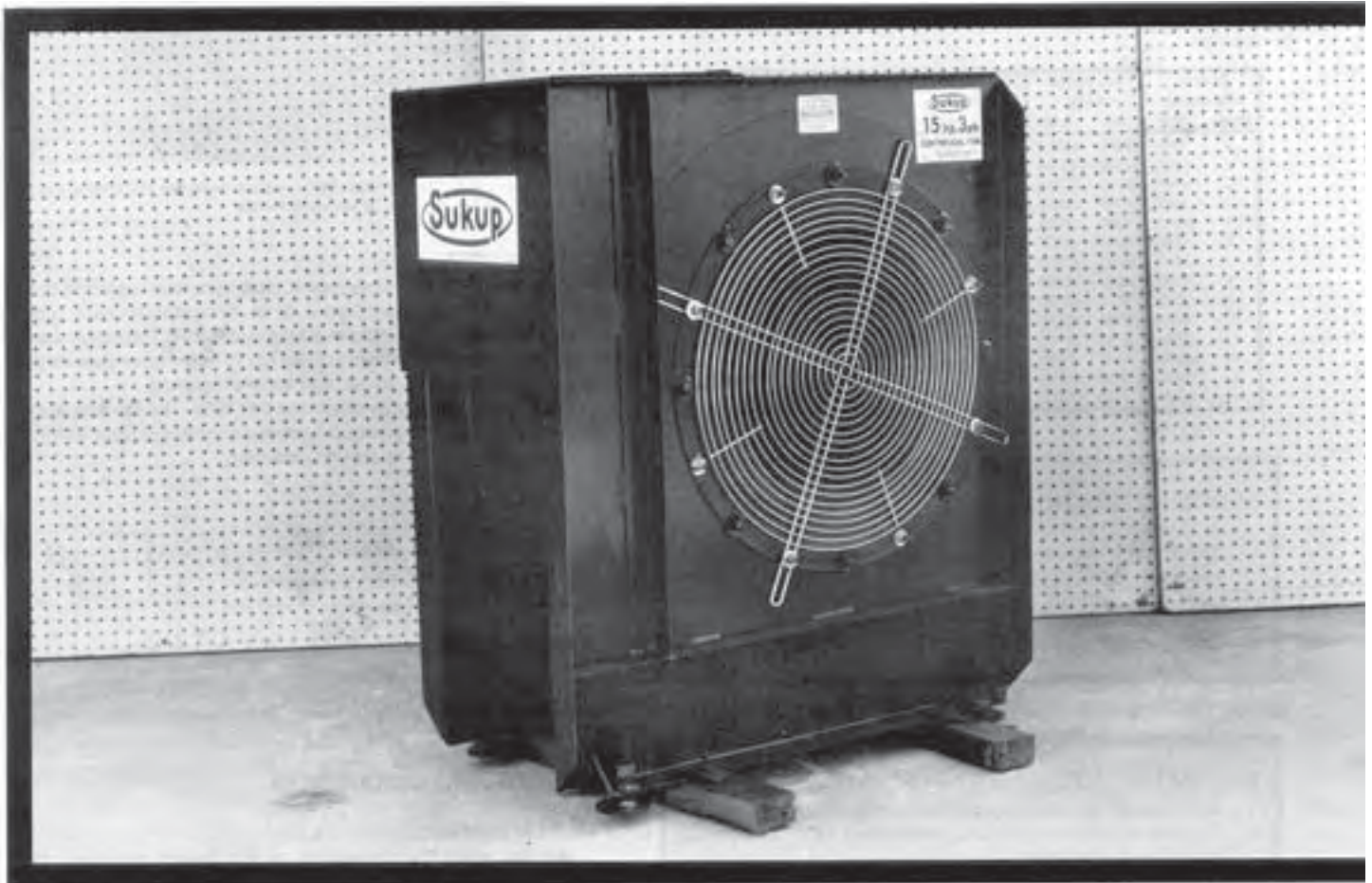


EVALUATION REPORT

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SUKUP 15 HP-THREE PHASE-3450 RPM CENTRIFUGAL FAN

A Co-operative Program Between



SUKUP 15 HP - THREE PHASE - 3450 RPM CENTRIFUGAL FAN

MANUFACTURER:

Sukup Manufacturing Company
Sheffield, Iowa
50475

DISTRIBUTOR:

United Farmers of Alberta Co-operative Limited
1016 - 68 Avenue S.W.
Calgary, Alberta
T2V 4J2

RETAIL PRICE:

\$1795.00 (November, 1984, f.o.b. Lethbridge, Alberta complete with optional control assembly).

SUMMARY OF RESULTS

TABLE 1. Sukup 15 hp - Three Phase - 3450 rpm 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
1	(249)	9070	(4280)	14.8	(11.1)	10	3520
2	(497)	8400	(3960)	18.2	(13.5)	25	3502
3	(747)	8020	(3790)	18.9	(14.1)	29	3492
4	(996)	7690	(3630)	19.2	(14.3)	33	3487
5	(1240)	7280	(3440)	19.3	(14.4)	35	3483
6	(1490)	6600	(3110)	17.8	(13.3)	36	3490
7	(1740)	6290	(2970)	18.1	(13.5)	40	3485
8	(1990)	5840	(2760)	18.3	(13.6)	42	3482
9	(2240)	5510	(2600)	18.3	(13.6)	44	3483
10	(2490)	5300	(2500)	18.3	(13.7)	44	3481
11	(2740)	5110	(2410)	18.1	(13.5)	45	3483
12	(2990)	4720	(2230)	17.9	(13.3)	45	3484
13	(3240)	3710	(1750)	17.0	(12.7)	43	3489
14	(3490)	1430	(673)	11.8	(8.83)	16	3526

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.

Senior Engineer: E. H. Wiens

Project Engineer: R. P. Atkins

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Air flow information is available and will be supplied with each fan in the future.

GENERAL DESCRIPTION

The Sukup 15 hp, three phase, 3450 rpm centrifugal fan is a 19 in (483 mm) diameter, single speed, direct drive, centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Sukup 15 hp, three phase, 3450 rpm fan is equipped with a wire mesh guard grill, an inlet bell, duct mounting flange and levelling lugs. An optional control assembly consisting of a magnetic motor starter, motor overload protection and a start-stop switch was supplied with the fan. The impeller consists of a steel and cast iron hub-backplate, 9 sheet metal, backward inclined airfoil blades and a steel flange. The impeller is directly mounted on the 15 hp (11.2 kW), three phase, 208-230/460 V electric motor. The fan housing is 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 I.

SCOPE OF TEST

The Sukup 15 hp, three phase, 3450 rpm was tested in the outlet chamber set up (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 460V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

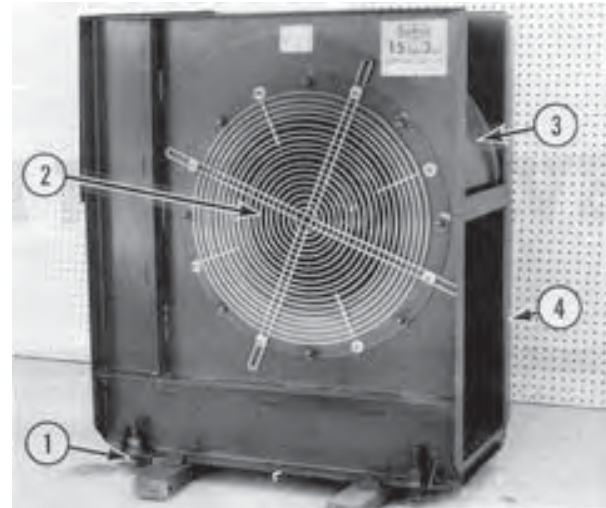


FIGURE 1. Sukup 15 hp- Three Phase- 3450 rpm Centrifugal Fan: (1) Levelling Lugs, (2) Guard Grill (3) Fan Housing, (4) Mounting Flange.

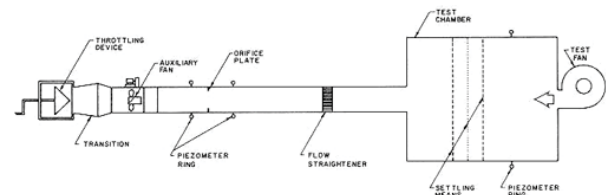


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

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 1430 cfm (673 Us) at 14 in wg (3490 Pa) to 9070 cfm (4280 lds) at 1 in wg (249 Pa). FIGURE 3 illustrates the fan performance curves for the Sukup 15 hp, three phase, 3450 rpm 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 11.8 hp (8.83 kW) at maximum static pressure and minimum air flow rate to 18.3 hp (13.7 kW) at 10 in wg (2490 Pa) static pressure and an air flow rate of 5300 cfm (2500 L/s). The maximum amperage drawn by the motor was 15.3 amps, which was less than the rated motor amperage of 17 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 10 to 45%. The maximum total efficiency of 45% occurred at 4610 cfm (2180 L/s) at a static pressure of 12.2 in wg (3030 Pa).

EASE OF OPERATION

Maintenance: Seasonal inspection of the control assembly, fan blades, housing and mounts was required. Covering of the fan inlet during the off season was recommended to keep out weather and pests and to prevent windmilling of the motor. Every six weeks during the off season the motor required a 10-minute run to re-

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).

distribute grease in the motor bearings and to expel condensation from the motor housing. The removable guard grill and inlet bell allowed easy access for maintenance.

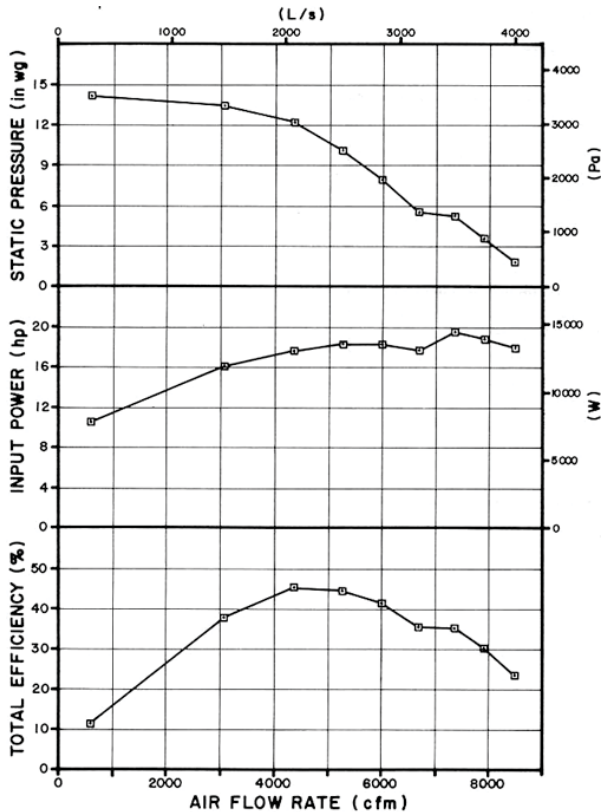


FIGURE 3. Sukup 15 hp - Three Phase - 3450 rpm Fan Performance Curves.

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 Sukup 15 hp, three phase, 3450 rpm fan was not CSA approved. The manufacturer indicated that application for CSA approval has been made and is expected in 1985.

The noise level³ of the Sukup fan, 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 94 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Sukup fan 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.

OPERATOR'S MANUAL

The operating instructions contained information on preparation, installation, wiring, safety, maintenance, service and trouble shooting.

³PAMI Test Procedure for Determining Fan Noise Level.

**APPENDIX I
SPECIFICATIONS**

MAKE: Sukup
MODEL: 15 hp - three phase - 3450 rpm
SERIAL NUMBER: 04165
MANUFACTURER: Sukup Manufacturing Company
 Sheffield, Iowa
 50475

OVERALL DIMENSIONS:
 -- housing width 33.2 in (845 mm)
 -- housing depth 32.4 in (822 mm)
 -- housing height 37.9 to 39.4 in (962 to 1000 mm)
 -- inlet bell diameter 11 in (279 mm)
 -- guard grill diameter 20 in (508 mm)
 -- grill opening 0.125 in (3 mm) diameter, spaced at 0.5 in (13 mm) in a circular pattern-discharge opening 12.2 x 19.2 in (311 x 489 mm)

IMPELLER:
 -- diameter 19 in (483 mm)
 -- inside flange diameter 12.9 in (327 mm)
 -- number of blades 9
 -- blade angle 45°

WEIGHT: 391 lb (178 kg)

MOTOR NAMEPLATE DATA:
 -- make Baldor
 -- model M3713T
 -- frame 215T
 -- class F
 -- code H
 -- design B
 -- duty continuous
 -- rpm 3450
 -- service factor 1.0
 -- ambient temperature rise 40°C
 -- volts 208-230/460 V
 -- amps 37.5-34/17A
 -- phase 3
 -- cycles 60 Hz
 -- horsepower 15 hp (11.2 kW)

**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

SUKUP 15 HP - THREE PHASE - 3450 RPM CENTRIFUGAL FAN

RETAIL PRICE: \$1795.00 (November, 1984, f.o.b. Lethbridge)

FAN DESCRIPTION: 19 in (483 mm) single speed, direct drive, 15 hp (11.2 kW) electric motor.

FAN SPEED: 3481 to 3526 rpm

MAXIMUM EFFICIENCY: 45%

AIR FLOW RATE:
 -range 1430 to 9070 cfm (673 to 4280 L/s)
 -at maximum efficiency 4610 cfm (2180 L/s) at a 12.2 in wg (3030 Pa) static pressure

INPUT POWER: 11.8 to 18.3 hp (8.83 to 13.7 kW)

OPERATOR SAFETY: Guard grill provided not CSA approved Noise level = 94 dB(A) at 4.9 ft (1.5 m) from fan inlet

OPERATOR'S MANUAL:adequate



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