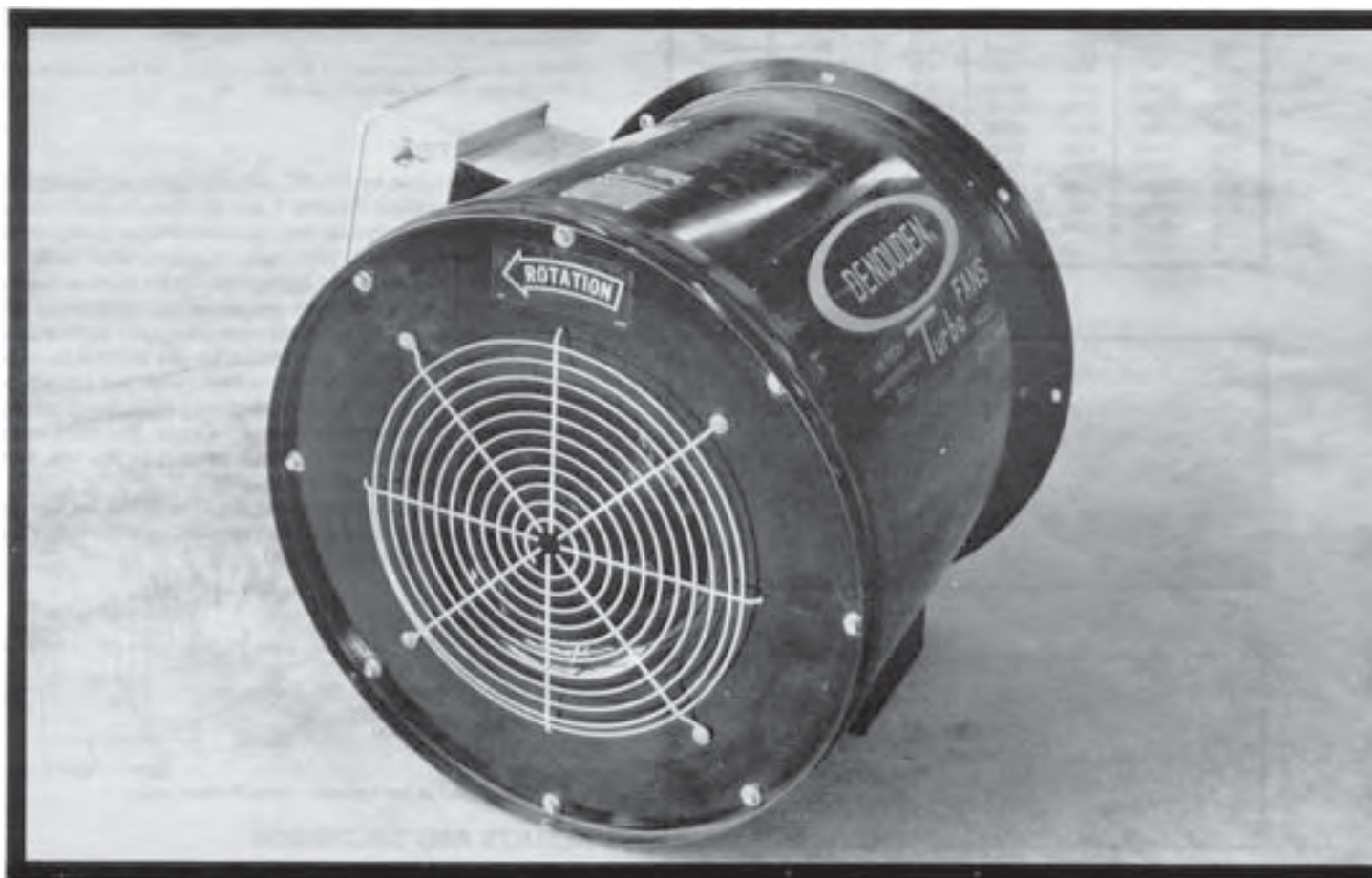


Evaluation Report

630



Denouden Model ILC 24/28-512 Aeration Fan

A Co-operative Program Between



DENOUDEN MODEL ILC 24/28-5612

MANUFACTURER:

Caldwell Manufacturing Company
P.O. Box 338
Kearney, Nebraska
U.S.A. 68848

DISTRIBUTOR:

Denouden Agri
559 Park Street
Regina, Saskatchewan
S4N 5B2

RETAIL PRICE: \$1,369.00 (April 1990, f.o.b. Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Denouden Model ILC 24/28-512 Fan Performance at Typical Levels of Operation

Static Pressure		Air Flow Rate		Input Power	Total Efficiency	Fan Speed
in wg	(Pa)	cfm	(L/s)	kW	%	rpm
0.94	(234)	5990	(2830)	4.48	21	3512
1.00	(249)	5970	(2820)	4.38	20	3514
2.00	(496)	5670	(2680)	4.86	30	3505
3.00	(747)	5360	(2530)	5.28	37	3494
4.00	(996)	5200	(2450)	5.64	43	3485
5.00	(1250)	4740	(2240)	5.97	47	3477
6.00	(1490)	4360	(2060)	6.27	49	3468
7.00	(1740)	4010	(1890)	6.50	51	3462
8.00	(1990)	3630	(1710)	6.64	51	3459
9.00	(2240)	3200	(1510)	6.64	50	3457
10.00	(2490)	1370	(647)	5.01	30	3502
10.16	(2530)	0	(0)	3.38	0	3540

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.

Manager: R. P. Atkins

Project Engineer: R. C. Maze

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. In the future, specific information will be made available on air flow performance over a complete range of static pressures for the ILC 24/28-512.

GENERAL DESCRIPTION

The Denouden Model ILC24/28-512 5 hp inline centrifugal fan is a 16.7 in (423 mm) diameter, single speed, direct drive, inline centrifugal flow fan. It is primarily used for grain aeration or grain drying systems.

The Denouden Model ILC24/512, 5 hp fan is equipped with a steel housing that forms a transition from a 27 in (686 mm) inlet to a 24.4 inch (619 mm) outlet. The fan has a wire guard grill, an inlet bell, straightening vanes, mounting flange and motor control. The aluminum impeller consists of a hub backplate and nine airfoil backward curved blades. The impeller is directly mounted on a 5 hp (3.73 kW), single phase, 230 volt electric motor. The fan housing, motor mounts, straightening vanes, flanges and supports are of steel construction with a painted finish for corrosion protection.

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

SCOPE OF TEST

The fan evaluated by AFMRC was configured as described in the General Description, FIGURE 1, and the Specifications section of this report. The manufacturer may have built different configurations of this fan before or after AFMRC tests. Therefore, when using this report check that the fan under configuration is the same as the one reported here. If differences exist, assistance can be obtained from AFMRC or the manufacturer to determine changes in performance.

The Denouden 5 hp inline centrifugal fan was tested in the outlet chamber setup (FIGURE 2) in accordance with test procedures developed by the Prairie Agricultural Machinery Institute and adopted by the Alberta Farm Machinery Research Centre. 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 volts. The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

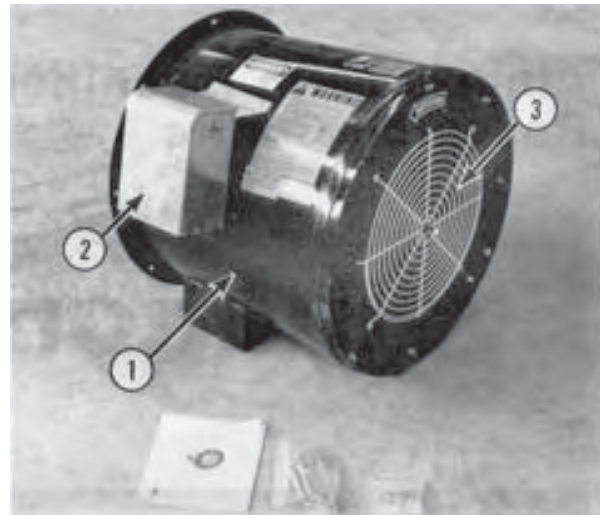


FIGURE 1. Denouden ILC24128-512, 5 hp inline centrifugal flow fan: (1) Fan Housing, (2) Motor Control, (3) Inlet Bell and Guard Grill.

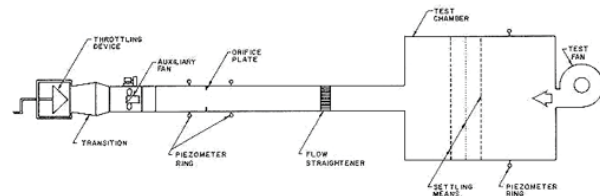


Figure 2. Schematic Fan Test Apparatus - Outlet Chamber Setup.

RESULTS AND DISCUSSION

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 percent 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 0 cfm (0 L/s) at 10.16 in wg (2530 Pa) to 5990 cfm (2830 L/s) at 0.94 in wg (234 Pa). FIGURE 3 illustrates the fan performance curves for the Denouden ILC24/28-512, 5 hp inline centrifugal Fan. The manufacturer did not provide any information on rated performance.

It is recommended that for fan selection purposes, the manufacturer supplying a table or curve of air flow rates over a complete range of static pressures.

Power Consumption: The power consumption numbers given in TABLE 1 can be used to calculate the cost of operating the fan. To calculate the cost of fan operation, multiply the power consumption (kW) by the number of hours of fan operation times the cost per kilowatt hour.

The power consumed by the fan depended upon the point of operation of the fan. The power consumption varied from 3.38 kW at 10.16 in wg (2530 Pa) static pressure and an airflow rate of 0 cfm (0 L/s) to 6.64 kW at 9.0 in wg (2240 (Pa) static pressure and an air flow rate of 3200 cfm (1510 Pa). The maximum amperage drawn by the motor was 27.6 amps, which was less than the rated motor amperage of 29 amps.

¹Standard air is air with a density of 0.075 lbm/ft³ (1.2 kg/m³), 50 percent 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).

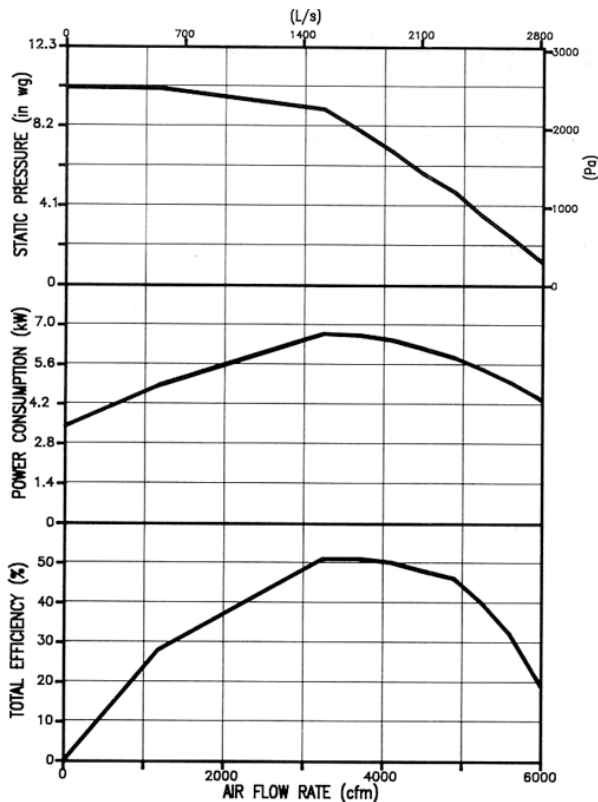


FIGURE 3. Denouden 5 hp Inline Centrifugal Fan Performance Curves.

Total Efficiency: Total efficiency is the ratio of 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 0 to 51 percent. The maximum total efficiency of 51 percent occurred at 3630 cfm (1710 L/s) at a static pressure of 8 in wg (1990 Pa).

EASE OF OPERATION

Maintenance: The inlet screen was easily removed, which allowed for cleaning of the wheel and fan housing. Seasonal inspection of the switch control box and fan motor was required. Sealed bearings are used for the fan motor, which should be inspected seasonally to ensure a long service life. 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 totally enclosed unit and presented no safety hazards. The Denouden ILC 24/28-512 5 hp, single phase, 3450 rpm fan was CSA approved.

The noise level of the Denouden 5 hp inline centrifugal 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 87.8 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Denouden 5 hp inline centrifugal

fan falls within range 4 of the Alberta Farm Machinery Research Centre 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 operator's manual was very informative and contained information on operation, specifications, installation, wiring, maintenance, safety, performance, service and troubleshooting. However, the manual did not include information specifically for the Denouden ILC24/28-512 fan.

APPENDIX I SPECIFICATIONS	
MAKE:	Denouden
MODEL:	ILC24 / 28-512
SERIAL NUMBER:	90C55
MANUFACTURER:	Caldwell Manufacturing Company P.O. Box 338 Kearney, Nebraska 68848
OVERALL DIMENSIONS:	
-- housing width	27.3 in (692 mm)
-- housing depth	25.0 in (635 mm)
-- housing height	27.3 in (692 mm)
-- inlet bell diameter	11.8 in (298 mm)
-- guard grill diameter	17.3 in (438 mm)
-- grill opening	0.125 in (3 mm) diameter wire spaced at 0.75 in (19 mm)
-- discharge opening diameter	24.4 in (619 mm)
IMPELLER:	
-- diameter	16.7 in (423 mm)
-- inside flange diameter	11.6 in (295 mm)
-- number of blades	9
-- blade angle	48°
WEIGHT:	228 lb (103 kg)
MOTOR NAMEPLATE DATA:	
-- make	Century
-- model	Crop dryer
-- part number	6-362902-40
-- serial number	XXOF12078
-- frame	L184TZ
-- type	CX
-- insulation class	F
-- form	MCA
-- duty	Air Over
-- rpm	3450
-- service factor	1.0
-- pf	96.0
-- ambient temperature rise	40°C
-- volts	230 V
-- amps	29 A
-- phase	Single
-- cycles	60 Hz
-- horsepower	5 hp (3.73 kW)

SUMMARY CHART DENODEN ILC24/28-512 5 HP INLINE CENTRIFUGAL FAN

RETAIL PRICE:	\$1,369.00, (1989, f. o. b. Lethbridge)
FAN DESCRIPTION:	22.3 in (566 mm) single speed, direct drive, 5 hp (3.73 kW), 230 volt electric motor
FAN PERFORMANCE:	
Air Flow Rate:	
-- range	0 to 5990 cfm (0 to 2830 L/s)
-- at maximum efficiency	3630 cfm (1710 L/s) at a 8 in wg (1990 Pa) static pressure
Power Consumption:	3.38 to 6.64 kW
Total Efficiency:	maximum 51%
OPERATOR SAFETY:	guard grill provided, CSA approved motor noise level = 87 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	very good, needs performance information for Denouden ILC24/28-512



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