



Value Analysis

Project:

Location: BALTIMORE, MD, USA

Prepared By: Benjamin Seidel





THE ENDURADRIIVE® FAN SYSTEM OFFERS THE HIGHEST RELIABILITY, LOWEST MAINTENANCE AND ENERGY COSTS GIVING YOU TOTAL PEACE OF MIND.



UNMATCHED PEACE OF MIND

- No gears or transmission parts to fail
- No gear oil testing, inspection, or changes
- Industry leading drive-train warranty



HIGHEST RELIABILITY

- Same technology as used in oil rigs, where uptime is essential
- Selected 9 out of 10 times versus competing solutions with more than 500 installed units
- Over 3 million run hours from installed equipment



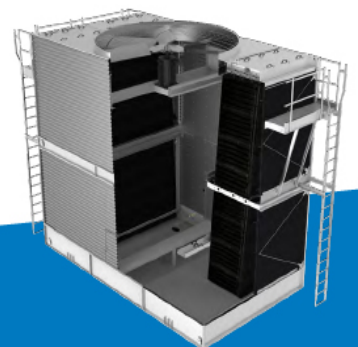
LOWEST MAINTENANCE COSTS

- Lack of gears, sheaves, and belts results in almost maintenance-free operation
- No more expensive, messy and environmentally harmful oil changes
- No need to stock spare gear boxes, belts or other parts in case of unplanned downtime



LOWEST ENERGY COSTS

- 5% to 10% more efficient than belt or gear-drives resulting from:
 - No gear box, no transmission losses
 - State-of-the-art permanent-magnet technology





Baltimore Aircoil Company
Cooling Tower Selection Report

Version: 8.10.3 NA
 Product data correct as of: September 03, 2020

Project Name:
 Selection Name:
 Project State/Province: Maryland
 Project Country: United States
 Date: September 03, 2020

Model Information

Product Line: Series 3000
 Model: S3E-1424-14S ENDURA
 Number of Units: 1

This model includes the ENDURADRIVE® Fan System.
 Fan Type: Standard Fan
 Fan Motor: (1) 75.00 = 75.00 HP/Unit
 Total Standard Fan Power: Full Speed, 75.00 BHP/Unit
 Intake Option: None
 Internal Option: None
 Discharge Option: None

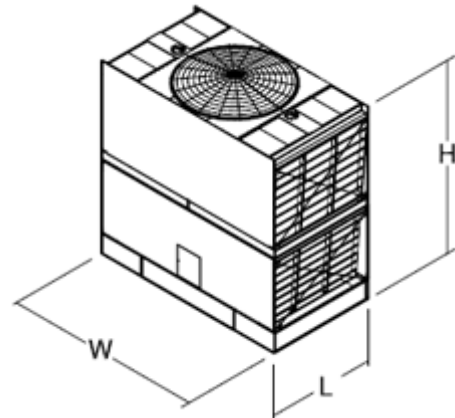
Design Conditions

Flow Rate: 3,645.00 USGPM
 Hot Water Temp.: 95.00 °F
 Cold Water Temp.: 85.00 °F
 Wet Bulb Temp.: 78.00 °F
 Tower Pumping Head: 9.02 psi
 Reserve Capability: 1.32 %
 Heat Rejection: 18,217,710 BTUH

Thermal performance at design conditions and standard total fan motor power is certified by the Cooling Technology Institute (CTI).

Engineering Data, per Unit

Unit Length: 13' 11.25"
 Unit Width: 24' 00.50"
 Unit Height: 22' 05.00"
 Air Flow: 284,460 CFM
 Approximate Shipping Weight: 22,630 pounds
 Heaviest Section: 12,860 pounds
 Approximate Operating Weight: 47,650 pounds
 Heater kW Data (Optional)
 0°F (-17.8°C) Ambient Heaters: (2) 14 kW
 -20°F (-28.9°C) Ambient Heaters: (2) 20 kW



Minimum Distance Required for Single Unit:
 (For multiple units, refer to Layout Guidelines)

From Solid Wall: 8 ft.
 From 50% Open Wall: 3 ft.

Energy Rating:
 57.44 per ASHRAE 90.1, ASHRAE 189 and CA Title 24.

Note: These unit weights and dimensions account for the selected fan type for the standard cataloged drive configuration, but they do not account for other options/accessories. Please contact your local BAC sales representative for weights and dimensions of units with other options/accessories.



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Model & Fan Motor

Product Line: Series 3000
 Model: S3E-1424-14S ENDURA
 Number of Units: 1

Model Accessories

Intake Option: None
 Internal Option: None
 Discharge Option: None
 Fan Type: Standard Fan

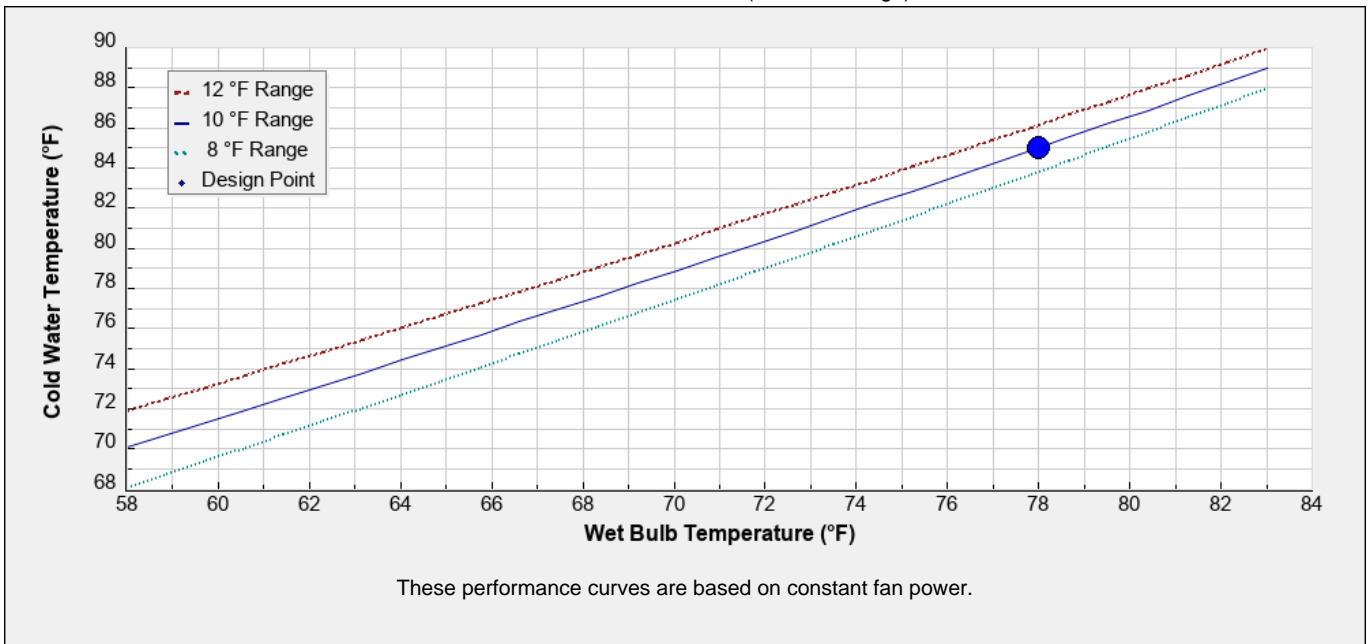
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 Total Standard Fan Power: Full Speed, 75.00 BHP/Unit

Design Conditions @ Standard Total Fan Motor Power per Unit (75.00 HP)

Thermal performance at design conditions and standard total fan motor power is certified by the Cooling Technology Institute (CTI).

Flow Rate: 3,645.00 USGPM
 Hot Water Temp.: 95.00 °F
 Cold Water Temp.: 85.00 °F
 Wet Bulb Temp.: 78.00 °F
 Heat Rejection: 18,217,710 BTUH

Predicted Performance
 Fan Motor Alternative = Full Speed, 0.00 BHP
 Flow Rate = 3645.00 USGPM (100% of Design)



Warning	Applies to Design Conditions	Applies to OffDesign Conditions
1. One or more selection parameters are outside of CTI Certification limits.	No	Yes



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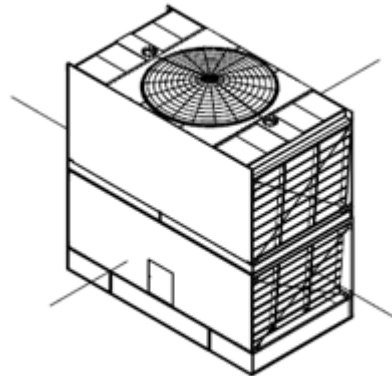
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Fan Type: Standard Fan
Fan Motor: (1) 75.00 = 75.00 HP/Unit
Total Standard Fan Power: Full Speed, 75.00 BHP/Unit

Octave band and A-weighted sound pressure levels (Lp) are expressed in decibels (dB) reference 0.0002 microbar. Sound power levels (Lw) are expressed in decibels (dB) reference one picowatt. Octave band 1 has a center frequency of 63 Hertz.

Top Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	88	76
2	88	76
3	87	76
4	83	70
5	80	65
6	75	61
7	70	56
8	69	53
A-wgtd	85	72

Air Inlet Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	82	70
2	84	69
3	82	72
4	76	68
5	69	63
6	63	54
7	58	48
8	54	44
A-wgtd	78	69



End Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	82	77
2	82	71
3	80	72
4	73	66
5	68	62
6	60	53
7	53	47
8	51	43
A-wgtd	76	68

End Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	82	77
2	82	71
3	80	72
4	73	66
5	68	62
6	60	53
7	53	47
8	51	43
A-wgtd	76	68

Total Sound Power (dB)		
Octave Band	Center Frequency (Hertz)	Lw
1	63	107
2	125	104
3	250	105
4	500	100
5	1000	95
6	2000	88
7	4000	83
8	8000	80

Air Inlet Sound Pressure (dB)		
Octave Band	Distance	
	5 ft.	50 ft.
1	82	70
2	84	69
3	82	72
4	76	68
5	69	63
6	63	54
7	58	48
8	54	44
A-wgtd	78	69

Note: The use of frequency inverters (variable frequency drives) can increase sound levels.



Baltimore Aircoil Company
Cooling Tower Selection Report

Date: September 03, 2020
Location: BALTIMORE, MD, USA

Preventative Maintenance Schedules

Gear Drive	Monthly	Quarterly	Semi-Annually	Annually	Every 5 Years	Labor Hours	QTY/Year	Hours/Year
Inspect and tighten all fasteners, including oil plug			✓			2	2	4.0
Check for and repair oil leaks	✓					2	12	24.0
Check oil level	✓					1	12	12.0
Change gear oil					✓	3	0.2	0.6
Make sure gear vent is open			✓			1	2	2.0
Check driveshaft or coupling alignment			✓			2	2	4.0
Inspect and tighten driveshaft or coupling fasteners				✓		1	1	1.0
Oil Quality Testing		✓				1	4	4.0
Check driveshaft or coupling bushing / flex elements for unusual wear				✓		1	1	1.0
							Total	52.6
Belt Drive	Monthly	Quarterly	Semi-Annually	Annually	Every 5 Years	Labor Hours	QTY/Year	Hours/Year
Check belt condition	✓					1	12	12.0
Check and Adjust Belt Tension		✓				1	4	4.0
Lubricate Bearings		✓				2	4	8.0
Lubricate Motor Base		✓				2	4	8.0
Replace Belt				✓		2.5	1	2.5
							Total	34.5
ENDURADRIVE® Fan System	Monthly	Quarterly	Semi-Annually	Annually	Every 5 Years	Labor Hours	QTY/Year	Hours/Year
Inspect motor		✓				0.5	4	2.0
Grease bearing				✓		1.5	1	1.5
							Total	3.5



Baltimore Aircoil Company Cooling Tower Selection Report

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Drive System Lifetime Analysis

LOAD PROFILE/BUILDING USE

Load Profile	Data Center
Hours per Day	24
Days per Week	7
Weeks per Year	52
Total Hours per Year	8,736
Minimum Load	95%

PROJECTED OPERATING COST BREAKDOWN ASSUMPTIONS

Average Energy Cost (U.S. \$/kWh)	\$0.13
Labor Cost per Hour	\$125.00
Oil Cost per 5 gal Bucket	\$300.00
Annual Oil Testing Costs (Recommended for Extended Life Synthetic Oil)	\$1,500.00
Grease Cost per 12 oz Bottle	\$20.00
Downtime and Lost Productivity Costs per Hour	\$0.00
Estimated Life of Equipment (Years)	23
Inflation Rate	3.0%

Compared Drive Systems

	Gear Box and VFD S3E-1424-14S	Belt Drive and VFD S3E-1424-14S	ENDURADRIVE® Fan System S3E-1424-14S ENDURA
Quantity (Cells)	1	1	1

NEW EQUIPMENT COST INCLUDING VFD

	Gear Box and VFD S3E-1424-14S	Belt Drive and VFD S3E-1424-14S	ENDURADRIVE® Fan System S3E-1424-14S ENDURA
Fan Motor Horsepower per Cell / Total (HP)	75 / 75	75 / 75	75 / 75
Brake Horsepower at Design Load (HP)	74.94	74.94	71.93
Drive System Pricing Premium (per Cell)	\$4,731	BASE	\$22,129
Variable Frequency Drive with NEMA 1 Enclosure (per Cell)	\$5,020	\$5,020	\$0
	ENDURADRIVE Premium over Gear	ENDURADRIVE Premium over Belt Drive	
Total Pricing Premiums	\$12,378		\$17,109

PROJECTED LIFE CYCLE COST BREAKDOWN

	Gear Box and VFD S3E-1424-14S	Belt Drive and VFD S3E-1424-14S	ENDURADRIVE® Fan System S3E-1424-14S ENDURA
New or Rebuild Drive System (Gear or Belt/Sheaves)	\$12,000	\$1,500	N/A
How Many Rebuilds over Product Lifetime?	2	12	N/A
Motor Rebuild/Replacement Cost	\$7,907	\$7,907	\$24,975
How Many Motor Replacements over Product Lifetime?	1	1	1
External Flex Shaft Replacement	\$700	N/A	N/A
Internal Gear Drive Coupling Replacement	\$0	N/A	N/A
Total Part Costs over Life of Equipment	\$32,607	\$25,907	\$24,975

ANNUAL OPERATING COSTS

	Gear Box and VFD S3E-1424-14S	Belt Drive and VFD S3E-1424-14S	ENDURADRIVE® Fan System S3E-1424-14S ENDURA
Energy Use (kWh)	121,849.55	121,849.55	112,062.60
Energy Costs	\$15,840	\$15,840	\$14,568
Annual Maintenance Labor Costs	\$6,575	\$4,313	\$438
Annual Down Time/Lost Productivity	\$0	\$0	\$0
Annual Maintenance Materials Costs	\$116	\$233	\$4
Annual Operational Costs	\$22,531	\$20,386	\$15,010

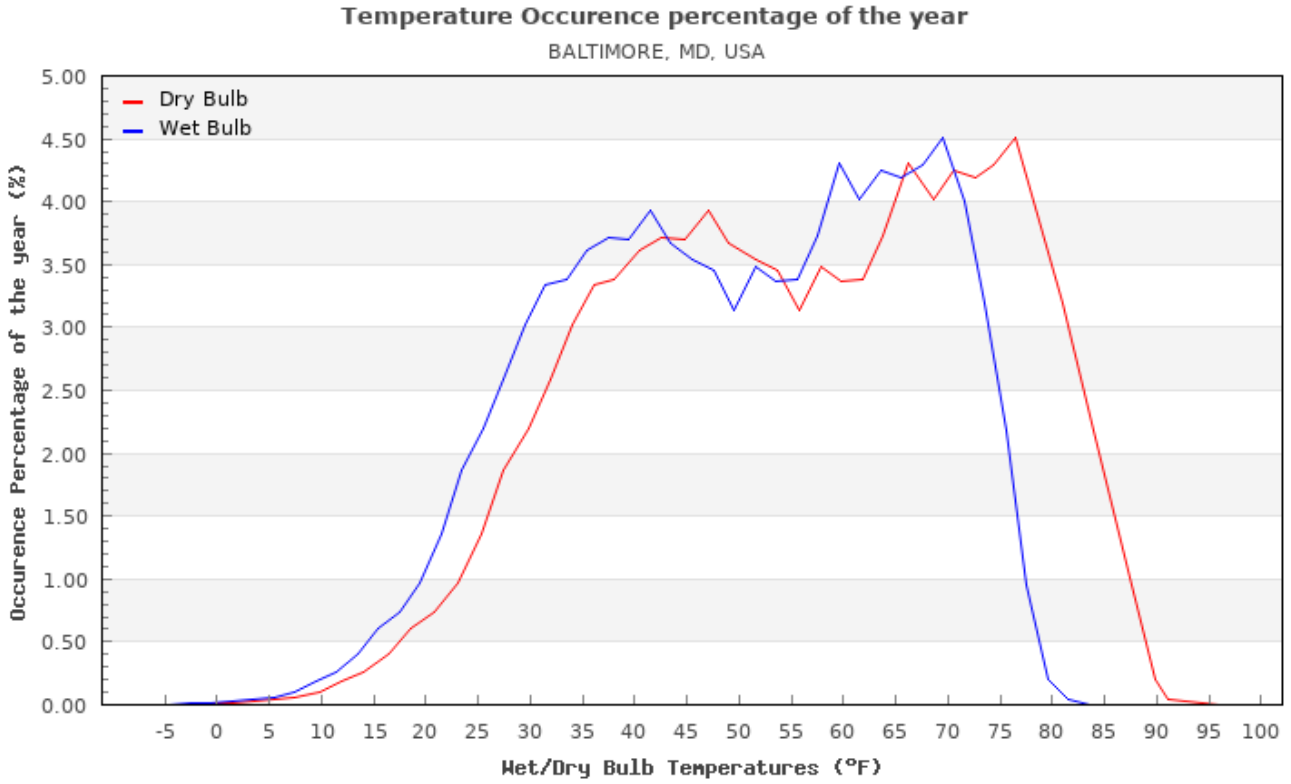
TOTAL LIFETIME COSTS (Incl. Inflation)	\$763,817	\$687,500	\$512,086
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	ENDURADRIVE Savings over Gear	ENDURADRIVE Savings over Belt Drive
TOTAL LIFETIME OPERATIONAL SAVINGS	\$251,731	\$175,414
AVERAGE ANNUAL OPERATIONAL SAVINGS	\$10,945	\$7,627
SIMPLE PAYBACK IN YEARS FOR ENDURADRIVE	1.13	2.24



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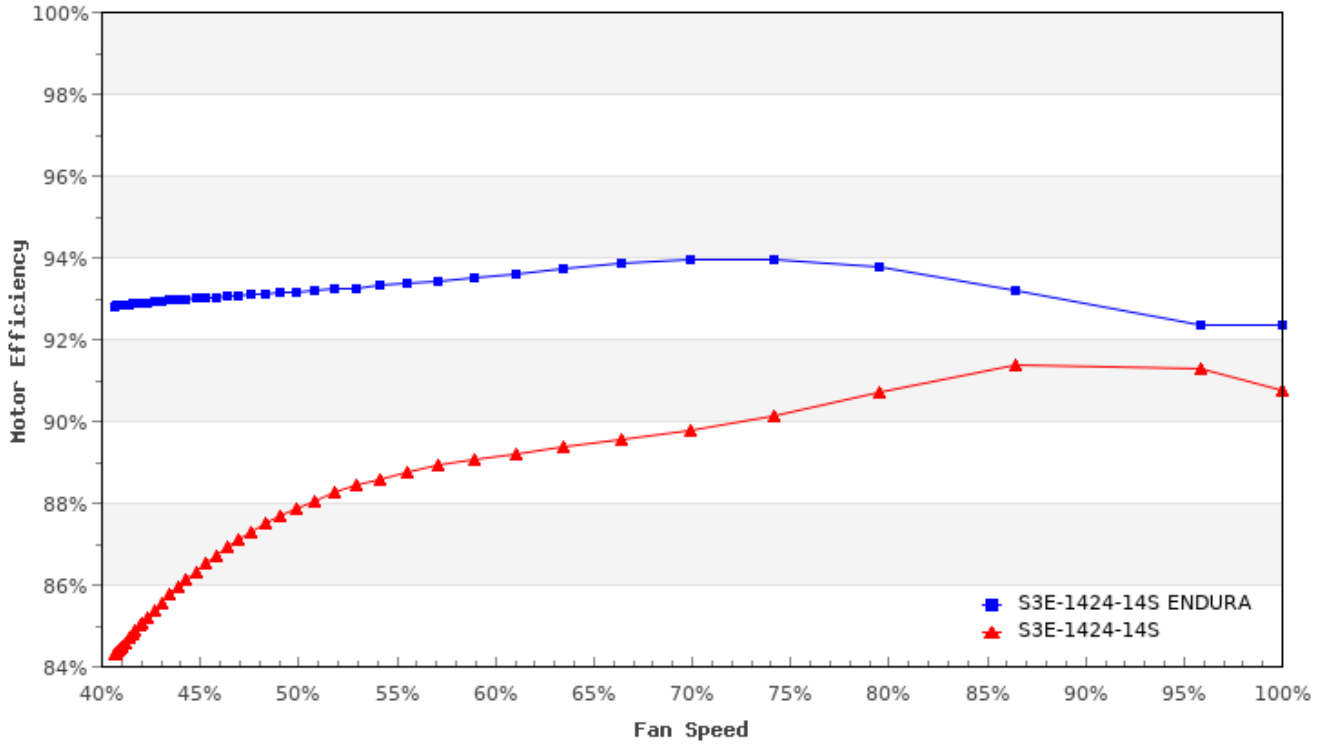
Note: Weather data is based on ASHRAE 2017.



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Motor Efficiencies



Note: Figures are estimates and not a guarantee of actual performance.