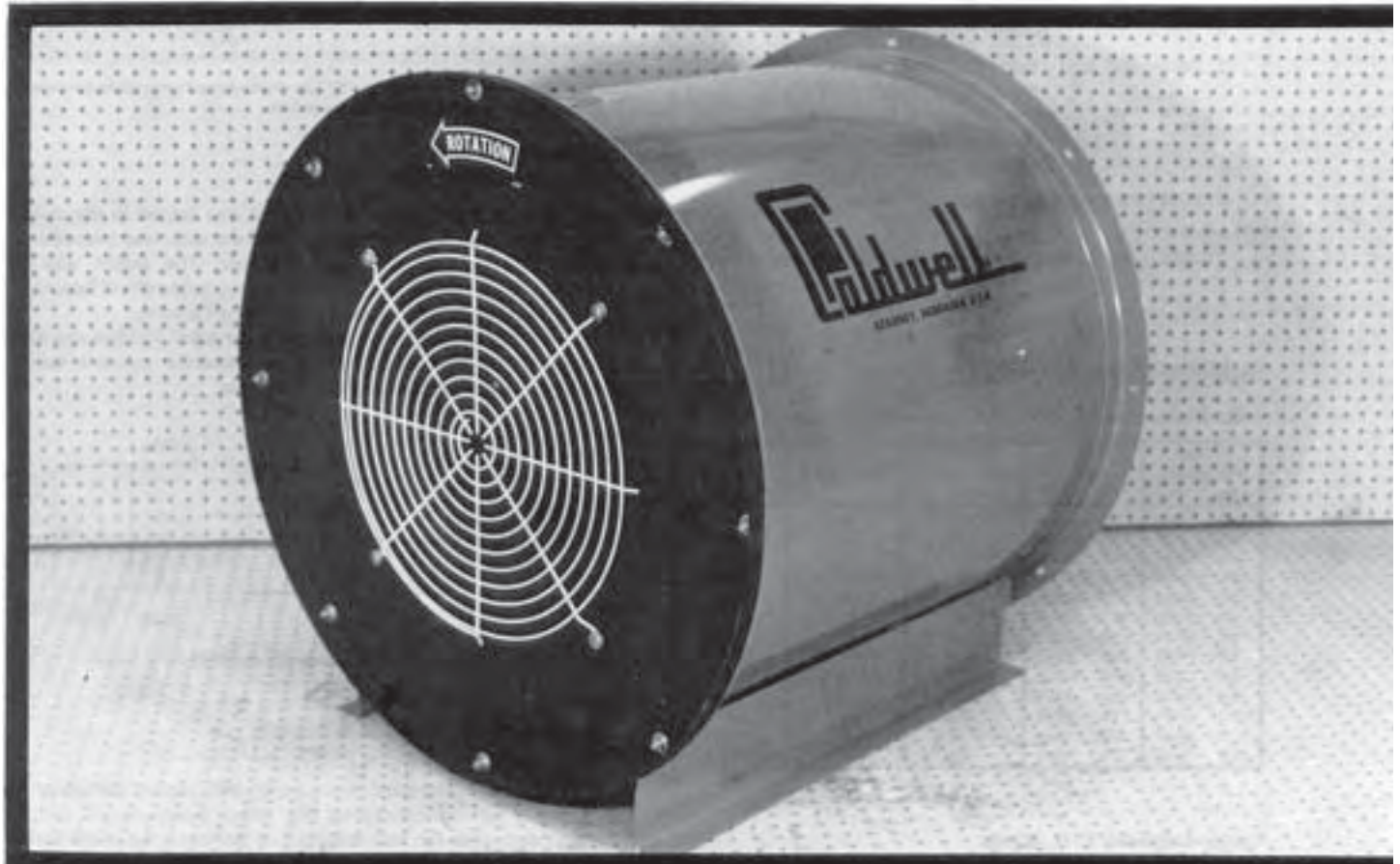


Evaluation Report

416



Caldwell Model ILC 28-1032 In-Line Centrifugal Fan

A Co-operative Program Between



CALDWELL MODEL ILC 1032 IN-LINE CENTRIFUGAL FAN

MANUFACTURER:

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

DISTRIBUTOR:

1. Westland Metals
 - Edmonton, Alberta
 - Saskatoon, Sask.
 - Regina, Sask.
 - Swan River, Man.
 - Steinbach, Man.
 - Portage la Prairie, Man.
 - Spirling, Man.
2. Frank Flaman
 - Edmonton, Alberta
 - Saskatoon, Sask.
 - Prince Albert, Sask.
 - Southey, Sask.
3. Denouden Agri
 - Edmonton, Alberta
 - Saskatoon, Sask.
 - Prince Albert, Sask.
 - Yorkton, Sask.
 - Regina, Sask.
4. Wall Grain Handling -Brandon, Man.

RETAIL PRICE:

\$1630.00 (April, 1985, f.o.b. Lethbridge, Alberta).

SUMMARY OF RESULTS

TABLE 1. Caldwell Model ILC 28-1032 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
1.0	(249)	7960	(3760)	7.97	15	3531
2.0	(497)	7650	(3610)	8.64	22	3525
3.0	(747)	7330	(3460)	9.31	29	3517
4.0	(996)	7000	(3300)	9.94	34	3507
5.0	(1240)	6660	(3140)	10.52	38	3497
6.0	(1490)	6320	(2980)	11.04	41	3487
7.0	(1740)	5980	(2820)	11.50	43	3478
8.0	(1990)	5620	(2650)	11.88	44	3470
9.0	(2240)	5250	(2480)	12.18	45	3464
10.0	(2490)	4830	(2280)	12.35	45	3460
11.0	(2740)	4300	(2030)	12.31	44	3460
12.0	(2990)	1070	(504)	7.66	18	3524
12.6	(3140)	825	(389)	7.58	15	3527

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

GENERAL DESCRIPTION

The Caldwell Model ILC 28-1032 fan is a 18.75 in (476 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 28-1032 is equipped with a wire mesh guard grill, an inlet bell, duct mounting flange and a motor control. The welded steel impeller consists of a hub backplate, 9 backward curved blades and a flange. The impeller is directly mounted on the 10 hp (7460 W) three phase, 230/460 V electric motor. The fan housing, 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 28-1032 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 460 V. The fan was also

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

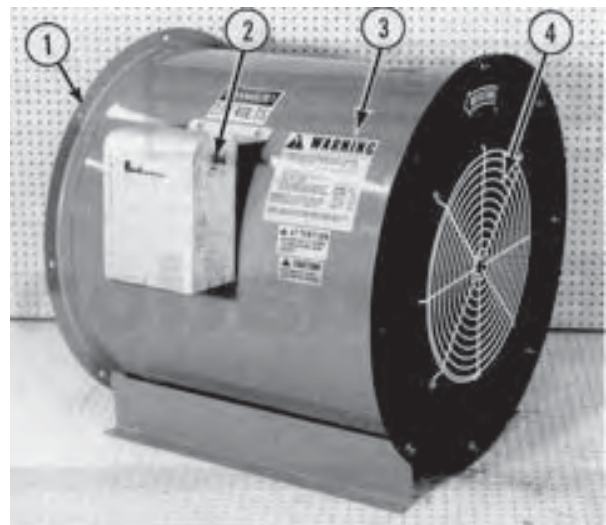


FIGURE 1. Caldwell Model ILC 28-1032 Fan: (1) Mounting Flange, (2) Motor Control, (3) Fan Housing, (4) Guard Grill and Inlet Bell.

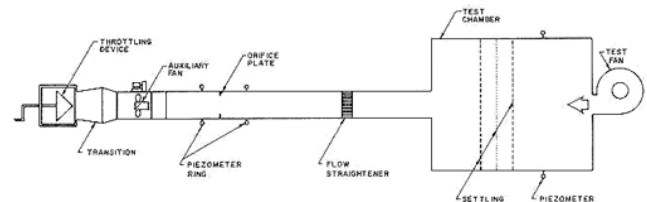


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

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 825 cfm (389 L/s) at 12.6 in wg (3140 Pa) to 7960 cfm (3760 L/s) at 1 in wg (249 Pa). FIGURE 3 illustrates the fan performance curves for the Caldwell model ILC 28-1032 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 12.6 in wg (0 to 3140 Pa). The difference in output depended upon the level of operation. For example, PAMI's measured air flow rate at peak efficiency of 45% was 4990 cfm (2360 L/s) at a static pressure of 9.64 in wg (2400 Pa). This was 3% lower than the manufacturer's rated output of 5120 cfm (2420 L/s) at a static pressure of 9.64 in wg (2400 Pa).

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 7.58 kWh at maximum static pressure and minimum air flow rate to 12.35 kWh at 10 in wg (2490 Pa) static pressure and an air flow rate of 4830 cfm (2030 L/s). The maximum amperage drawn by the motor was 12.1 amps, which was below the rated motor amperage of 13.8 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 15 to 45%. The maximum total efficiency of 45% occurred at 4990 cfm (2360 L/s) at a static pressure of 9.64 in wg (2400 Pa).

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).

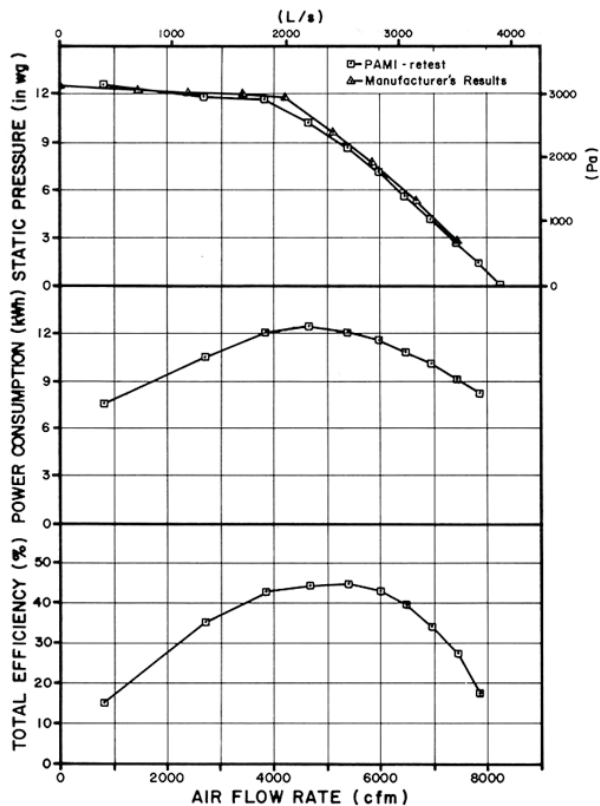


FIGURE 3. Caldwell Model ILC 28-1032 Fan Performance Curves.

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.

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 28-1032 was CSA approved.

The noise level of the Caldwell ILC 28-1032, 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 84 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Caldwell ILC 28-1032 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, installation, wiring, maintenance, safety, performance, service and trouble shooting.

APPENDIX I SPECIFICATIONS

MAKE: Caldwell
MODEL: ILC 28-1032
SERIAL NUMBER: 84K2
MANUFACTURER: Caldwell Manufacturing Company Division of Chief Industries, Inc.
 P. O. Box 338
 Kearney, Nebraska 68847-0338

OVERALL DIMENSIONS:
 -- housing width 34.75 in (883 mm)
 -- housing depth 29 in (737 mm)
 -- housing height 31.75 in (806 mm)
 -- inlet bell diameter 11 in (279 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 28.2 in (715 mm)

IMPELLER:
 -- diameter 18.75 in (476 mm)
 -- inside flange diameter 12.9 in (329 mm)
 -- number of blades 9
 -- blade angle 86 degrees

WEIGHT: 269 lb (122 kg)

MOTOR NAMEPLATE DATA:
 -- make Century
 -- model 6-350724-45
 -- frame S 184TZ
 -- class F
 -- code J
 -- duty continuous
 -- rpm 3500 rpm
 -- service factor 1
 -- ambient temperature rise 40°C
 -- volts 230/460 V
 -- amps 27.6/13.8 A
 -- phase 3
 -- cycles 60 Hz
 -- horsepower 10 hp (7460 W)
 -- maximum amps(air over duty) 30115 A

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 ILO 28-1032 IN-LINE CENTRIFUGAL FAN

RETAIL PRICE: \$1630.00 (April, 1985, f.o.b. Lethbridge)
FAN DESCRIPTION: 18.75 in (476 mm) single speed, direct drive, 10 hp (7460 W) electric motor.
FAN SPEED: 3460 to 3531 rpm
MAXIMUM EFFICIENCY: 45%
AIR FLOW RATE:
 -range 825 to 7960 cfm (389 to 3760 L/s)
 -at maximum efficiency 4990 cfm (2360 L/s) at a 9.64 in wg (2400 Pa) static pressure
POWER CONSUMPTION: 7.58 to 12.35 kWh
OPERATOR SAFETY: guard grill provided CSA approved noise level = 84 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL: 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