

# Evaluation Report

# 336



## Farm Fan Model 318AFG Tube Axial Aeration Fan

A Co-operative Program Between



# FARM FAN MODEL 318AFG TUBE AXIAL AERATION FAN

## MANUFACTURER:

Farm Fans, Inc.  
5900 Elmwood Ave.  
Indianapolis, Indiana 46203

## DISTRIBUTOR:

Westeel-Rosco Limited  
Box 792  
Winnipeg, Manitoba  
R3C 2N5

## RETAIL PRICE:

\$695.00 (February 1984, f.o.b. Lethbridge, Alberta, complete with optional motor control assembly).

## SUMMARY OF RESULTS

TABLE 1. Farm Fan Model 318AFG Performance at Typical Levels of Operation

Static Pressure		Airflow Rate		Input Power		Total Efficiency	Fan Speed
in wg	Pa	cfm	L/s	hp	W	%	rpm
0	0	6070	2870	3.21	2390	20	3537
0.5	124	5570	2630	3.51	2610	26	3531
1.0	249	5130	2420	3.69	2750	29	3525
1.5	374	4500	2120	3.83	2860	32	3520
2.0	495	3810	1800	3.86	2880	32	3518
2.5	623	3110	1470	3.80	2840	31	3519
3.0	747	2410	1140	3.75	2800	28	3520
3.5	872	1780	839	3.77	2810	24	3521
4.0	996	1230	581	3.91	2920	18	3523

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

## GENERAL DESCRIPTION

The Farm Fan model 318AFG aeration fan is a 18 in. (457 mm) diameter single speed, direct drive, tube axial flow fan. It is primarily used for grain aeration or grain drying systems.

The Farm Fan 318AFG is equipped with a chromed guard grill, a duct mounting flange and an optional weather resistant control assembly. The control assembly consists of a magnetic motor starter, motor overload protection and a start-stop switch. The eight airfoil blades and hub are a single aluminium casting which is directly mounted on the 3 hp (2240 W), single phase, 230 V electric motor. The propeller is designed to push air up through the grain. By reversing the fan housing and the guard grill the fan is capable of drawing air down through the grain. The fan housing, motor mounts, flanges and mounting legs are of steel construction with an enamel coating for corrosion protection.

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

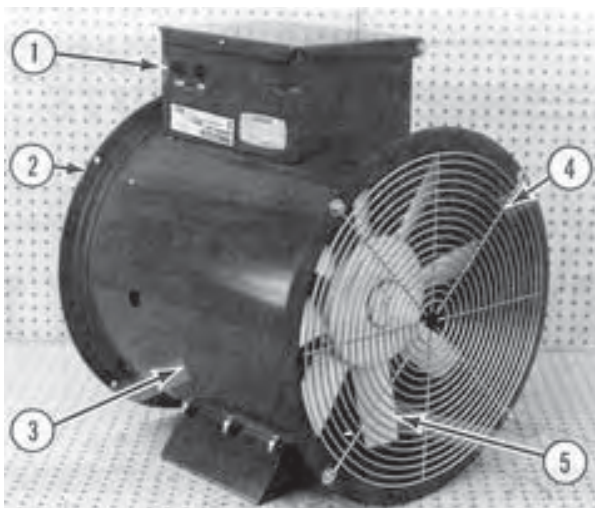


FIGURE 1. Farm Fan Model 318AFG Fan: (1) Control Assembly, (2) Mounting Flange, (3) Fan Housing, (4) Guard Grill, (5) Propeller Blades.  
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## SCOPE OF TEST

The Farm Fan model 318AFG fan 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.

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

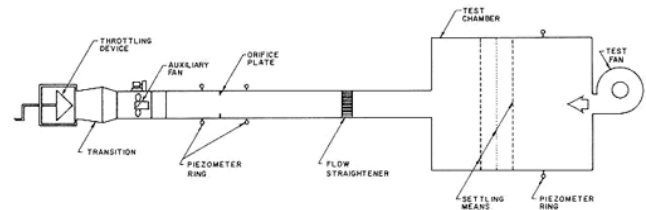


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

## RESULTS AND DISCUSSION

### FAN PERFORMANCE

All fan performance results in this report are given at standard 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 level of operation (i.e. static pressure<sup>2</sup>) are given in TABLE 1. The air flow rate ranged from 1230 cfm (581 L/s) at 4 in wg (996 Pa) to 6070 cfm (2870 L/s) at 0 in wg (0 Pa). FIGURE 3 illustrates the fan performance curves for the Farm Fan 318AFG aeration fan and a comparison to the manufacturer's rated performance. The manufacturer's literature provided fan performance information over a range of static pressures from 1 to 4 in wg (249 to 996 Pa) in increments of 0.5 in wg (124 Pa). There was no difference in output between the manufacturer's and PAMI's results. The air flow rate, at the peak efficiency of 32%, was 3980 cfm (1880 L/s) at a static pressure of 1.9 in wg (473 Pa).

**Power Requirements:** The power required to run the fan depended upon the point of operation of the fan. The input power required varied from 3.91 hp (2920 W) at maximum static pressure and minimum air flow rate to 3.21 hp (2390 W) at zero static pressure and maximum air flow rate (free air flow). The maximum amperage drawn by the motor was 14 amps, which was well below the rated motor amperage of 15 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 18 to 32%. The maximum total efficiency of 32% occurred at 3980 cfm (1880 L/s) at a static pressure of 1.9 in wg (473 Pa).

### EASE OF OPERATION

**Maintenance:** Seasonal inspection of the switch control box, motor mounts, propeller mounts, condition of the propeller, propeller clearance and motor bearings was required. Motor bearings required lubrication every 2 to 3 seasons or annually under continuous use. The removable guard grill allowed easy access for maintenance.

### 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 Farm Fan 318AFG was CSA approved.

The noise level<sup>3</sup> of the Farm Fan 318AFG, while operating at a 1 in wg (249 Pa) static pressure, was 96 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Farm Fan 318AFG falls within range 4 of the PAMI noise level range classification (APPENDIX II). The noise level produced could damage hearing depending on exposure time. Ear protection is definitely recommended.

<sup>1</sup>Standard air is air with a density of 0.075 lbm/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).

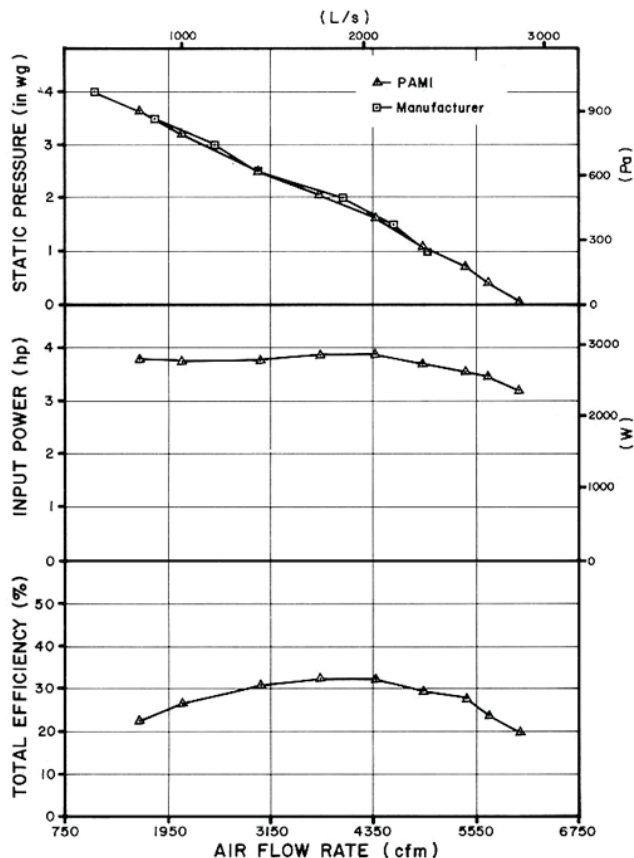


FIGURE 3. Farm Fan Model 318AFG Fan Performance Curves.

### OPERATOR'S MANUAL

The operator's manual was very informative and contained detailed information on operation, specifications, installation, maintenance, rated performance, safety and trouble shooting. A detailed, well illustrated parts list was included. Also included with the fan was a general bulletin on grain bin drying and aeration systems which contained useful application and design information.

<sup>3</sup>PAMI Test Procedure for Determining Fan Noise Level.

#### APPENDIX I SPECIFICATIONS

**MAKE:** Farm Fan  
**MODEL:** 318AFG-1 W/C  
**SERIAL NUMBER:** 1529G  
**MANUFACTURER:** Farm Fans, Inc.  
 5900 Elmwood Ave.  
 Indianapolis, Indiana 46203

**OVERALL DIMENSIONS:**  
 -- housing width 21 in (533 mm)  
 -- housing height 26 in (660 mm)  
 -- housing length 20 in (508 mm)  
 -- inside tube diameter 18.4 in (467 mm)  
 -- guard grill diameter 18 in (457 mm)  
 -- grill opening 0.125 in (3 mm) diameter, spaced at 0.5 in (13 mm) in a circular pattern.

**PROPELLER:**  
 -- diameter 18 in (457 mm)  
 -- hub diameter 7.75 in (197 mm)  
 -- number of blades 8  
 -- blade angle 24 degrees

**WEIGHT:** 108 lb (49 kg)

**MOTOR NAMEPLATE DATA:**  
 -- make Leeson  
 -- model C6C34NB78  
 -- frame J56 Hz  
 -- class F  
 -- type CN  
 -- duty air over  
 -- rpm 3450  
 -- service factor 1  
 -- ambient temperature rise 40°C  
 -- volts 230 V  
 -- amps 15 amps  
 -- 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	= millimeters (mm)
inches water gauge (in wg) x 249.1	= pascals (Pa)
pounds (lb) x 0.45	= kilograms (kg)

#### SUMMARY CHART FARM FAN 318AFG TUBE AXIAL AERATION FAN

<b>RETAIL PRICE:</b>	\$695.00 (February, 1984, f.o.b. Lethbridge)
<b>FAN DESCRIPTION:</b>	18 in (457 mm) single speed, direct drive, 3 hp (2240 W) electric motor
<b>FAN SPEED:</b>	3518 to 3537 rpm
<b>MAXIMUM EFFICIENCY:</b>	32%
<b>AIR FLOW RATE:</b>	- range 1230 to 6070 cfm (581 to 2870 L/s) - at maximum efficiency 3980 cfm (1880 L/s) at a 1.9 in wg (473 Pa) static pressure
<b>INPUT POWER:</b>	3.21 to 3.91 hp (2390 to 2920 W)
<b>OPERATOR SAFETY:</b>	guard grill provided CSA approved noise level = 96 dB(A)
<b>OPERATOR'S MANUAL:</b>	complete and very informative



3000 College Drive South  
 Lethbridge, Alberta, Canada T1K 1L6  
 Telephone: (403) 329-1212  
 FAX: (403) 329-5562  
<http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html>

### Prairie Agricultural Machinery Institute

Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0  
 Telephone: (306) 682-2555

Test Stations:  
 P.O. Box 1060  
 Portage la Prairie, Manitoba, Canada R1N 3C5  
 Telephone: (204) 239-5445  
 Fax: (204) 239-7124

P.O. Box 1150  
 Humboldt, Saskatchewan, Canada S0K 2A0  
 Telephone: (306) 682-5033  
 Fax: (306) 682-5080