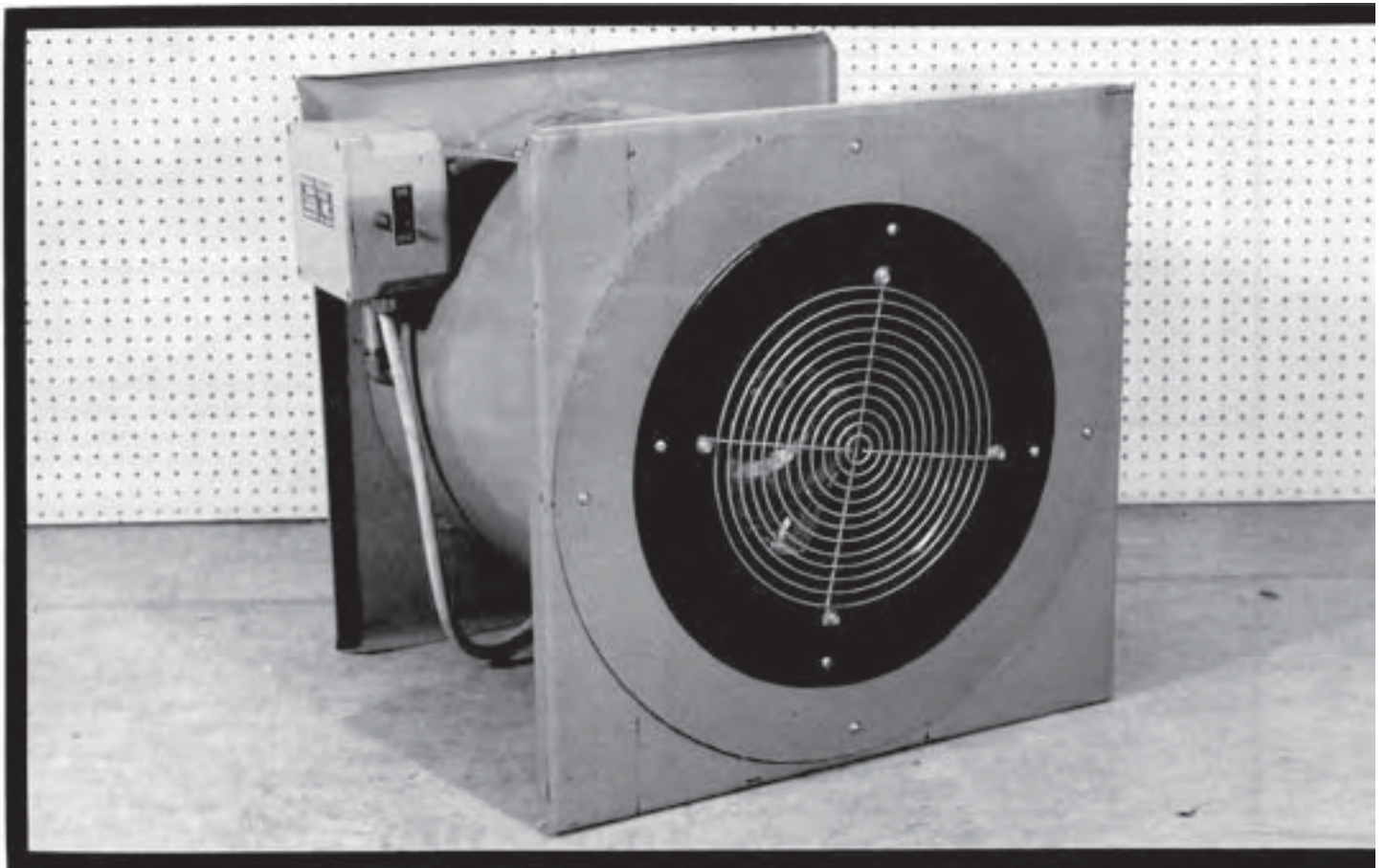


# Evaluation Report

# 478



## Zach Model 118 In-Line Centrifugal Fan

A Co-operative Program Between



# ZACH MODEL 118 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:

\$1095.00 (May, 1986, f.o.b. Lethbridge, Alberta.)

## SUMMARY OF RESULTS

TABLE 1. Zach Model 118 Performance at Typical Levels of Operations

Static Pressure		Air Flow Rate		Power Consumption	Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kWh	%	rpm
0.5	(125)	3460	(1630)	2.76	11	3515
1.0	(249)	3340	(1580)	2.85	17	3512
1.5	(374)	3220	(1520)	2.93	22	3509
2.0	(497)	3090	(1460)	3.01	26	3505
2.5	(623)	2950	(1390)	3.07	30	3502
3.0	(747)	2800	(1320)	3.13	33	3499
3.5	(872)	2650	(1250)	3.18	36	3497
4.0	(996)	2500	(1180)	3.21	37	3495
4.5	(1120)	2340	(1110)	3.23	38	3494
5.0	(1240)	2170	(1020)	3.23	39	3494
5.5	(1370)	1960	(925)	3.20	40	3495
6.0	(1490)	1690	(798)	3.12	39	3499
6.5	(1620)	1310	(618)	2.94	36	3510
7.0	(1740)	753	(355)	2.49	28	3530

## 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.

Manager/Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

## 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 118 fan is a 14.9 in (378 mm) diameter, single speed, direct drive, in-line centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Zach Model 118 is equipped with a wire mesh guard grill, inlet bell, duct mounting flange and motor control. The aluminium impeller consists of a hub back plate, 8 backward curved blades and a flange. The impeller is directly mounted on the 3 hp (2240 W), 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. The inlet bell is formed from PVC plastic.

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

## SCOPE OF TEST

The Zach Model 118 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 230 V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

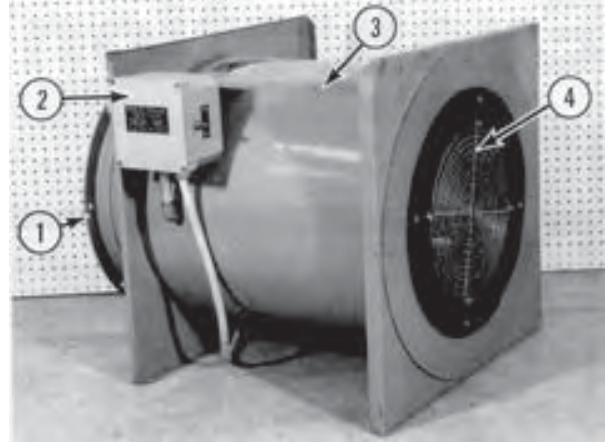


FIGURE 1. Zach Model 118 Fan: (1) Mounting Flange, (2) Motor Control, (3) Fan Housing, (4) Guard Grill and Inlet Bell.

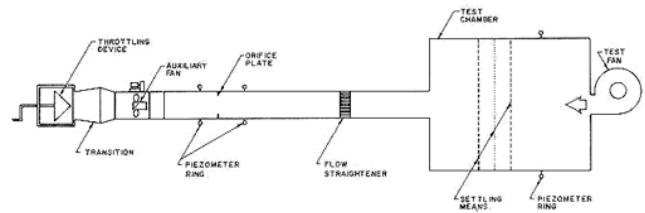


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

## RESULTS AND DISCUSSION

### FAN PERFORMANCE

All fan performance results in this report are given at standard air<sup>1</sup> 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<sup>2</sup>) are given in TABLE 1. The air flow rate ranged from 753 cfm (355 L/s) at 7.0 in wg (1740 Pa) to 3460 cfm (1630 L/s) at 0.5 in wg (125 Pa). FIGURE 3 illustrates the fan performance curves for the Zach model 118 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 I 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 2.49 kW at maximum static pressure and minimum air flow rate to 3.23 kW at 5.0 in wg (1240 Pa) static pressure and an air flowrate of 2170 cfm (1020 L/s).

The maximum amperage drawn by the motor was 14.3 amps, which was slightly greater than the rated motor amperage of 14.0 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 11 to 40%. The maximum total efficiency of 40% occurred at 1960 cfm (930 L/s) at a static pressure of 5.5 in wg (1370 Pa).

<sup>1</sup>Standard air is air with a density of 0.075 lb/ft<sup>3</sup> (1.2 kg/m<sup>3</sup>), which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

<sup>2</sup>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).

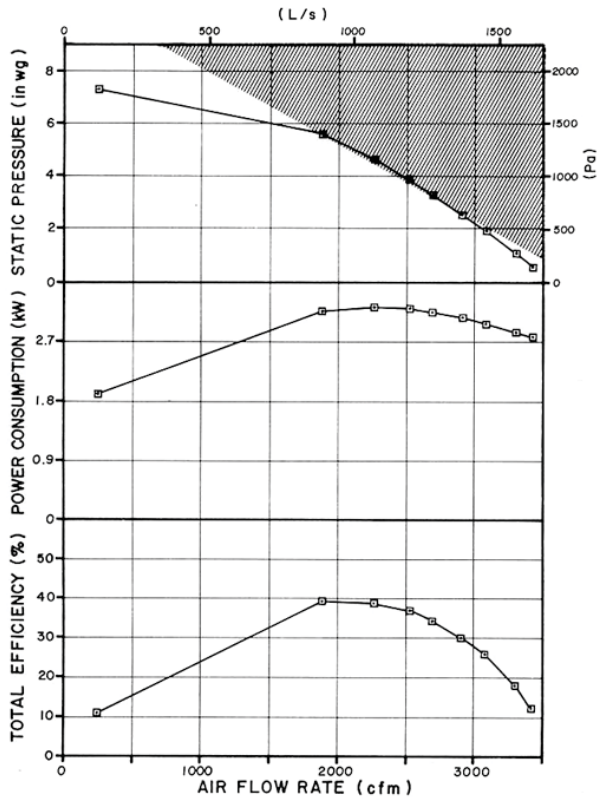


FIGURE 3. Zach Model 118 Fan Performance Curves.

### 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 118, at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 1.0 in wg (249 Pa) static pressure, was 77 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Zach model 118 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:** 118  
**SERIAL NUMBER:** 186 101  
**MANUFACTURER:** Zach Incorporated  
 R. R. 2, Box 118  
 Humphrey, NE  
 U.S.A. 68642

**OVERALL DIMENSIONS:**  
 -- housing width: 28 in (711 mm)  
 -- housing depth: 26.75 in (679 mm)  
 -- housing height: 25.25 in (641 mm)  
 -- inlet bell diameter: 9.75 in (248 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 18 in (457 mm)

**IMPELLER:**  
 -- diameter: 14.9 in (378 mm)  
 -- inside flange diameter: 10.6 in (268 mm)  
 -- number of blades: 8  
 -- blade angle: 60.5 degrees

**WEIGHT:** 329 lb (149 kg)

**MOTOR NAMEPLATE DATA:**  
 -- make: Baldor  
 -- frame: 562  
 -- code: H  
 -- rpm: 3460 rpm  
 -- service factor: 1.0  
 -- ambient temperature rise: 40°C  
 -- volts: 230 V  
 -- amps: 14.0 A  
 -- phase: 1  
 -- cycles: 60 Hz  
 -- horsepower: 3 hp (2240 W)

### 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.

### 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 118 IN-LINE CENTRIFUGAL FAN

<b>RETAIL PRICE:</b>	\$1095.00 (March, 1986, f.o.b. Lethbridge)
<b>FAN DESCRIPTION:</b>	14.9 in (378 mm) single speed, direct drive, 3 hp (2240 W) electric motor.
<b>FAN SPEED:</b>	3494 to 3530 rpm
<b>MAXIMUM EFFICIENCY:</b>	40%
<b>AIR FLOW RATE:</b>	
-range	753 to 3460 cfm (355 to 1630 L/s)
-at maximum efficiency	1960 cfm (925 L/s) at a 5.5 in wg (1370 Pa) static pressure
<b>POWER CONSUMPTION:</b>	2.49 to 3.23 kW
<b>OPERATOR SAFETY:</b>	guard grill provided CSA approved noise level = 77 dB(A) at 4.9 ft (1.5 m) from fan inlet
<b>OPERATOR'S MANUAL:</b>	none provided



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