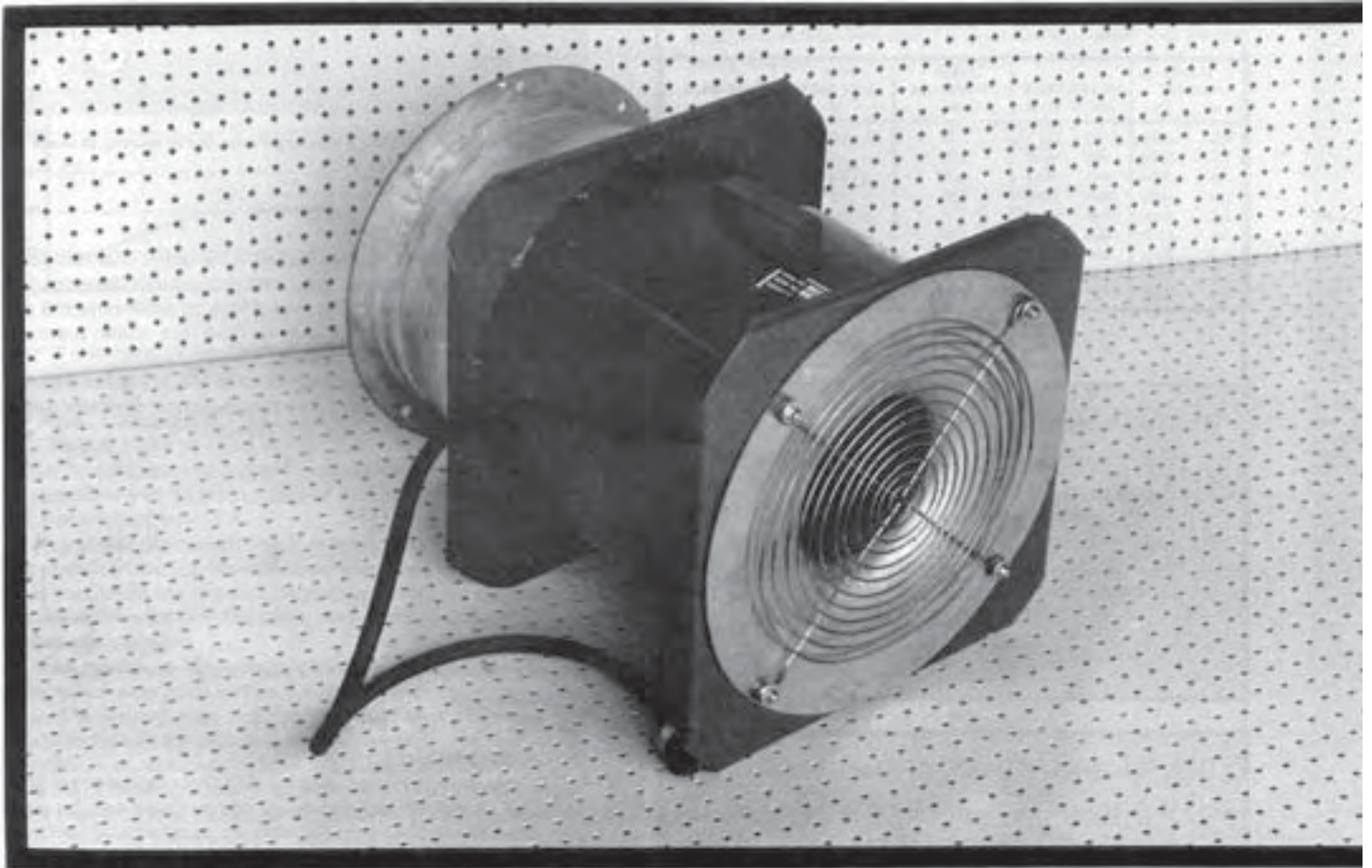


Evaluation Report

507



Zach Model 112 In-Line Centrifugal Fan

A Co-operative Program Between



ZACH MODEL 112 IN-LINE CENTRIFUGAL FAN

MANUFACTURER:

Zach Incorporated
 R. R. 2, Box 118
 Humphrey, NE
 U.S.A. 68642

DISTRIBUTOR:

Frank Flaman Sales Ltd.
 Box 1536
 5904 - 50 Street
 Leduc, Alberta
 T6E 3L2

RETAIL PRICE: \$695.00 (September, 1986, f.o.b. Leduc, Alberta.)

SUMMARY OF RESULTS

TABLE 1. Zach Model 112 Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Power Consumption	Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kWh	%	rpm
0.5	(124)	1040	(491)	1.36	5	3477
1.0	(249)	925	(437)	1.31	9	3480
1.5	(374)	911	(430)	1.25	14	3482
2.0	(498)	821	(388)	1.20	17	3488
2.5	(622)	749	(354)	1.13	20	3495
3.0	(747)	654	(309)	1.06	22	3504
3.5	(872)	494	(233)	0.91	20	3515
4.0	(996)	285	(135)	0.77	16	3537
4.4	(1096)	91	(43)	0.53	9	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.
2. Supplying a detailed manual containing information on installation, maintenance, rated performance, safety aspects and trouble shooting.

Project Manager: R. P. Atkins

Project Engineer: K. Shimek

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A performance curve or chart will be supplied with each blower.
2. An operator's manual will be included, containing information on installation, maintenance, rated performance, safety aspects and trouble shooting.

GENERAL DESCRIPTION

The Zach Model 112 fan is a 9.75 in (248 mm) diameter, single speed, direct drive, inline centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Zach Model 112 is equipped with a wire mesh guard grill, inlet bell and duct mounting flange. The impeller consists of 6 steel radial blades riveted to an aluminium hub backplate and flange. The impeller is directly mounted on the 1 hp (746 W), single phase, 115/230 V electric motor. The fan housing, motor mounts, straightening vanes, flanges and supports are of steel construction with an enamel finish for corrosion protection. The inlet bell and outlet flange are of galvanized steel construction.

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

SCOPE OF TEST

The Zach Model 112 was tested in the outlet 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.

Fan performance was determined at 115 V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

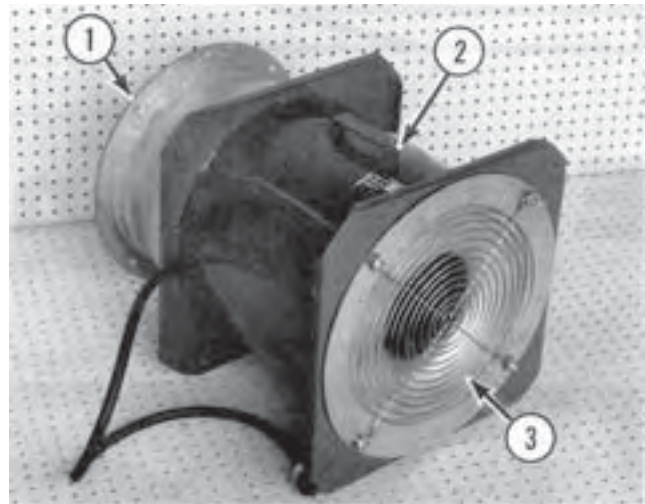


FIGURE 1. Zach Model 112 Fan: (1) Mounting Flange, (2) Fan Housing, (3) Guard Grill and Inlet Bell.

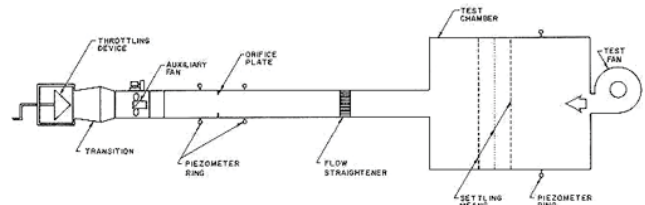


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

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 91 cfm (43 L/s) at 4.4 in wg (1096 Pa) to 1040 cfm (491 L/s) at 0.5 in wg (124 Pa). FIGURE 3 illustrates the fan performance curves for the Zach model 112 fan. The manufacturer did not provide any information on rated performance. It is recommended that for fan selection purposes, the manufacturer include a table or curve of air flow rates over a complete range of static pressures.

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 operating hours 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 0.53 kW at maximum static pressure and minimum air flow rate to 1.36 kW at 0.5 in wg (124 Pa) static pressure and an air flow rate of 1040 cfm (491 L/s).

The maximum amperage drawn by the motor was 13.2 amps, which was greater than the rated motor amperage of 12 amps. The shaded zone in FIGURE 3 illustrates operation levels where the rated motor amperage was exceeded. Prolonged operation in excess of 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 5 to 22%. The maximum total efficiency of 22% occurred at 654 cfm (309 L/s) at a static pressure of 3.0 in wg (447 Pa).

¹Standard air is air with a density of 0.075 lb/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).

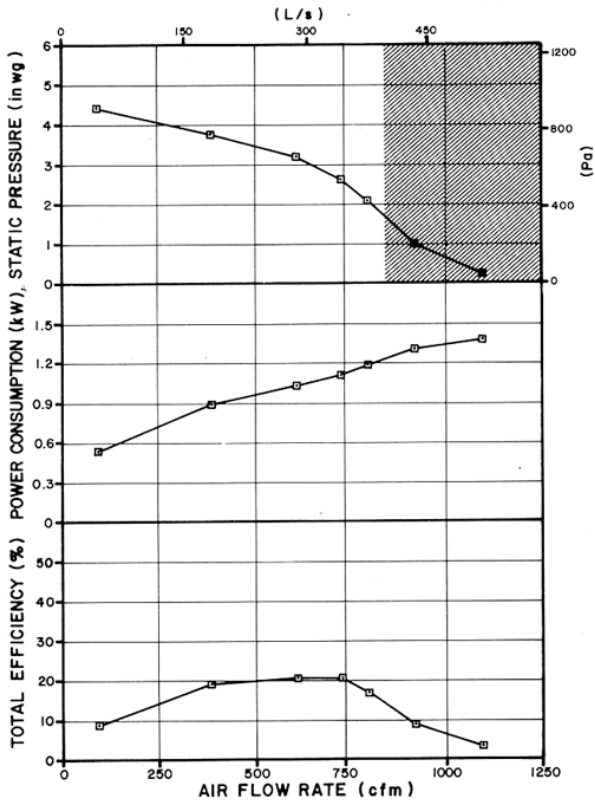


FIGURE 3. Zach Model 112 Fan Performance Curves.

EASE OF OPERATION

Maintenance: No maintenance instructions were supplied.

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 noise level of the Zach model 112, 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 76 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Zach model 112 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

No operator's manual was supplied. It is recommended that the manufacturer consider supplying a detailed manual containing information on maintenance, installation, rated performance, safety aspects and trouble shooting.

APPENDIX I SPECIFICATIONS	
MAKE:	Zach
MODEL:	112
SERIAL NUMBER:	486 203
MANUFACTURER:	Zach Incorporated R. R. 2, Box 118 Humphrey, NE U.S.A. 68642
OVERALL DIMENSIONS:	<ul style="list-style-type: none"> - housing width 16.75 in (425 mm) - housing depth 20.75 in (527 mm) - housing height 16.75 in (425 mm) - inlet bell diameter 5.8 in (148 mm) - guard grill diameter 12 in (305 mm) - grill opening 0.09 in (2 mm) diameter wire, spaced at 0.5 in (13 mm) in a circular pattern discharge opening 12 in (305 mm)
MPPELLER:	<ul style="list-style-type: none"> - diameter 9.75 in (248 mm) - inside flange diameter 6.125 in (156 mm) - number of blades 6 - blade angle 55 degrees
WEIGHT:	63 lb (29 kg)
MOTOR NAMEPLATE DATA:	<ul style="list-style-type: none"> - make Leeson - model C6C34NB1613 - frame E56 - class B* - type CN - code J - design N - duty air over - rpm 3450 rpm - service factor 1.0 - ambient temperature rise 40°C - volts 115/230 V - amps 12/6 A - phase 1 - cycles 60 Hz - horsepower 1 hp (746 W)

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.

APPENDIX III CONVERSION TABLE	
cubic feet/minute (cfm) x 0.472	= litres/second (L/s)
horsepower (hp) x 745.7	= watts (W)
inches (in) x 25.4	= millimetres (mm)
inches water gauge (in wg) x 249.1	= pascals (Pa)
pounds (lb) x 0.45	= kilograms (kg)

SUMMARY CHART ZACH MODEL 112 IN-LINE CENTRIFUGAL FAN	
RETAIL PRICE:	\$695.00 (July, 1986, f.o.b. Lethbridge)
FAN DESCRIPTION:	9.75 in (248 mm) single speed, direct drive, 1 hp (746 W) electric motor.
FAN SPEED:	3477 to 3564 rpm
MAXIMUM EFFICIENCY:	22%
AIR FLOW RATE:	<ul style="list-style-type: none"> -range 91 to 1040 cfm (43 to 491 L/s) -at maximum efficiency 654 cfm (309 L/s) at a 3.0 in wg (747 Pa) static pressure
POWER CONSUMPTION:	0.53 to 1.36 kW
OPERATOR SAFETY:	guard grill provided, noise level = 76 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	none provided

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