

# Evaluation Report

# 559



## Ceco Model 261003 Axial Fan

A Co-operative Program Between



# CECO MODEL 261003 AXIAL FAN

## MANUFACTURER:

Combustion Equipment Company  
 Division of Luffland Industries  
 P.O. Box 228  
 Bates City, MO. 64011

## DISTRIBUTOR:

Flaman Sales Ltd.  
 Box 280  
 Southey, Sask. S0G 4P0

## RETAIL PRICE:

\$1420.00 (February, 1988, f.o.b. Lethbridge, Alberta).

## SUMMARY OF RESULTS

TABLE 1. Ceco Model 261003 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
1.5	(374)	13700	(6470)	9.64	38	3510
2.0	(398)	12960	(6090)	10.08	41	3501
2.5	(623)	12200	(5760)	10.47	44	3492
3.0	(747)	11600	(5480)	10.74	45	3484
3.5	(872)	10900	(5150)	10.95	47	3476
4.0	(996)	10200	(4810)	11.11	48	3470
4.5	(1120)	9350	(4410)	11.16	48	3466
5.0	(1250)	8440	(3980)	11.04	47	3465
5.5	(1370)	7470	(3530)	10.88	46	3466
6.0	(1490)	6500	(3070)	10.64	43	3470
6.5	(1620)	5570	(2630)	10.40	41	3474
7.0	(1740)	4700	(2220)	10.11	38	3477
7.5	(1870)	3940	(1860)	9.85	35	3480
8.0	(1990)	3290	(1550)	9.69	32	3480
8.6	(2140)	2650	(1250)	9.56	27	3486

## 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.

Station Manager: R. P. Atkins

Project Engineer: K. Shimek

## THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. A table or curve of air flow rates over a range of static pressure will be supplied in the future.

## GENERAL DESCRIPTION

The Ceco Model 261003 fan is a 25.9 in (657 mm) diameter, single speed, direct drive, axial flow fan. It is primarily used for grain aeration or grain drying systems.

The Ceco Model 261003 fan is equipped with a wire mesh guard grill and duct mounting flange. The eight airfoil blades and hub are a single aluminum casting which is directly mounted on the 12.5 hp (9.3 W) three phase, 208-230/460V electric motor. The propeller is designed to push air up through the grain. By reversing the fan housing and the guard grill the fan is capable of drawing air down through the grain. The fan housing, motor mount, 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 I.

## SCOPE OF TEST

The Ceco Model 261003 fan 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.

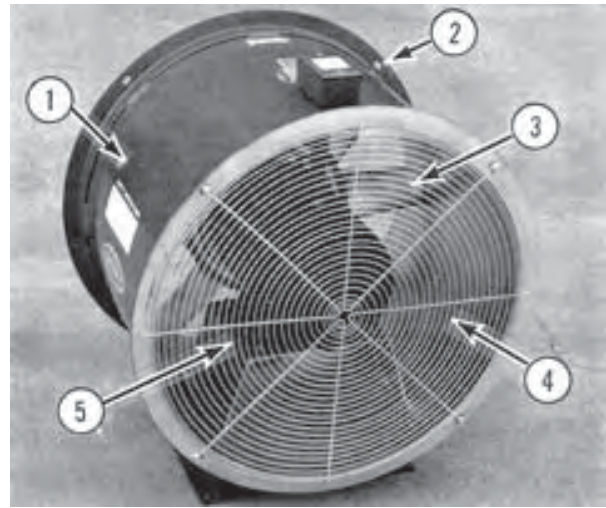


FIGURE 1. Ceco Model 261003 Axial Fan: (1) Fan Housing, (2) Mounting Flange, (3) Propeller, (4) Guard Grill, (5) Motor Mount.

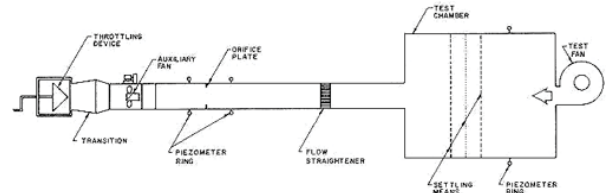


FIGURE 2. Schematic of Fan Test Apparatus - Outlet Chamber Setup.

## RESULTS AND DISCUSSION

### FAN PERFORMANCE

All fan performance results in this report are given at standard air<sup>1</sup> 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<sup>2</sup>) are given in TABLE 1. The air flow rate ranged from 2650 cfm (1250 L/s) at 8.6 in wg (2140 Pa) to 13700 cfm (6470 L/s) at 1.5 in wg (374 Pa). FIGURE 3 illustrates the fan performance curves for the Ceco 261003 fan. The manufacturer did not provide any information on rated performance. It is recommended that for fan selection purposes, the manufacturer include 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 9.56 kW at maximum static pressure and minimum air flow rate to 11.16 kW at 4.5 in wg (1120 Pa) static pressure and an air flowrate of 9350 cfm (4410 L/s). The maximum amperage drawn by the motor was 27.9 amps, which was less than the rated amperage of 30 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 27 to 48%. The maximum total efficiency of 48% occurred at 9350 cfm (4410 L/s) at a static pressure of 4.5 in wg (1120 Pa).

### EASE OF OPERATION

**Maintenance:** Weekly inspection of the fan and of the electrical connections were required. Seasonal lubrication of the motor bearings was required.

<sup>1</sup>Standard air is air with a density of 0.075 lbm/ft<sup>3</sup> (1.2 kg/m<sup>3</sup>), which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

<sup>2</sup>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).

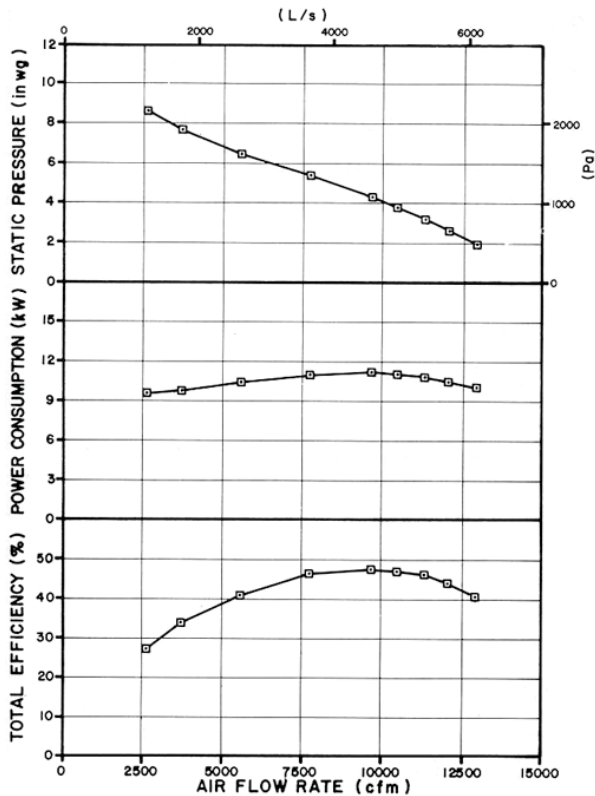


FIGURE 3. Ceco Model 261003 Fan Performance Curves.

#### 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 noise level of the Ceco 261003 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 103 dB(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Ceco 261003 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 operator's manual was very informative and contained illustrations and information on operation, installation, wiring, maintenance and trouble shooting.

#### APPENDIX I SPECIFICATIONS

<b>MAKE:</b>	Ceco
<b>MODEL:</b>	261003
<b>SERIAL NUMBER:</b>	21231
<b>MANUFACTURER:</b>	Combustion Equipment Company A Division of Luffland Industries P.O. Box 228 Bates City, MO 64011
<b>OVERALL DIMENSIONS:</b>	
-- housing width	29.0 in (737 mm)
-- housing depth	20.0 in (508 mm)
-- housing height	32.0 in (813 mm)
-- guard grill diameter	26.5 in (673 mm)
-- grill opening	0.125 in (3 mm) diameter wire, spaced at 0.5 in (13 mm)
-- discharge opening	26.0 in (660 mm)
<b>IMPELLERS:</b>	
-- diameter	25.9 in (657 mm)
-- inside flange diameter	12.75 in (324 mm)
-- number of blades	8
-- blade angle	20 degrees at hub, 11 degrees at tip
<b>WEIGHT:</b>	175 lb (79 kg)
<b>MOTOR NAMEPLATE DATA:</b>	
-- make	Baldor
-- specifications	37E755Z924
-- frame	215Z
-- class	F
-- code	H
-- duty	Continuous
-- rpm	3450
-- service factor	1.15
-- ambient temperature rise	40°C
-- volts	208-230/460
-- amps	32-30/15
-- phase	3
-- cycles	60
-- horsepower	12.5 hp (9.3 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 CECO MODEL 261003 AXIAL FAN

<b>RETAIL PRICE:</b>	\$1420 (February, 1988, f.o.b. Lethbridge)
<b>FAN DESCRIPTION:</b>	25.9 in (657 mm) single speed, direct drive, 12.5 hp (9.3 kW), 3 phase, 208-230/460 V electric motor.
<b>FAN PERFORMANCE:</b>	
<b>Air Flow Rate:</b>	
-range	2650 to 13700 cfm (1250 to 6470 L/s)
-at maximum efficiency	9350 cfm (4410 L/s) at a 4.5 in wg (1120 Pa) static pressure
<b>Power Consumption:</b>	9.56 to 11.16 kW
<b>Total Efficiency:</b>	maximum 48%
<b>OPERATOR SAFETY:</b>	guard grill provided CSA approved noise level = 103 dB(A) at 4.9 ft (1.5 m) from fan inlet
<b>OPERATOR'S MANUAL:</b>	informative



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