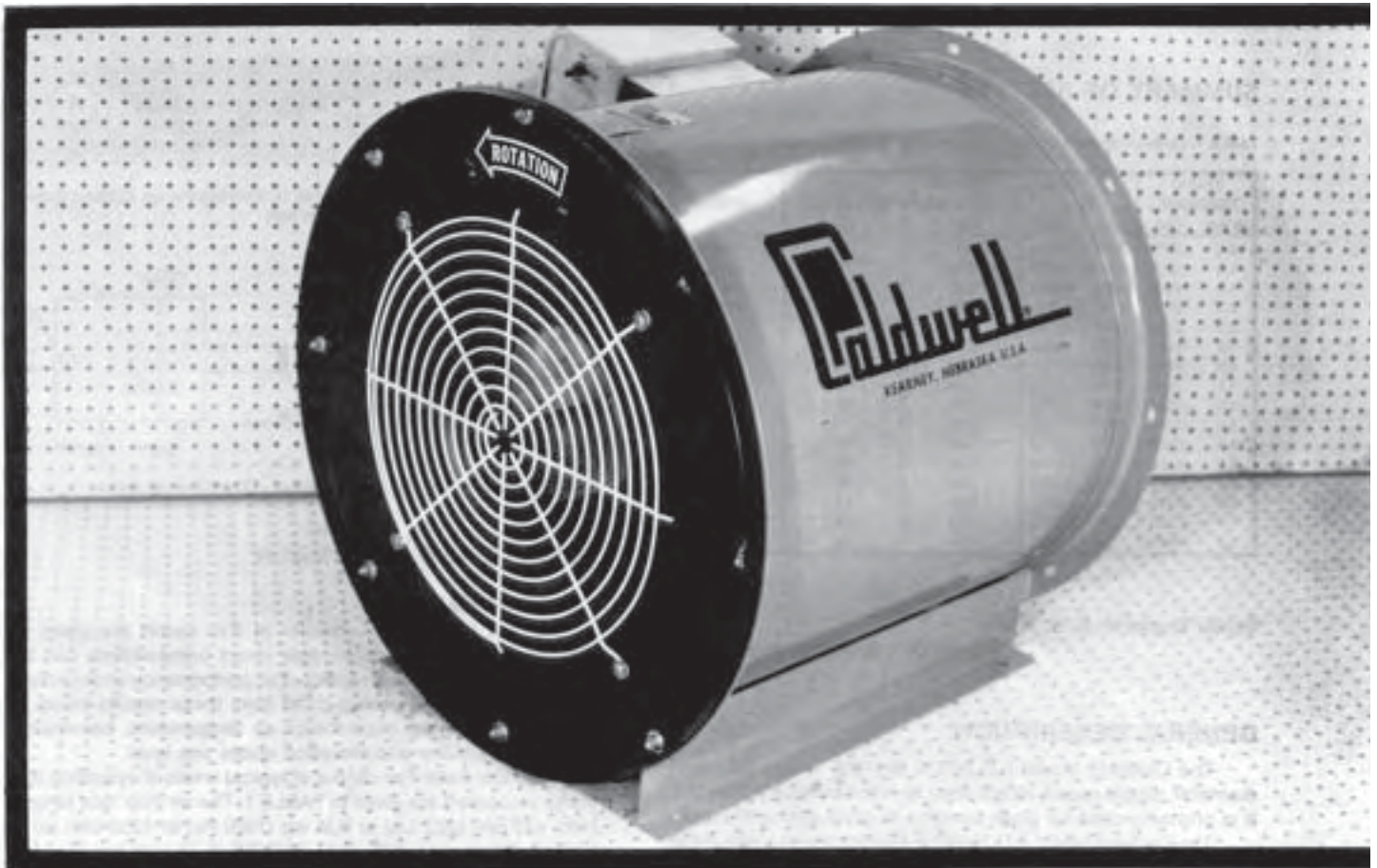


Evaluation Report

414



Caldwell Model ILC 24-312 In-Line Centrifugal Fan

A Co-operative Program Between



CALDWELL MODEL ILC 24-312 IN-LINE CENTRIFUGAL FAN

MANUFACTURER:

Caldwell Manufacturing Company
A Division of Chief Industries Inc.
P. O. Box 338
Kearney, Nebraska 68847-0338

DISTRIBUTORS:

1. Westland Metals - Edmonton, Alberta
Saskatoon, Sask.
Regina, Sask.
2. Frank Flaman - Edmonton, Alberta
Saskatoon, Sask.
Prince Albert, Sask.
Southey, Sask.
3. Denouden Agri - Regina, Sask.
4. Wall Grain Handling - Brandon, Man.

RETAIL PRICE:

\$1195.00 (February, 1985, f.o.b. Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Caldwell Model ILC 24-312 Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Power Consumption	Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kWh	%	rpm
0.5	(125)	4250	(2010)	2.57	12	3548
1.0	(249)	4160	(1980)	2.68	19	3544
1.5	(374)	4020	(1900)	2.88	29	3539
2.0	(497)	3940	(186)	2.98	33	3536
2.5	(623)	3880	(1830)	3.08	36	3533
3.0	(747)	3780	(1790)	3.21	40	3529
3.5	(872)	3660	(1730)	3.38	44	3524
4.0	(996)	3610	(1660)	3.56	47	3518
4.5	(1120)	3360	(1580)	3.71	50	3513
5.0	(1240)	3220	(1520)	3.82	51	3510
5.5	(1370)	3110	(1470)	3.88	52	3508
6.0	(1490)	3010	(1420)	3.93	53	3506
6.5	(1620)	2850	(1350)	3.97	53	3504
7.0	(1740)	2560	(1210)	3.95	52	3505
7.5	(1870)	1970	(930)	3.64	48	3519
8.0	(1990)	470	(222)	2.43	17	3549

Senior Engineer: E. H. Wiens
Project Engineer: R. P. Atkins

GENERAL DESCRIPTION

The Caldwell Model ILC 24-312 fan is a 15.5 in (394 mm) diameter, single speed, direct drive, in-line centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Caldwell Model ILC 24-312 is equipped with a wire mesh guard grill, an inlet bell, duct mounting flange and a motor control. The aluminium impeller consists of a hub backplate, 9 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, inlet bell, flanges and mounting legs are of steel construction with an enamel finish for corrosion protection. The motor control enclosure is made of galvalume material.

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

SCOPE OF TEST

The Caldwell Model ILC 24-312 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 230V. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

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.

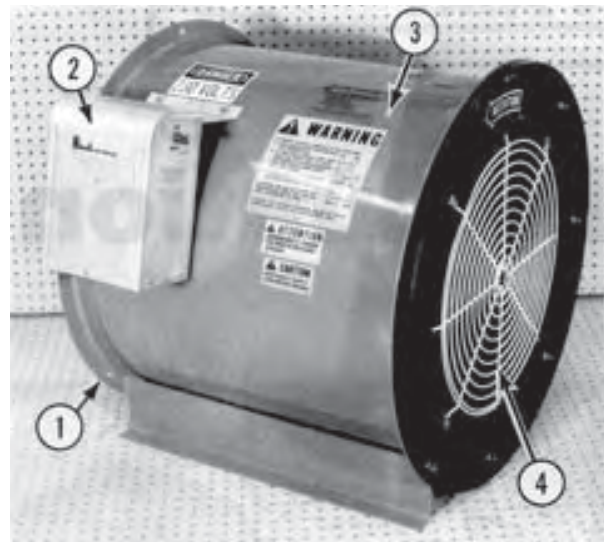


FIGURE 1. Caldwell Model ILC 24-312 Fan: (1) Mounting Flange, (2) Motor Control, (3) Fan Housing, (4) Guard Grill and Inlet Bell.

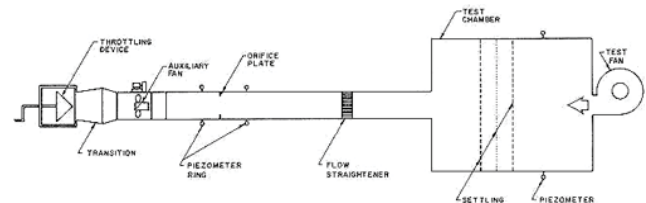


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

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 470 cfm (222 L/s) at 8 in wg (1990 Pa) to 4250 cfm (2010 L/s) at 0.5 in wg (125 Pa). FIGURE 3 illustrates the fan performance curves for the Caldwell model ILC 24-312 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 0 to 8.4 in wg (0 to 2090 Pa). There was no difference in fan performance between the manufacturer's rated output and PAMI's results.

Power Consumption: The power consumption is the amount of energy (kWh) used by the fan motor. The power consumed by the fan depended upon the point of operation of the fan. The power consumption varied from 2.43 kWh at maximum static pressure and minimum air flow rate to 3.97 kWh at 6.5 in wg (1620 Pa) static pressure and an air flow rate of 2850 cfm (1350 L/s). The maximum amperage drawn by the motor was 16 amps, which was equal to the maximum rated motor amperage for "air over" motor duty.

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 12 to 53%. The maximum total efficiency of 53% occurred at 2820 cfm (1330 L/s) at a static pressure of 6.6 in wg (1640 Pa).

EASE OF OPERATION

Maintenance: Seasonal inspection of the switch control box, motor mounts, impeller and fan motor was required. Seasonal lubrication of the motor was required. During the off season, operation of the fan for 30 minutes every three weeks was required to ensure bearing lubrication.

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).

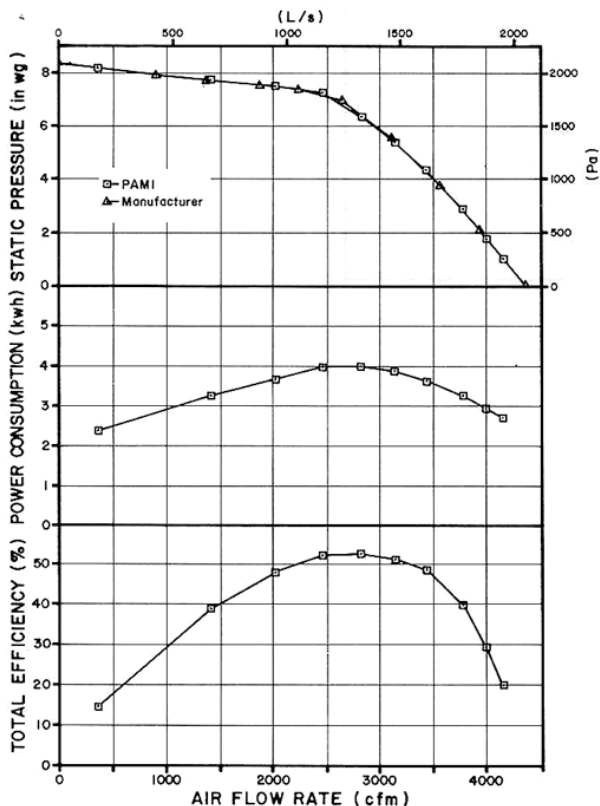


FIGURE 3. Caldwell Model ILC 24-312 Fan Performance Curves.

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 Caldwell ILC 24-312 was CSA approved.

The noise level of the Caldwell ILC 24-312, 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 Caldwell ILC 24-312 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.

OPERATOR'S MANUAL

The operator's manual was very informative and contained detailed illustrations and information on operation, specifications, installations, wiring, maintenance, safety, performance, service and trouble shooting.

APPENDIX I SPECIFICATIONS

MAKE: Caldwell
MODEL: ILC 24-312
SERIAL NUMBER: 84H30
MANUFACTURER: Caldwell Manufacturing Company
 P. O. Box 338
 Kearney, Nebraska 68847-0338

OVERALL DIMENSIONS:

-- housing width 30 in (762 mm)
 -- housing depth 25 in (635 mm)
 -- housing height 27.25 in (692 mm)
 -- inlet bell diameter 9.25 in (235 mm)
 -- guard grill diameter 17.5 in (445 mm)
 -- grill opening 0.125 in (3 mm) diameter, spaced at 0.75 in (19 mm) in a spiral pattern discharge opening 24.25 in (616 mm)

IMPELLERS:

-- diameter 15.5 in (394 mm)
 -- inside flange diameter 10.6 in (270 mm)
 -- number of blades 9
 -- blade angle 86 degrees

WEIGHT:

174 lb (79 kg)

MOTOR NAMEPLATE DATA:

-- make Century
 -- model 8-350716-01
 -- frame R 145T
 -- class B
 -- type CX
 -- code L
 -- duty air over
 -- rpm 3450 rpm
 -- service factor 1
 -- ambient temperature rise 40°C
 -- volts 230 V
 -- amps 12.5 A
 -- phase 1
 -- cycles 60 Hz
 -- horsepower 3 hp (2240 W)
 -- maximum amps (air over duty) 16A

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.

SUMMARY CHART CALDWELL MODEL ILC 24.312 IN.LINE CENTRIFUGAL FAN

RETAIL PRICE: \$1195.00 (February, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION: 15.5 in (394 mm) single speed, direct drive, 3 hp (2240 W) electric motor.
FAN SPEED: 3504 to 3549 rpm
MAXIMUM EFFICIENCY: 53%
AIR FLOW RATE:
 -range 470 to 4250 cfm (222 to 2010 L/s)
 -at maximum efficiency 2820 cfm (1330) at a 6.6 in wg (1640 Pa) static pressure
POWER CONSUMPTION: 2.43 to 3.97 kWh
OPERATOR SAFETY: guard grill provided CSA approved Noise level = 82 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL: complete and very informative



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