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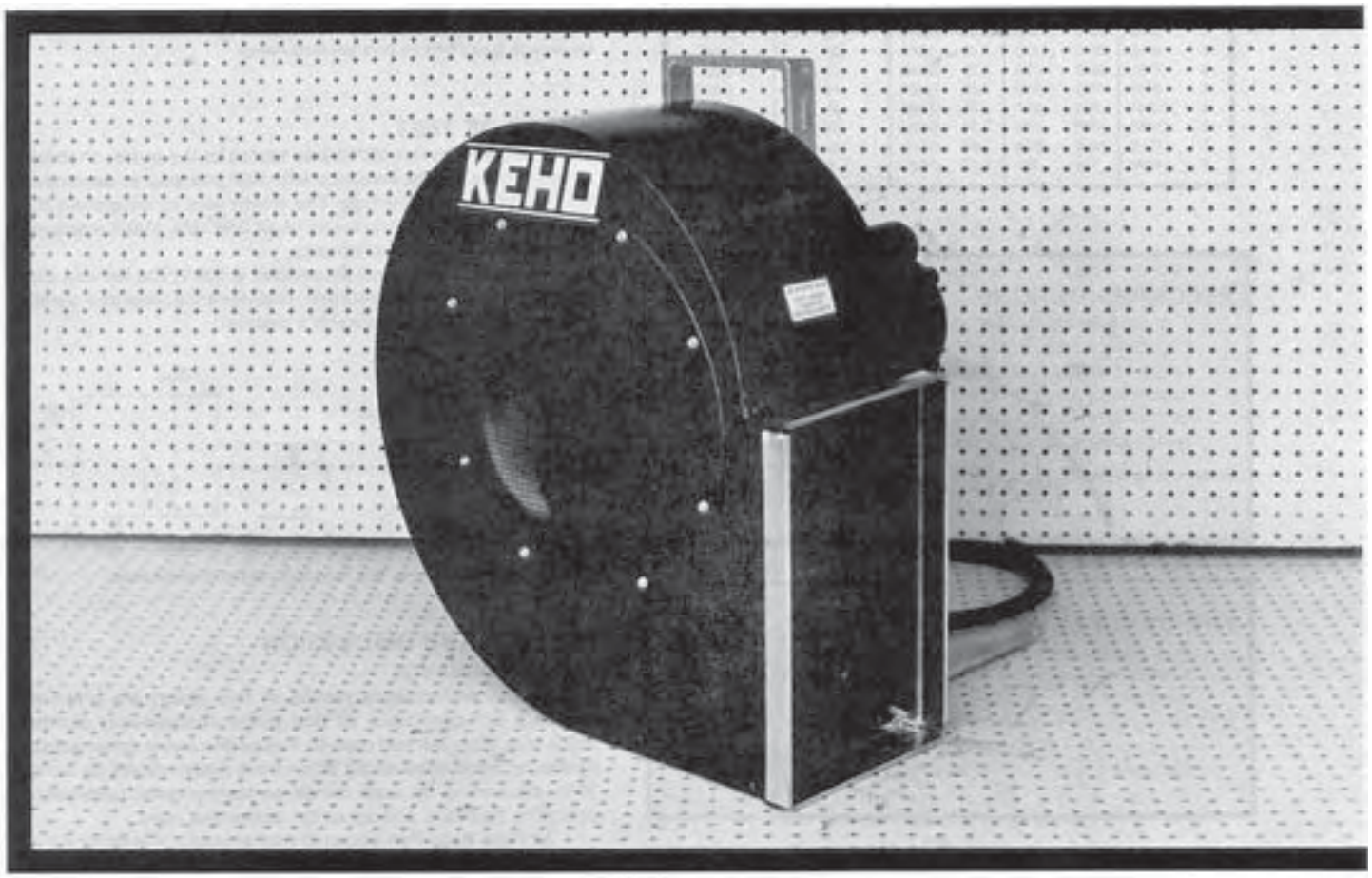

Keho Model 15000 2 hp Hi-Flow Centrifugal Fan

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

KEHO MODEL 15000 2 HP HI-FLOW CENTRIFUGAL FAN

MANUFACTURER & DISTRIBUTOR:

Keho Alta Products Ltd.
Box 70
Barons, Alberta
T0L 0G0

RETAIL PRICE:

$750.00 (September, 1984, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Keho Model 15000 2 hp Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Input Power		Total Efficiency	Fan Speed
in wg	Pa	cfm	L/s	hp	W	%	rpm
0.00	(0)	3500	(1650)	3.35	2500	17	3415
1.00	(249)	3270	(1540)	3.35	2500	26	3410
2.00	(497)	2970	(1400)	3.45	2570	35	3405
3.00	(747)	2640	(1250)	3.39	2530	41	3408
4.00	(996)	2320	(1090)	3.35	2500	44	3408
5.00	(1240)	1960	(927)	3.34	2480	44	3399
6.00	(1490)	1560	(735)	3.21	2400	43	3412
7.00	(1740)	1070	(504)	2.83	2110	38	3435
8.00	(1990)	170	(80)	2.17	1620	9	3501

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 operator's manual containing information on installation, maintenance, rated performance, safety aspects and trouble shooting.

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 Keho Model 15000 2 hp Hi-Flow Fan is a 13.5 in (343 mm) diameter, single speed, direct drive, centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Keho Model 15000 is equipped with a wire mesh guard grill, an inlet bell, duct mounting flange and weatherproof switch. The copolymer impeller consists of a hub-backplate, 8 backward curved airfoil blades and a flange. The impeller is directly mounted on the 2 hp (1490 W) single phase, 115/230 V electric motor. The fan housing is of steel construction with a painted finish for corrosion protection. The support frame and motor mount are of cast aluminium.

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

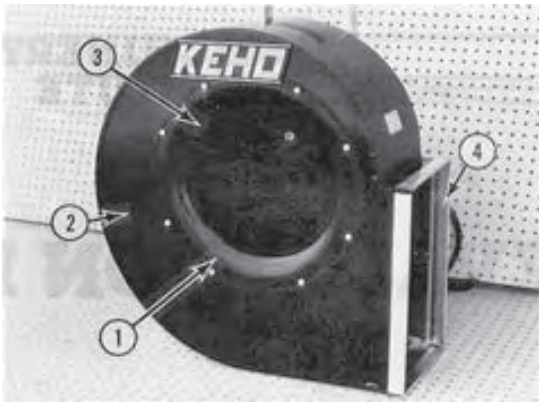

FIGURE 1. Keho Model 15000 2 hp Hi-Flow Centrifugal Fan: (1) Inlet Bell, (2) Fan Housing, (3) Guard Grill, (4) Duct Mounting Flange.

SCOPE OF TEST

The Keho Model 15000 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.

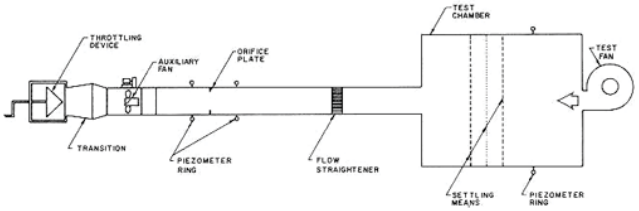

FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air[1] 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[2]) are given in TABLE 1. The air flow rate ranged from 170 cfm (80 L/s) at 8 in wg (1990 Pa) to 3500 cfm (1650 L/s) at 0 in wg (0 Pa). FIGURE 3 illustrates the fan performance curves for the Keho Model 15000 2 hp Hi-Flow fan. There was no manufacturer's performance information provided. It is recommended that for fan selection purposes, the manufacturer provide a table or curve of air flow rates over a complete range of static pressures.

Power Requirements: The power required to run the fan depended upon the point of operation of the fan. The input power required varied from 2.17 hp (1620 W) at maximum static pressure and minimum air flow rate to 3.45 hp (2570 W) at 2 in wg (497 Pa) static pressure and an air flow rate of 2970 cfm (1400 L/s). The maximum amperage drawn by the motor was 11.4 amps, which was just within the rated motor amperage of 9.5 amps with a service factor of 1.2. 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 9 to 44%. The maximum total efficiency of 44% occurred at 2020 cfm (951 L/s) at a static pressure of 4.8 in wg (1200 Pa).

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 Keho Model 15000 was CSA approved.

The noise level[3] of the Keho Model 15000, 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 82 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Keho Model 15000 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 blower for prolonged periods.

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[1]Standard 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).

[2]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).

[3]PAMI Test Procedure for Determining Fan Noise Level.

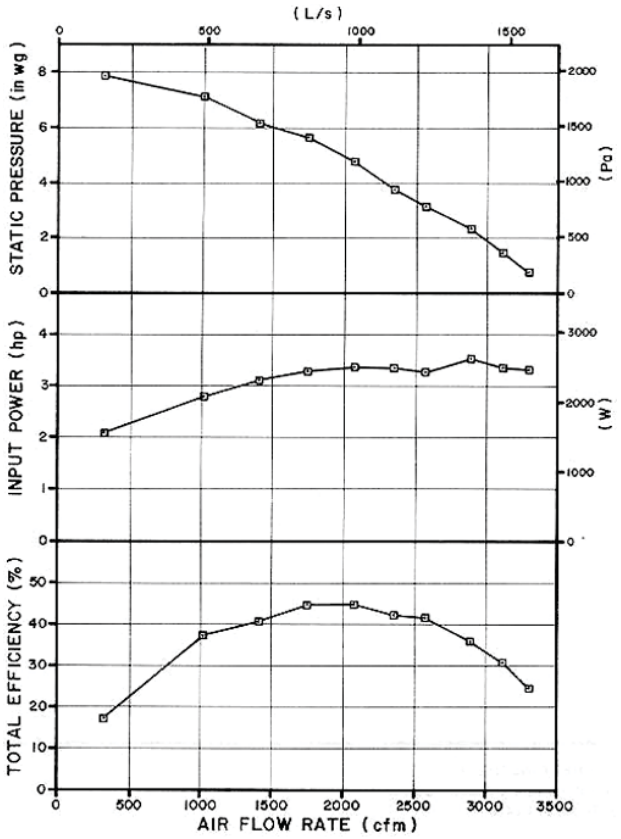

FIGURE 3. Keho Model 15000 Fan Performance Curves.

OPERATOR'S MANUAL

The operator's manual contained very useful information on aeration and natural air drying, but had very little information on the fan itself. It is recommended that the manufacturer supply a detailed manual containing information on installation, maintenance, rated performance, safety aspects and trouble shooting.

APPENDIX I
SPECIFICATIONS

MAKE:	Keho
MODEL:	15000 2 hp Hi-Flow Fan
MANUFACTURER:	Keho Alta Products Ltd. Box 70 Barons, Alberta T0L 0G0
OVERALL DIMENSIONS:	
-- housing width	20.5 in (521 mm)
-- housing depth	23 in (584 mm)
-- housing height	25.5 in (648 mm)
-- inlet bell diameter	8.4 in (213 mm)
-- guard grill diameter	15.1 in (384 mm)
-- grill opening	28 gauge (0.4 mm) wire on 0.25 in (6 mm) grid-discharge opening 9 x 14 in (229 x 356 mm)
IMPELLERS:	
-- diameter	13.5 in (343 mm)
-- inside flange diameter	9.1 in (232 mm)
-- number of blades	8
-- blade angle	48 degrees
WEIGHT:	72.5 lb (32.9 kg)
MOTOR NAMEPLATE DATA:	
-- make	Doerr
-- model	LR12132
-- frame	K56H
-- class	BR
-- type	T
-- code	H
-- duty	continuous
-- rpm	3450
-- service factor	1.2
-- ambient temperature rise	40°C
-- volts	115/230 V
-- amps	19/9.5 A
-- phase	1
-- cycles	60 Hz
-- horsepower	2 hp (1490 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
KEHO MODEL 15000 2 HP HI-FLOW CENTRIFUGAL FAN

RETAIL PRICE:	$750.00 (September, 1984, f.o.b. Lethbridge)
FAN DESCRIPTION:	13.5 in (343 mm) single speed, direct drive, 2 hp (1480 W) electric motor.
FAN SPEED:	3399 to 3501 rpm
MAXIMUM EFFICIENCY:	44%
AIR FLOW RATE:	
- range	170 to 3500 cfm (80 to 1650 L/s)
- at maximum efficiency	2020 cfm (951 L/s) at a 4.8 in wg (1200 Pa) static pressure
INPUT POWER:	2.17 to 3.45 hp (1620 to 2570 W)
OPERATOR SAFETY:	Guard grill provided CSA approved Noise level = 94 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	Good general information but need more detail on the fan itself.

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