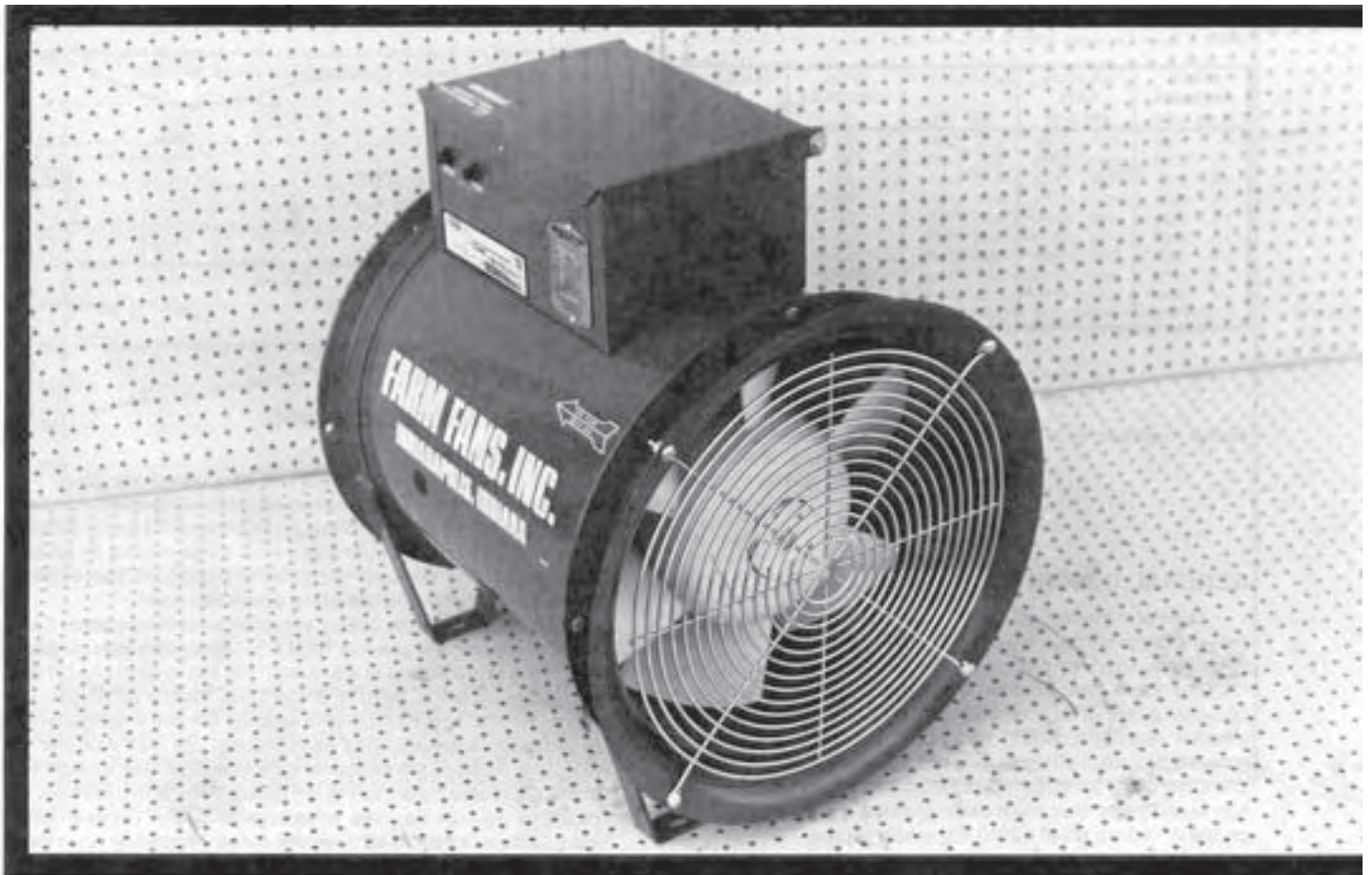


Evaluation Report

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Farm Fan Model 316SHG Vane Axial Aeration Fan

A Co-operative Program Between



FARM FAN MODEL 316SHG VANE 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:

\$928.00 (February 1984, f.o.b. Lethbridge, Alberta, complete with optional motor control assembly).

SUMMARY OF RESULTS

TABLE 1. Farm Fan Model 316SHG 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	5810	2740	3.59	2680	23	3518
0.5	124	5490	2590	3.95	2950	29	3508
1.0	249	5300	2500	4.20	3130	31	3503
1.5	374	5020	2370	4.51	3360	34	3493
2.0	495	4290	2020	4.73	3530	35	3487
2.5	623	3180	1500	4.05	3020	29	3503
3.0	747	2280	1080	4.27	3180	26	3497
3.5	872	2200	1040	4.34	3240	26	3494
4.0	996	1930	911	4.63	3450	25	3487
4.5	1120	1650	780	4.90	3650	22	3479

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Farm Fan model 316SHG aeration fan is a 16 in (406 mm) diameter single speed, direct drive, vane axial flow fan. It is primarily used for grain aeration or grain drying systems.

The Farm Fan 316SHG is equipped with a bell inlet, 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 six variable pitch airfoil blades and hub are a single aluminium casting which is directly mounted on the 3 - 4.5 hp (2240 - 3360 W), single phase, 230 V electric motor. The propeller is designed to push air up through the grain. By reversing the fan housing, the guard grill and bell inlet, the fan is capable of drawing air down through the grain. The fan housing, motor mounts, guide vanes, 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.

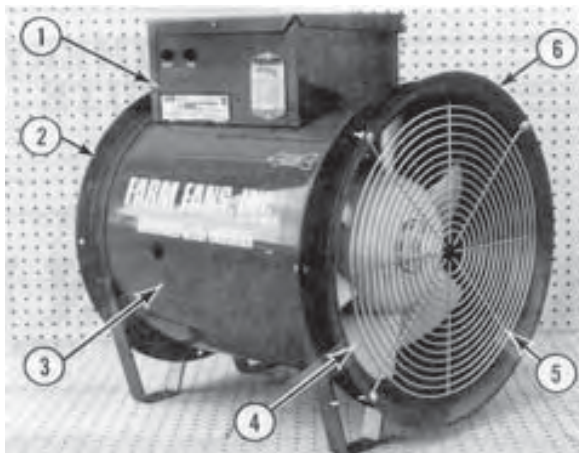


FIGURE 1. Farm Fan Model 316SHG Fan: (1) Control Assembly, (2) Mounting Flange, (3) Fan Housing, (4) Propeller Blades, (5) Guard Grill, (6) Bell inlet.

SCOPE OF TEST

The Farm Fan model 316SHG 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.

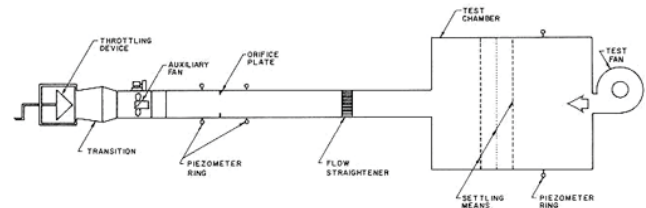


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard 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 level of operation (i.e. static pressure²) are given in TABLE 1. The air flow rate ranged from 1650 cfm (780 L/s) at 4.5 in wg (1120 Pa) to 5810 cfm (2740 L/s) at 0 in wg (0 Pa). FIGURE 3 illustrates the fan performance curves for the Farm Fan 316SHG 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). The difference in output between the manufacturer's and PAMI's results varied depending upon the level of operation. For example, PAMI's measured air flow rate, at the peak efficiency of 35%, was 4550 cfm (2150 L/s) at a static pressure of 1.8 in wg (450 Pa). This was 19% lower than the manufacturer's rated output of 5600 cfm (2640 L/s) at a static pressure of 1.8 in wg (450 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 4.90 hp (3650 W) at maximum static pressure and minimum air flow rate to 3.59 hp (2680 W) at zero static pressure and maximum air flow rate (free air flow). The maximum amperage drawn by the motor was 14.8 amps, which was well below the rated motor amperage of 18.4 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 22 to 35%. The maximum total efficiency of 35% occurred at 4550 cfm (2150 L/s) at a static pressure of 1.8 in wg (450 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 316SHG was CSA approved.

The noise level³ of the Farm Fan 316SHG, while operating at a 1 in wg (249 Pa) static pressure, was 83 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Farm Fan 316SHG falls within range 3 of the PAMI noise level range classification (APPENDIX II). The noise level produced by this

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).

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.

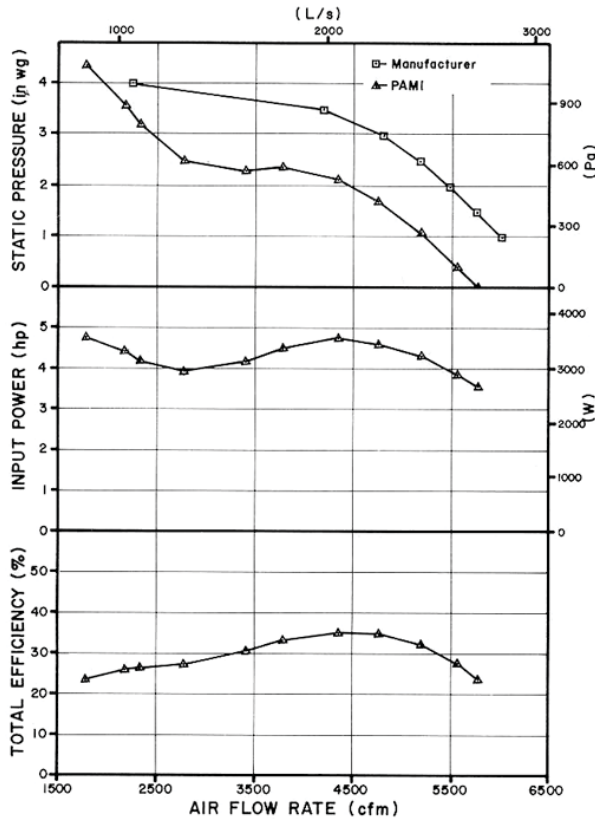


FIGURE 3. Farm Fan Model 316SHG Fan Performance Curves.

OPERATOR'S MANUAL

The operator's manual was very informative and contained detailed illustrations and 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.

³PAMI Test Procedure for Determining Fan Noise Level.

APPENDIX I SPECIFICATIONS	
MAKE:	Farm Fan
MODEL:	316SHG-1-W/C
SERIAL NUMBER:	1699G
MANUFACTURER:	Farm Fans, Inc. 5900 Elmwood Ave. Indianapolis, Indiana 46203
OVERALL DIMENSIONS:	
-- housing width	20.2 in (514 mm)
-- housing height	25.5 in (648 mm)
-- housing length	20.6 in (524 mm)
-- inside tube diameter	16.2 in (413 mm)
-- guard grill diameter	16.4 in (416 mm)
-- grill opening	0.125 in (3 mm) diameter, spaced at 0.5 in (13 mm) in a circular pattern.

PROPELLER:	
-- diameter	16 in (406 mm)
-- hub diameter	8.5 in (216 mm)
-- number of blades	6
-- blade angle	variable
WEIGHT:	143 lb (65 kg)
MOTOR NAMEPLATE DATA:	
-- make	Baldor
-- model	36 E698-969
-- frame	184Z
-- class	F
-- duty	continuous
-- rpm	3450
-- service factor	1
-- ambient temperature rise	95°C
-- volts	230 V
-- amps	18.4 amps
-- phase	1
-- cycles	60 Hz
-- horsepower	3 - 4.5 hp (2240 - 3360 W)

APPENDIX II NOISE LEVEL RANGES		
Range	SOUND LEVEL (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 316SHG VANE AXIAL AERATION FAN	
RETAIL PRICE:	\$928.00 (February, 1984, f.o.b. Lethbridge)
FAN DESCRIPTION:	16 in (406 mm) single speed, direct drive, 3 - 4.5 hp (2240 - 3360 W) electric motor
FAN SPEED:	3479 to 3518 rpm
MAXIMUM EFFICIENCY:	35%
AIR FLOW RATE:	- range: 1650 to 5810 cfm (780 to 2740 L/s) - at maximum efficiency: 4550 cfm (2150 L/s) at a 1.8 in wg (450 Pa) static pressure
INPUT POWER:	3.59 to 4.90 hp (2680 to 3650 W)
OPERATOR SAFETY:	guard grill provided CSA approved noise level = 83 dB(A)
OPERATOR'S MANUAL:	complete and very informative



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