How to Select the Right Fan

amca insite

AHR EXPO Atlanta FEB 6-8

Lisa Cherney

Education Manager, AMCA International

Session Moderator

- Joined AMCA in February 2019
- Responsible for development of AMCA's education programs; staff liaison for the Education & Training Committee
- Projects include webinars, online education modules, presentations at trade shows, AMCA Speakers Network and many other items.

Participation Guidelines

- Please place your cell phone on silent or vibrate.
- There will be Q&A at the end of the session.
- To receive PDH credit for attending:
  - Be sure to have your badge scanned by a room monitor so a complete attendee list can be generated.
  - You must be present for the entire session and complete a post-session online evaluation. Partial credit cannot be given for anyone who arrives late, leaves early or does not complete the evaluation.
  - There will be a QR code for the survey on screen at the end of the presentation, and a link will be emailed to everyone within 2 weeks. The survey must be completed to qualify for today's PDH credit. If you do not want PDH credit, completing the survey is optional, and your feedback is greatly appreciated.

AMCA International has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

Attendance for the entire presentation AND a completed evaluation are required for PDH credit to be issued.

DISCLAIMER

The information contained in this education session is provided by AMCA International as an educational service and is not intended to serve as professional engineering and/or manufacturing advice. The views and/or opinions expressed in this educational activity are those of the speaker(s) and do not necessarily represent the views of AMCA International. In making this educational activity available AMCA International is not endorsing, sponsoring or recommending a particular company, product or application. Under no circumstances, including negligence, shall AMCA International be liable for any damages arising out of a party's reliance upon or use of the content contained in this education session.

COPYRIGHT MATERIALS

Jason Meinke

Director of Sales – Commercial Products
Twin City Fan

- Over 10 years in the HVAC industry as an engineer and sales leader
- BS in Civil Engineering from University of Minnesota Twin cities
- Focus on new business, channel development and building successful teams
- Has served on several AMCA committees
- Passionate about educating the HVAC community on energy efficiency, reliability and quality

How to Select the Right Fan

Purpose and Learning Objectives

This purpose of this presentation is to review the types of fans and fan construction and address the important fan selection considerations and other factors that should be known in order to ensure the right fan for the right job is guaranteed.

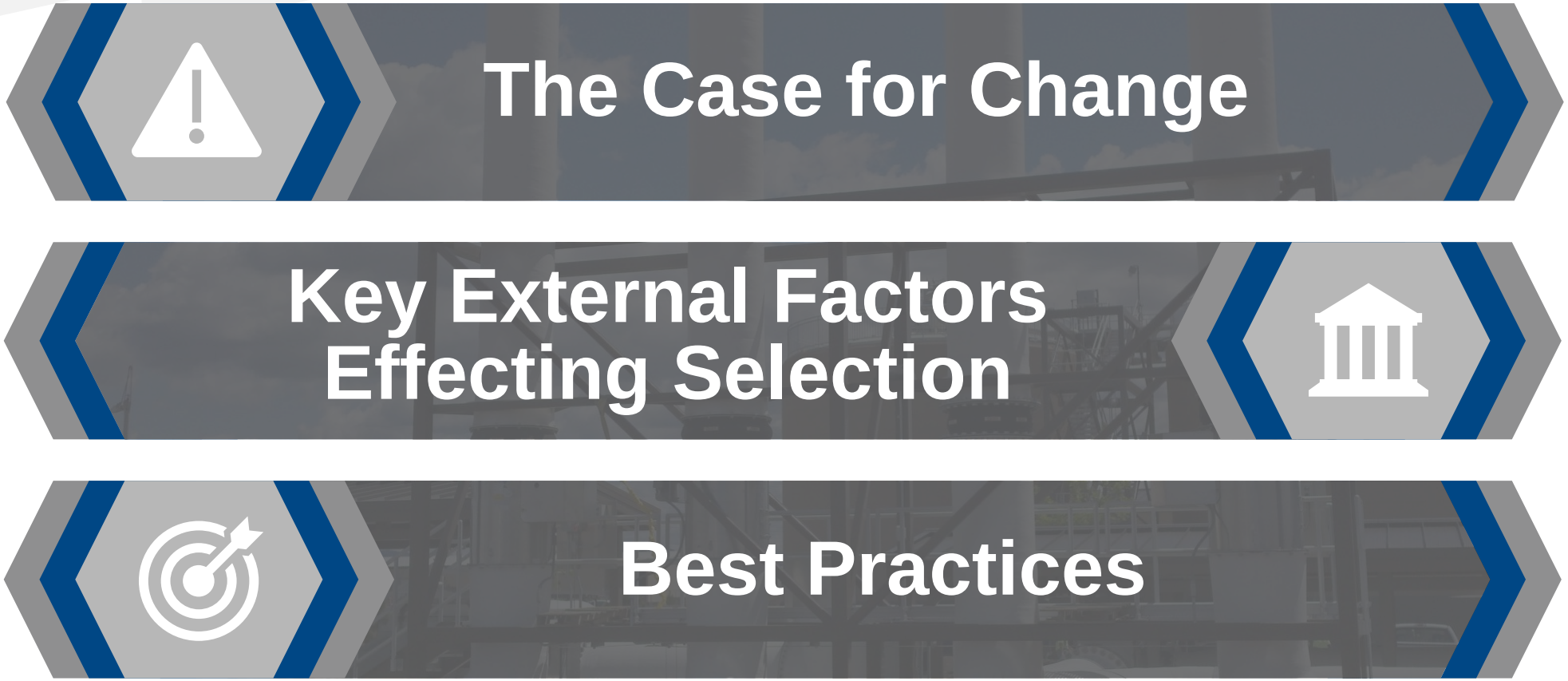
At the end of this presentation, you will be able to:

1. Explain the main reasons why selecting the right fan is critical.
2. Identify the key external factors effecting selection of the proper fan for the job requirements.
3. Describe how energy efficiency, safety and upfront cost all need to be evaluated per project.
4. Outline the questions that need to be asked when making a fan selection.

3 Takeaways

1. We have a choice -
   - Increasing safety requirements
   - Energy efficiency is more important then ever
2. Regulations are here and more are coming
3. Every selection is different and important. Rely on the experts with your questions.

Learning Outcomes



The Case for Change

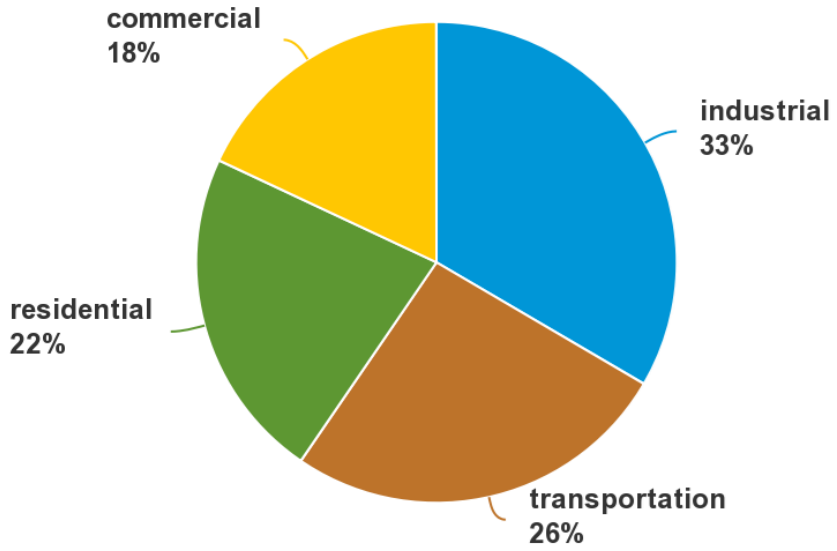

Energy
Efficiency
Safety


Up front
Cost

Energy Consumption

Share of total U.S. energy consumption by end-use sectors, 2020

Total = 92.94 quadrillion British thermal units

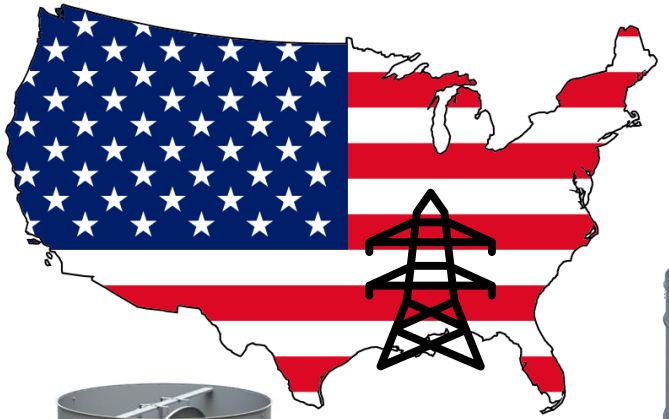


"Commercial and Industrial buildings account for approximately 51% of total U.S. energy use."

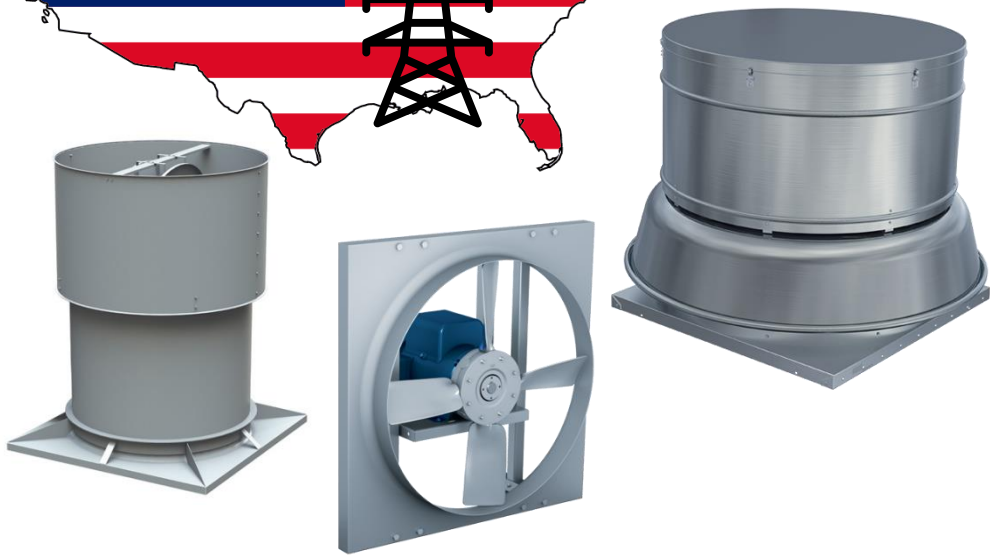
- U.S. Energy Information Administration, April 2021

Energy Consumption

The yearly consumption of Commercial & Industrial fans



7.6%



2020 US Energy Consumption

27,238,916,784,001 kWh

What we can do - 1% Reduction

Extra households to power

25.6M Households

- Based on average household consumption of 10,649 kWh / year

Savings

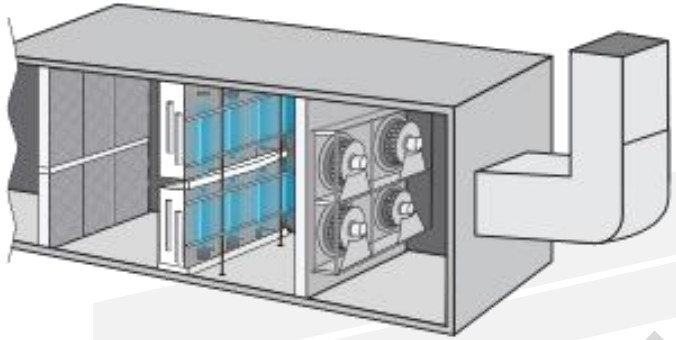
$34.2 Billion

- Based on average US Electricity Rate of 12.55 cents / kWh

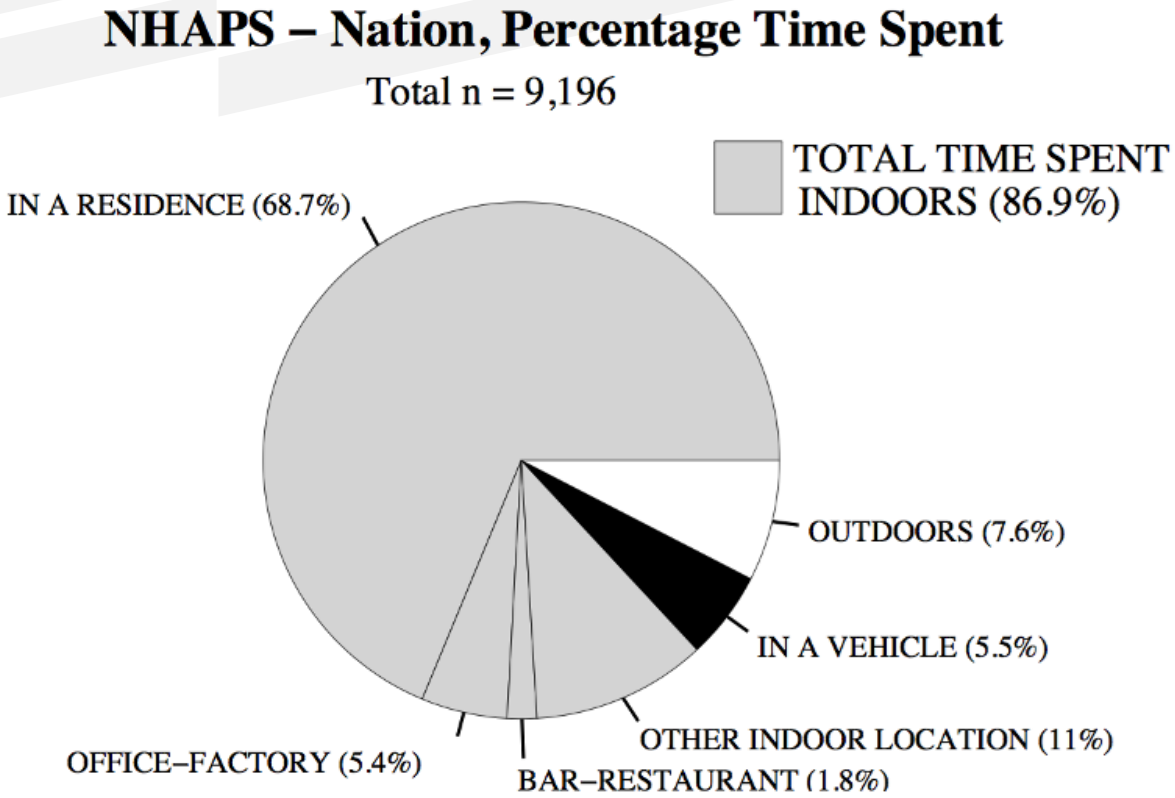
Safety – Pandemic

ASHRAE Recommendations for COVID-19

- 24/7 operation - ASHRAE 62.1 Airflow Recommendations
- MERV 13 Filtration
- Ultraviolet Germicidal Disinfection
- Portable Room Cleaners with HEPA Filter
- Increase Outside Air



Safety



National Human Activity Pattern Survey

-Funded by EPA (Environmental Protection Agency)

Indoor Air Quality

- Estimated percentage of buildings with complaints related to indoor air quality

Real Consequences

U.S. indirect costs, including missed work and lost productivity.

- **Asthma:** $5 Billion / Year
- **Allergic Rhinitis:** $9.7 Billion / Year

-Asthma & Allergy Foundation of America, 2021

Environmental Litigation

Dangerous indoor air quality and sick building syndrome are a **growing** area of law for lawyers in the areas of personal injury, real estate, construction, homeowner associations and business.

Return on Investment

Professional Productivity

Average Productivity Savings of Proper Ventilation

$6,500 /person / year

Average Cost of Proper Ventilation

$40 /person / year

Return on Investment

16,250%

- U.S. Department of Labor and Harvard University Study, 2017

Student Performance

"54% of public school districts needed to update or replace multiple building systems or features in their schools"

- U.S. Government Accountability Office, June 2020

Proper Ventilation:

Reduced rate of absenteeism

Improves overall health and productivity of Teachers

Improves test scores

External Factors

External Factors

AMCA

OSHA

NFPA

Miami Dade Regulation

OSHPD Regulation

FEI vs. FEG

Wire-to-Air Metric

Output Power (Air Power)
"Airflow x Pressure"

Input Power
"Fan Shaft Power"

Fan Electrical
Input Power
"FEP"

Software vs. Knowledge

Compute-A-Fan
A Fast & Easy to Use Fan-Selection Program
V10
COOK
75 YEARS OF IMAGINATION, INNOVATION & INSPIRATION

FS10

TCF
TWIN CITY FAN

eCAPS®
Engineer Application Suite

Does software know…

- about energy efficiency requirements?
- what the application is?
- duct design to avoid system effect?
- the latest ASHRAE 62.1 recommendations?
- advise on initial cost vs. cost of ownership?
- safety requirements?
- your project goals and intentions?

External Factors

Your Local Fan and Ventilation Representation?

ORDER OF THE ENGINEER

Best Practices

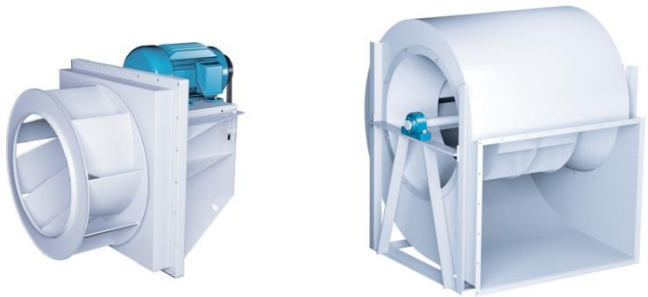
Selection Story

Mike Johnson, the owner of Wood Cutters Direct has reached out to you because they need to add additional dust collection lines to their Manufacturing facility. Through a discussion you have determined that the fan will be on the clean side of the dust collector and that it will require **30,000 CFM at 10 inches** of static pressure when the filters require cleaning.

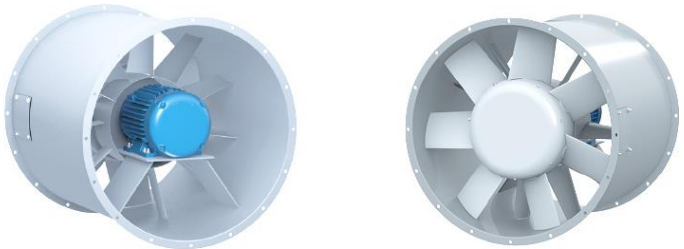
Some key facts that you have uncovered are:

- Sanding equipment will be used in the system
- There is currently no process set up for fan maintenance at the facility
- When the filters are clean the system requires the fan to overcome 6 inches of static pressure
- The collector currently does not have a mechanism to shut off in the event a filter is ruptured or breaks.
- The fan is outdoors located on a large concrete pad

What Type of Fan Is It?



Centrifugal



Axial

Inline /
Roof Exhaust

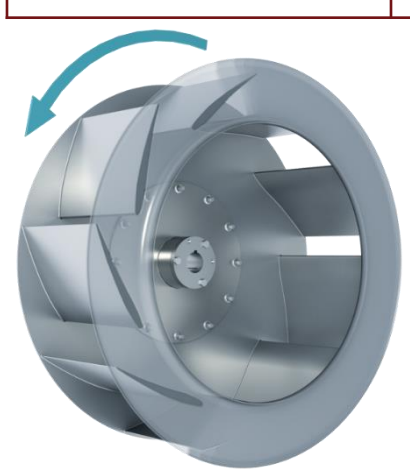
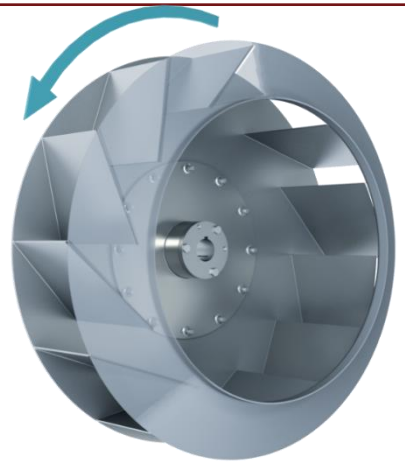
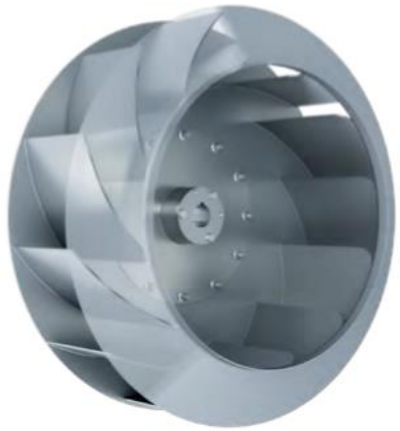
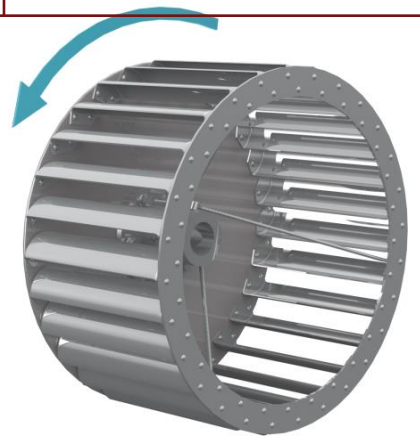
Single Width or Double Width?

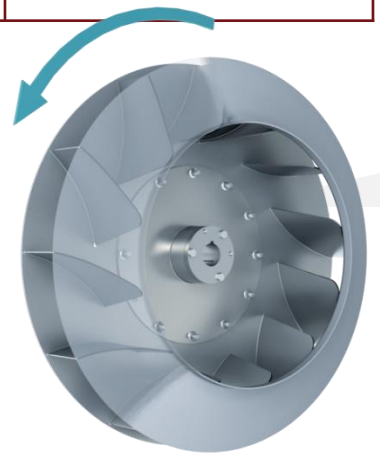
SWSI

DWDI

What Centrifugal Impeller?

Airfoil	Backward Inclined	Backward Curved	Forward Curved	Radial Blade	Radial Tip
Very High Efficiency	High Efficiency	Higher Efficiency	Medium Efficiency	Low Efficiency	Medium - Low Efficiency
Energy savings are of prime importance	Energy savings are important but other factors do not allow for airfoil	Similar effects to airfoil	Low Speed, Noise	Airstream contains heavy particulate or corrosive elements	Airstream contains light particulate and corrosive elements
Clean Air, AHU	Clean Air, AHU, Dust Collection, pneumatic conveying	Clean Air	Clean Air, Residential, Low-Cost AHU	Dust Collection	

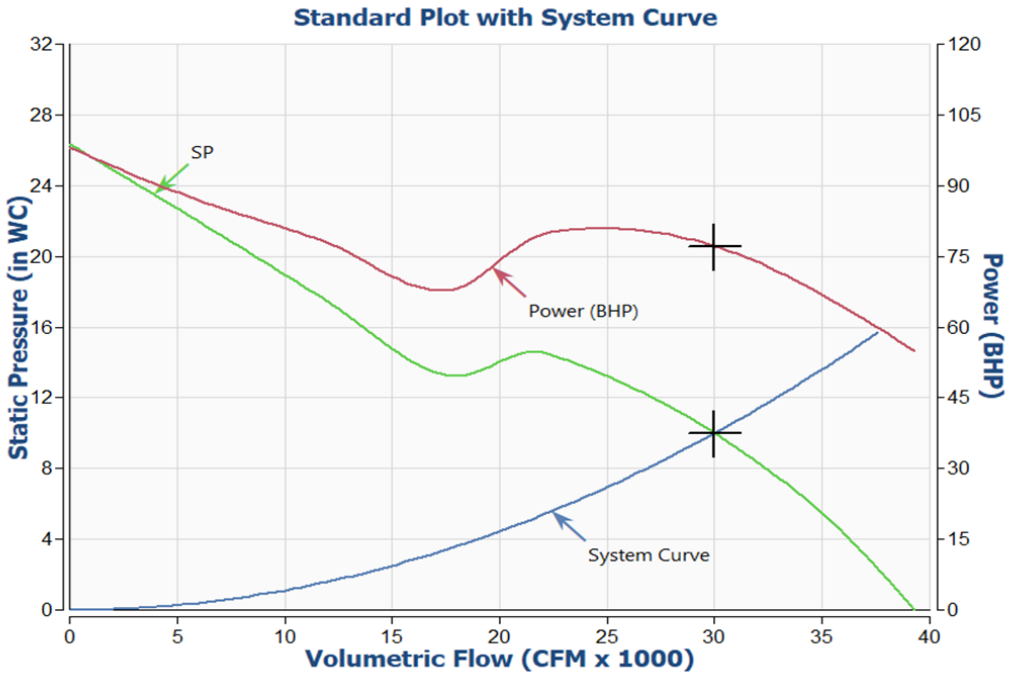


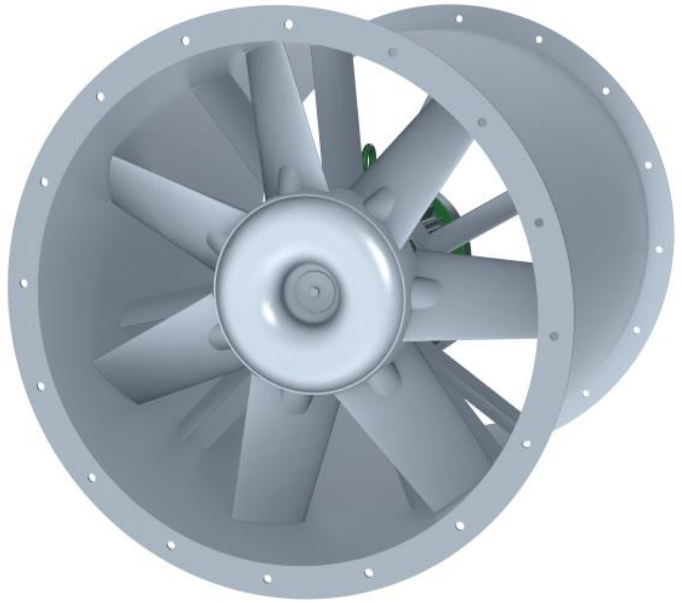
Axial Fans

Fan information

Size/Model	28B4/TCVA	Class	III	Outlet Vel (FPM)	6892
Volumetric Flow (CFM)	30000	Speed (RPM)	4220	Density (lb/ft³)	0.075
SP (in WC)	1	Max Speed	2,456 RPM @ 70 °F		
Blade Angle	0°	Power (BHP)	77.16		

Adjusted for





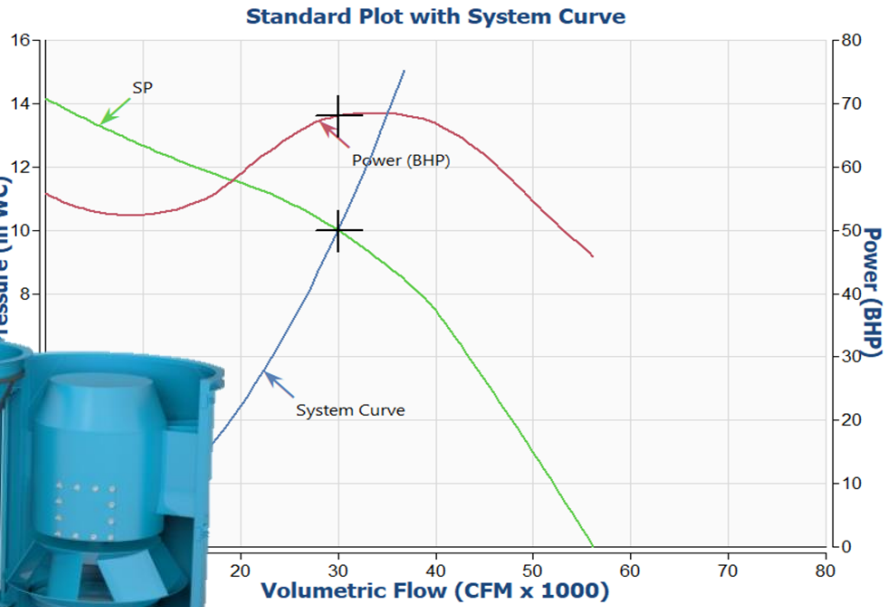
Back to Type of Fan

Other Fan Types

Fan information

Size/Model	365/QSL	Class	I	Outlet Vel (FPM)	2251
Volumetric Flow (CFM)	30000	Speed (RPM)	1583	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1459		
		Power (BHP)	68.08		

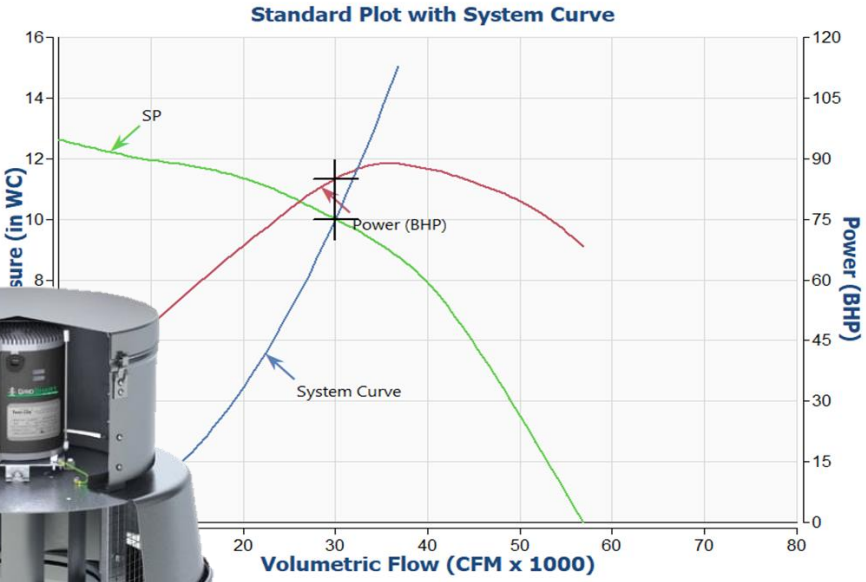
Adjusted for

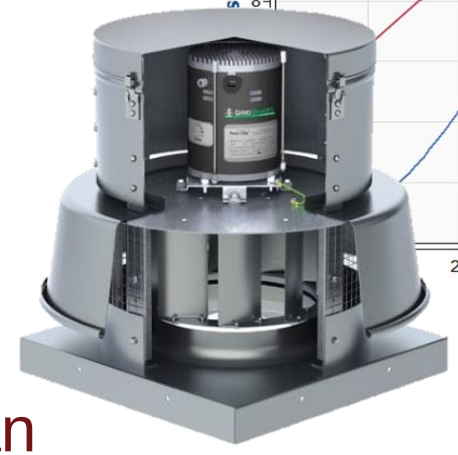


Fan information

Size/Model	420D/BCRD	Class	N/A	Outlet Vel (FPM)	2632
Volumetric Flow (CFM)	30000	Speed (RPM)	1389	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	615		
		Power (BHP)	84.98		

Adjusted for

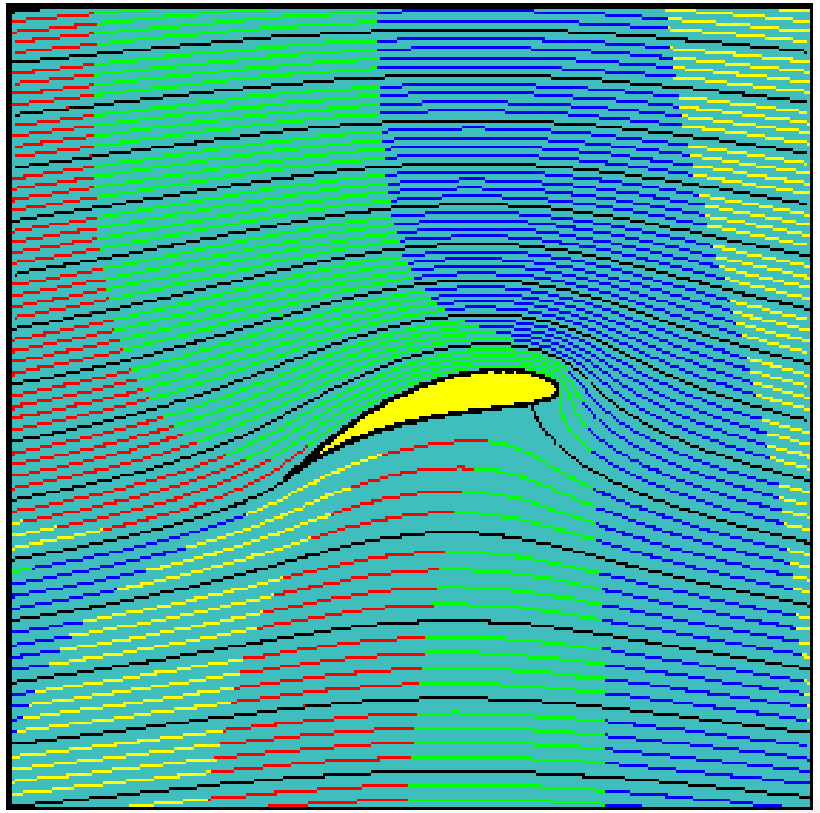




Back to Type of Fan

Airfoil

- Is the filter media of the dust collector a bag or a cartridge?
- Does the owner have a fan/collector maintenance schedule?



Back to Type of Impeller

Back to Type of Fan

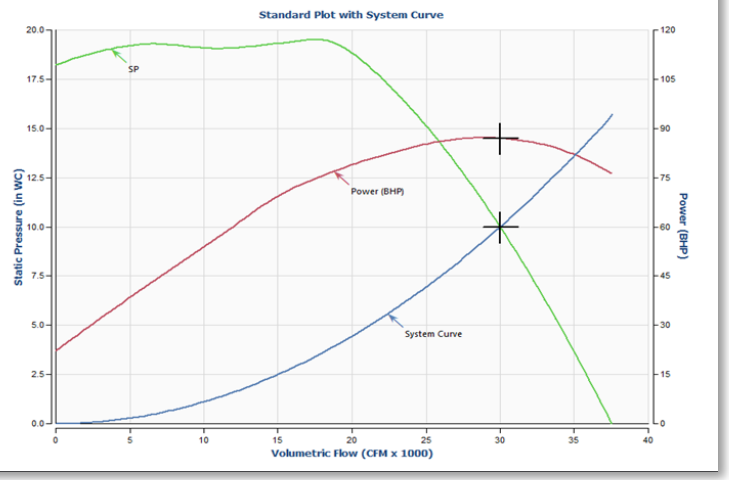
Backward Inclined

Size 300

Fan information

Size/Model	300/BC-SW	Class	V	Outlet Vel (FPM)	5803
Volumetric Flow (CFM)	30000	Speed (RPM)	2350	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	2,670 RPM @ 70 °F		
		Power (BHP)	87.04		

Adjusted for

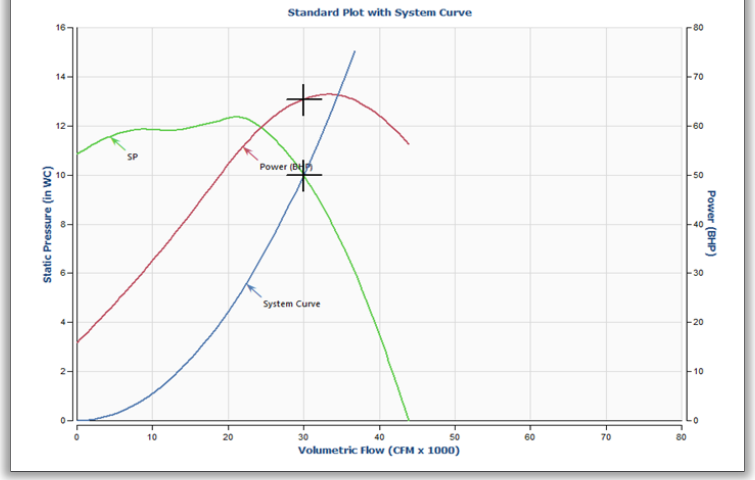


Size 365

Fan information

Size/Model	365/BC-SW	Class	III	Outlet Vel (FPM)	3916
Volumetric Flow (CFM)	30000	Speed (RPM)	1510	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,727 RPM @ 70 °F		
		Power (BHP)	65.42		

Adjusted for

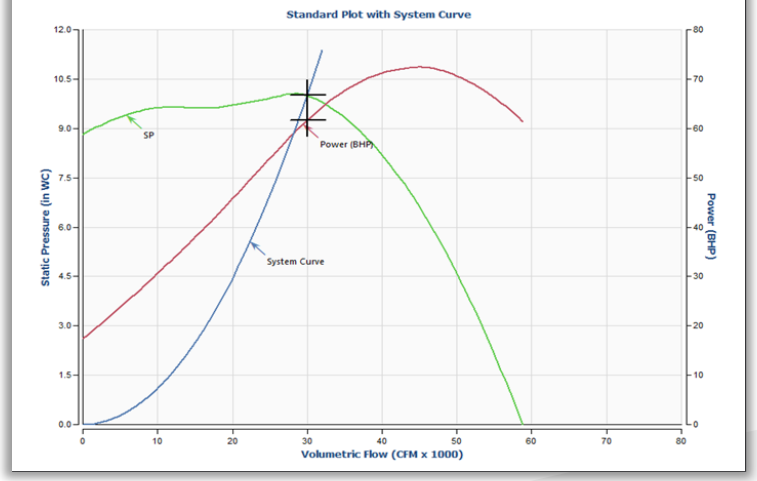


Size 445

Fan information

Size/Model	445/BC-SW	Class	III	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1117	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,416 RPM @ 70 °F		
		Power (BHP)	61.65		

Adjusted for



Back to Type of Impeller Back to Type of Fan Final Selections

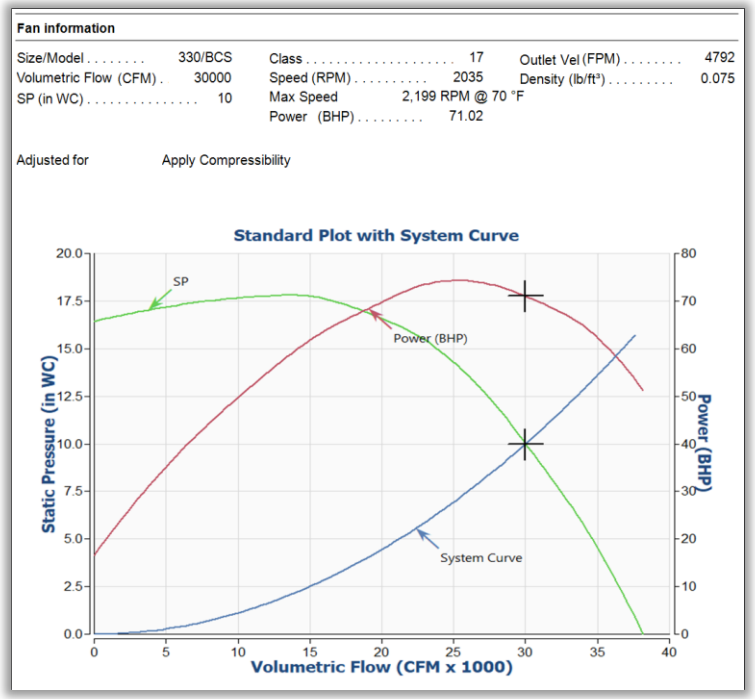
Backward Curved

Size 330

Fan information

Size/Model	330/BCS	Class	17	Outlet Vel (FPM)	4792
Volumetric Flow (CFM)	30000	Speed (RPM)	2035	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	2,199 RPM @ 70 °F		
		Power (BHP)	71.02		

Adjusted for Apply Compressibility

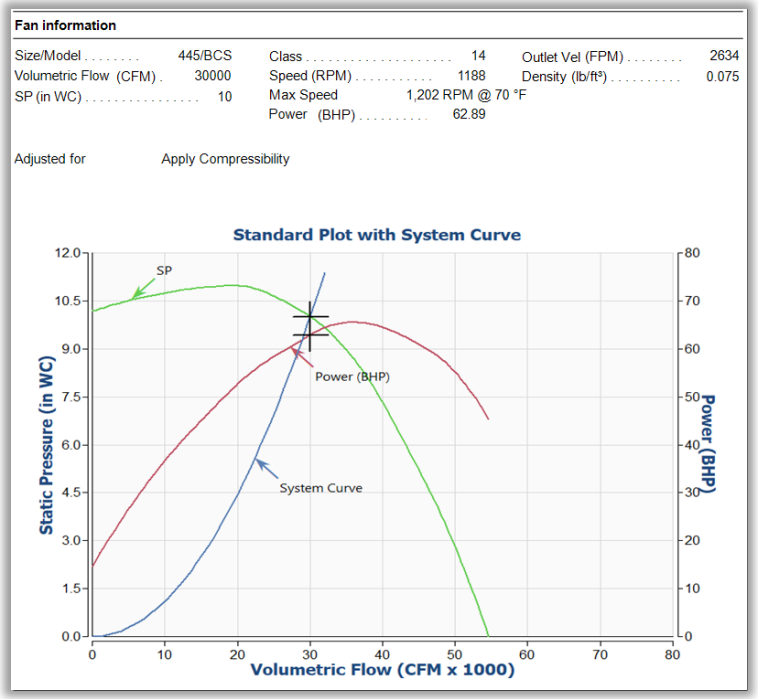


Size 445

Fan information

Size/Model	445/BCS	Class	14	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1188	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,202 RPM @ 70 °F		
		Power (BHP)	62.89		

Adjusted for Apply Compressibility

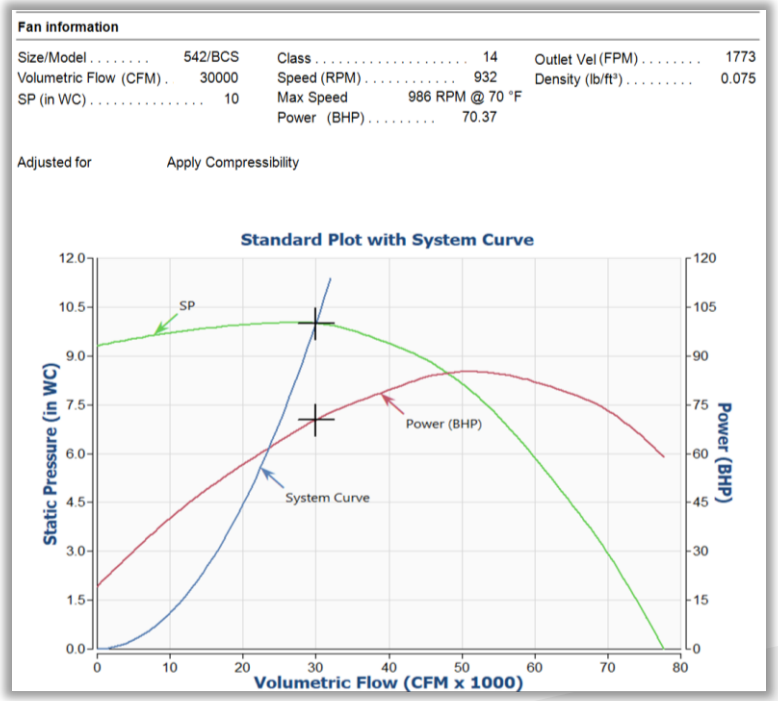


Size 542

Fan information

Size/Model	542/BCS	Class	14	Outlet Vel (FPM)	1773
Volumetric Flow (CFM)	30000	Speed (RPM)	932	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	986 RPM @ 70 °F		
		Power (BHP)	70.37		

Adjusted for Apply Compressibility



Back to Type of Impeller

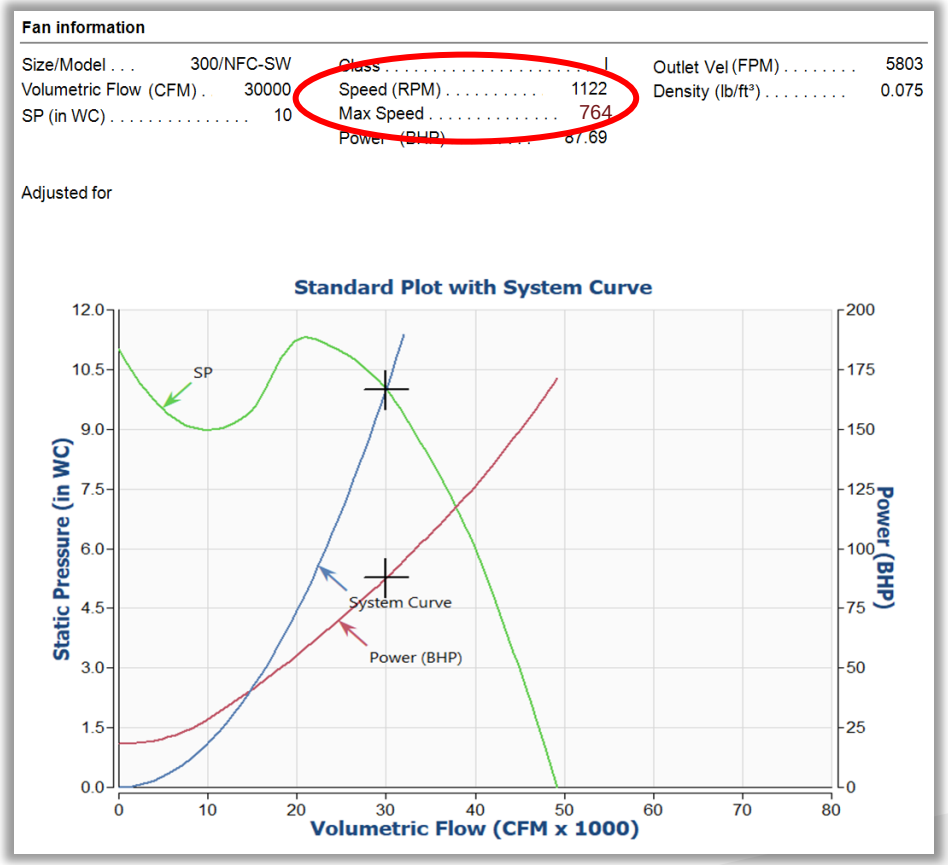
Back to Type of Fan

Final Selections

Forward Curved

- Too Fast RPM
- Outlet Velocity

Size 300



Back to Type of ImpellerBack to Type of Fan Final Selections

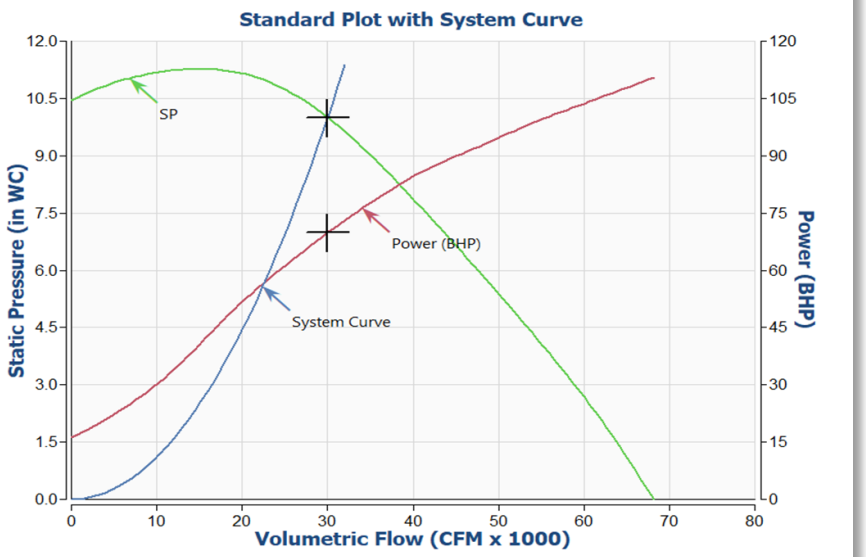
Radial Blade

Dirty Filters

Fan information

Size/Model	937/RBA	Class	22	Outlet Vel (FPM)	3995
Volumetric Flow (CFM)	30000	Speed (RPM)	689	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	983 RPM @ 70 °F		
		Power (BHP)	69.82		

Adjusted for Apply Compressibility

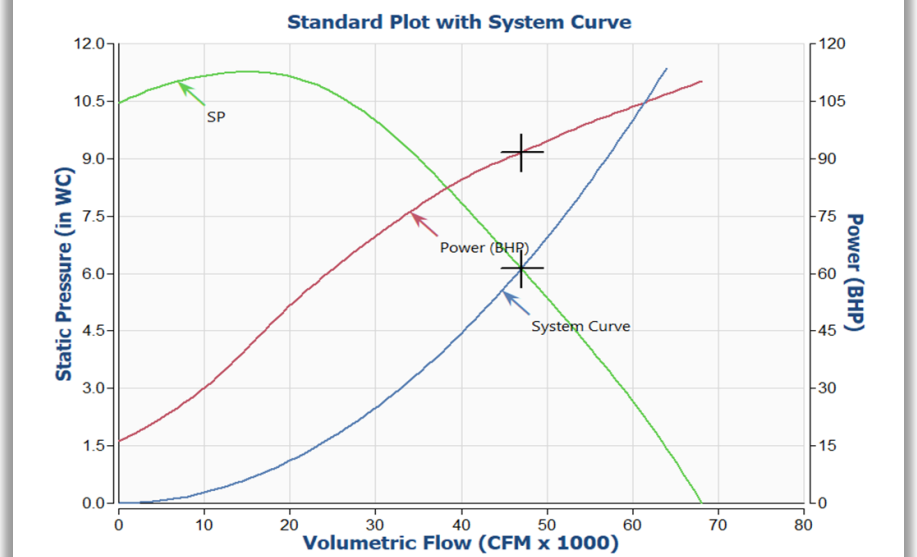


Clean Filters

Fan information

Size/Model	937/RBA	Class	22	Outlet Vel (FPM)	6258
Volumetric Flow (CFM)	47000	Speed (RPM)	689	Density (lb/ft³)	0.075
SP (in WC)	6.129	Max Speed	983 RPM @ 70 °F		
		Power (BHP)	91.61		

Adjusted for Apply Compressibility



Possible Solution:

- Outlet Damper
- VFD

Outlet Velocity?

Back to Type of Impeller Back to Type of Fan Final Selections

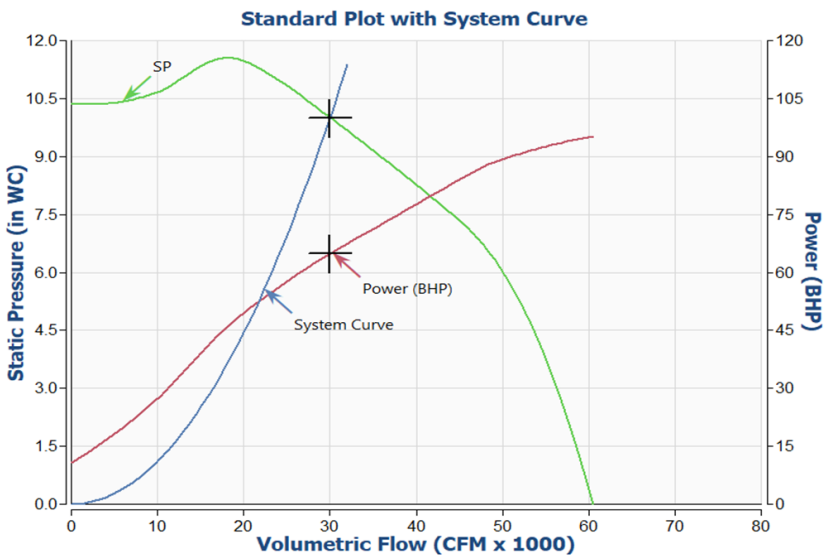
Radial Tip

Dirty Filters

Fan information

Size/Model	490/RTF	Class	18	Outlet Vel (FPM)	2105
Volumetric Flow (CFM)	30000	Speed (RPM)	840	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,247 RPM @ 70 °F		
		Power (BHP)	64.87		

Adjusted for Evase, Apply Compressibility

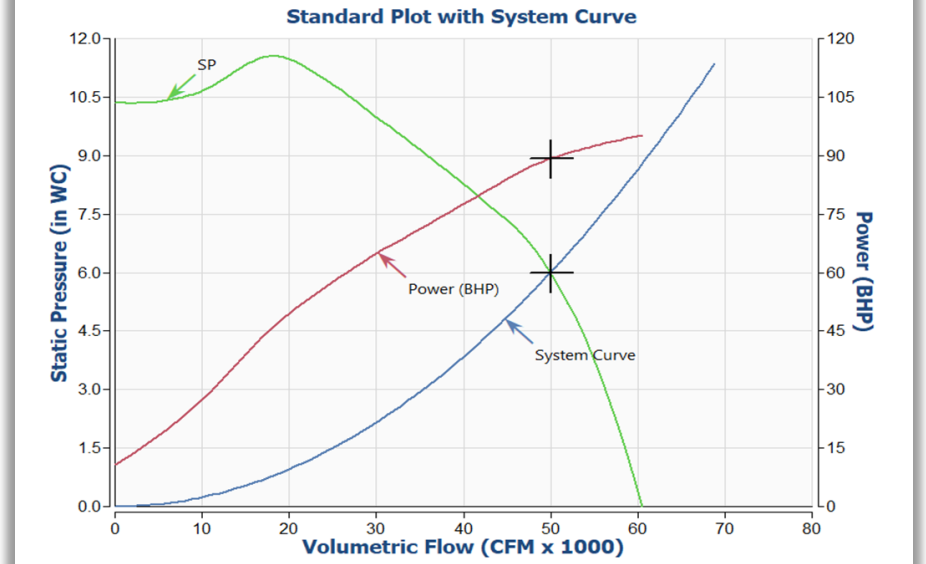


Clean Filters

Fan information

Size/Model	490/RTF	Class	18	Outlet Vel (FPM)	3508
Volumetric Flow (CFM)	49996	Speed (RPM)	840	Density (lb/ft³)	0.075
SP (in WC)	6	Max Speed	1,247 RPM @ 70 °F		
		Power (BHP)	89.2		

Adjusted for Evase, Apply Compressibility



Possible Solution:

- Outlet Damper
- VFD

Back to Type of Impeller Back to Type of Fan Final Selections

Options - Selection

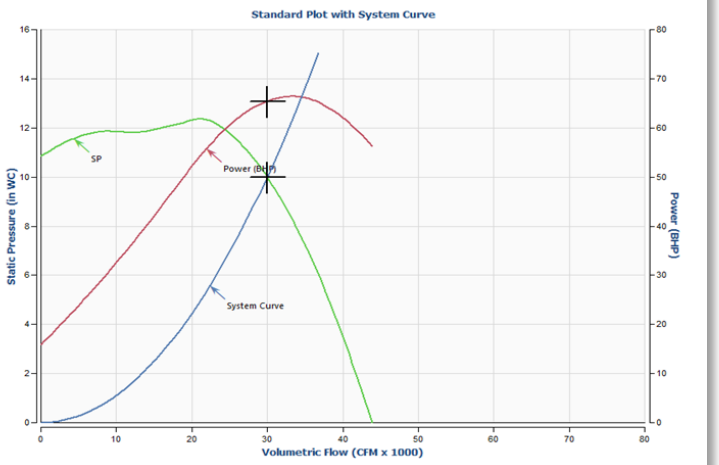
Option 1

Backward Inclined Size 365

Fan information

Size/Model	365/BC-SW	Class	III	Outlet Vel (FPM)	3916
Volumetric Flow (CFM)	30000	Speed (RPM)	1510	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,727 RPM @ 70 °F		
		Power (BHP)	65.42		

Adjusted for



Cost : 1.0

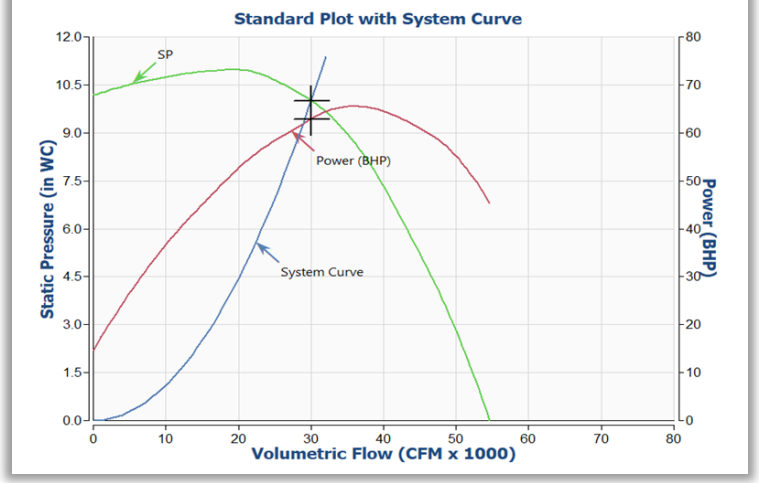
Option 2

Backward Curved Size 445

Fan information

Size/Model	445/BCS	Class	14	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1188	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,202 RPM @ 70 °F		
		Power (BHP)	62.89		

Adjusted for Apply Compressibility



Cost : 1.12

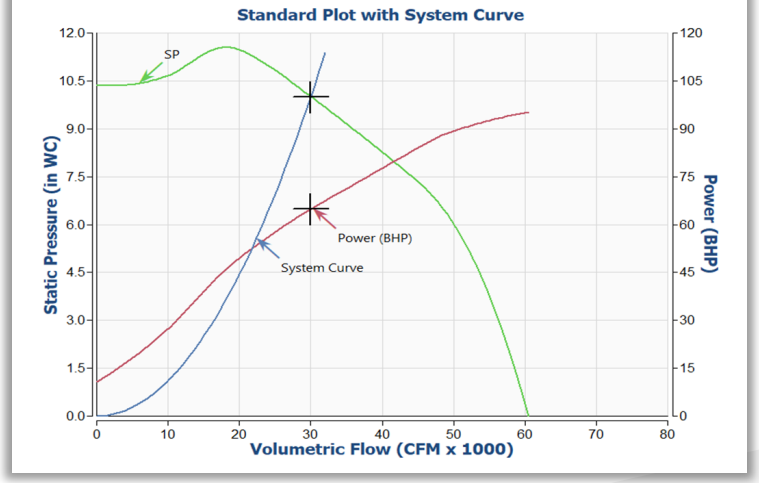
Option 3

Radial Tip Size 490

Fan information

Size/Model	490/RTF	Class	18	Outlet Vel (FPM)	2105
Volumetric Flow (CFM)	30000	Speed (RPM)	840	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,247 RPM @ 70 °F		
		Power (BHP)	64.87		

Adjusted for Evase, Apply Compressibility



Cost : 2.87

Options - Selection

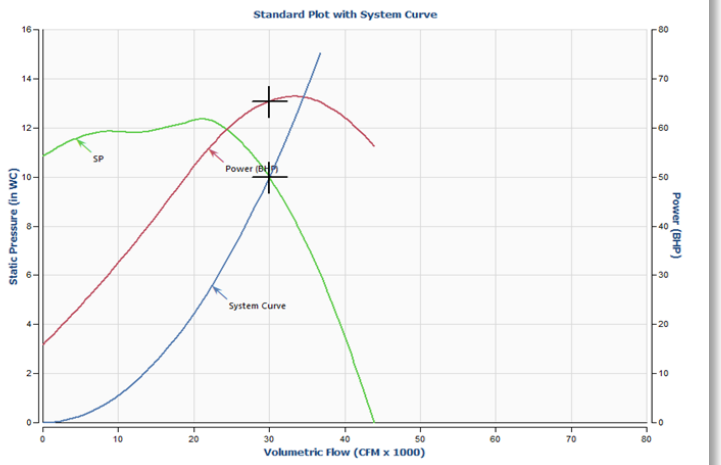
Option 1

Backward Inclined Size 365

Fan information

Size/Model	365/BC-SW	Class	III	Outlet Vel (FPM)	3916
Volumetric Flow (CFM)	30000	Speed (RPM)	1510	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,727 RPM @ 70 °F		
		Power (BHP)	65.42		

Adjusted for



Cost : 1.0

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
	104	100	104	102	98	95	90	83	104

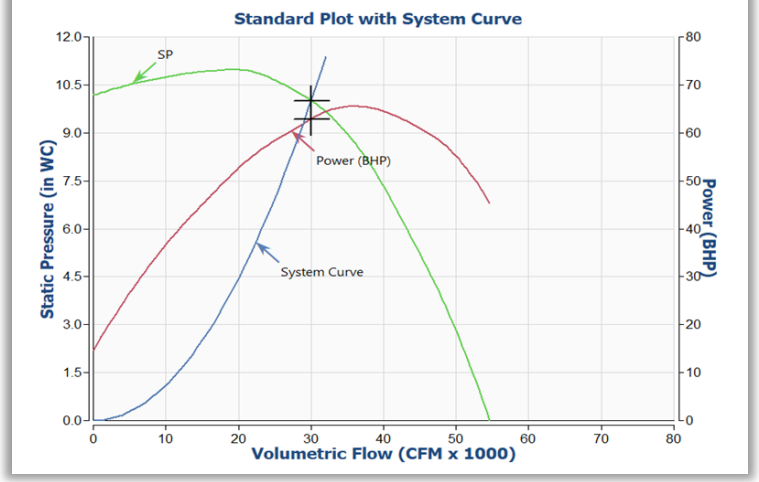
Option 2

Backward Curved Size 445

Fan information

Size/Model	445/BCS	Class	14	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1188	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,202 RPM @ 70 °F		
		Power (BHP)	62.89		

Adjusted for Apply Compressibility



Cost : 1.12

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
	100	98	104	96	95	92	87	82	101

Option 3

Radial Tip Size 490

Cost : 2.87

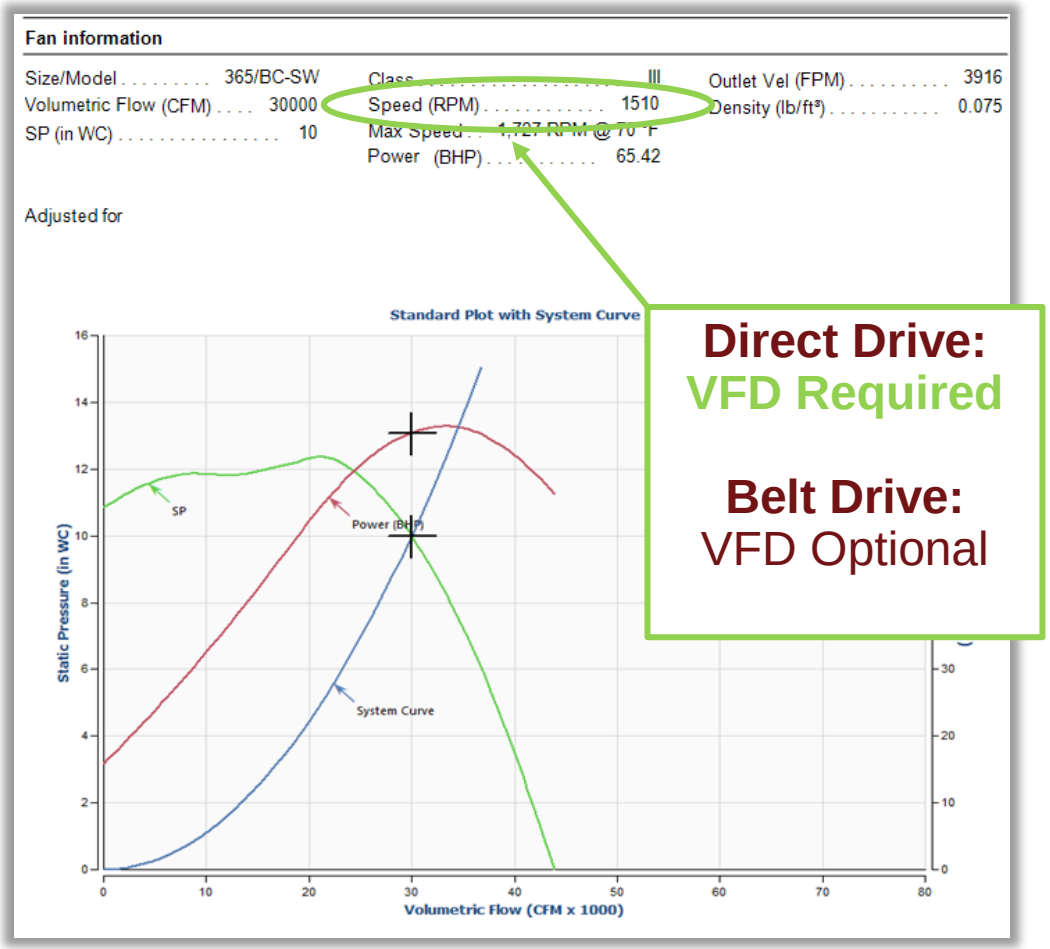
Direct Drive or Belt Driven?

	Direct Drive	Belt Driven
Pros	Low Maintenance *Energy Efficiency* Safety Smaller Footprint	Low Cost Low Wear and Tear Flexibility
Cons	*Cost of VFD* Difficult Replacement Impeller Weight	High Maintenance Belt Noise Poor Spark Resistance

Direct Drive or Belt Driven?

Option 1

Backward Inclined Size 365

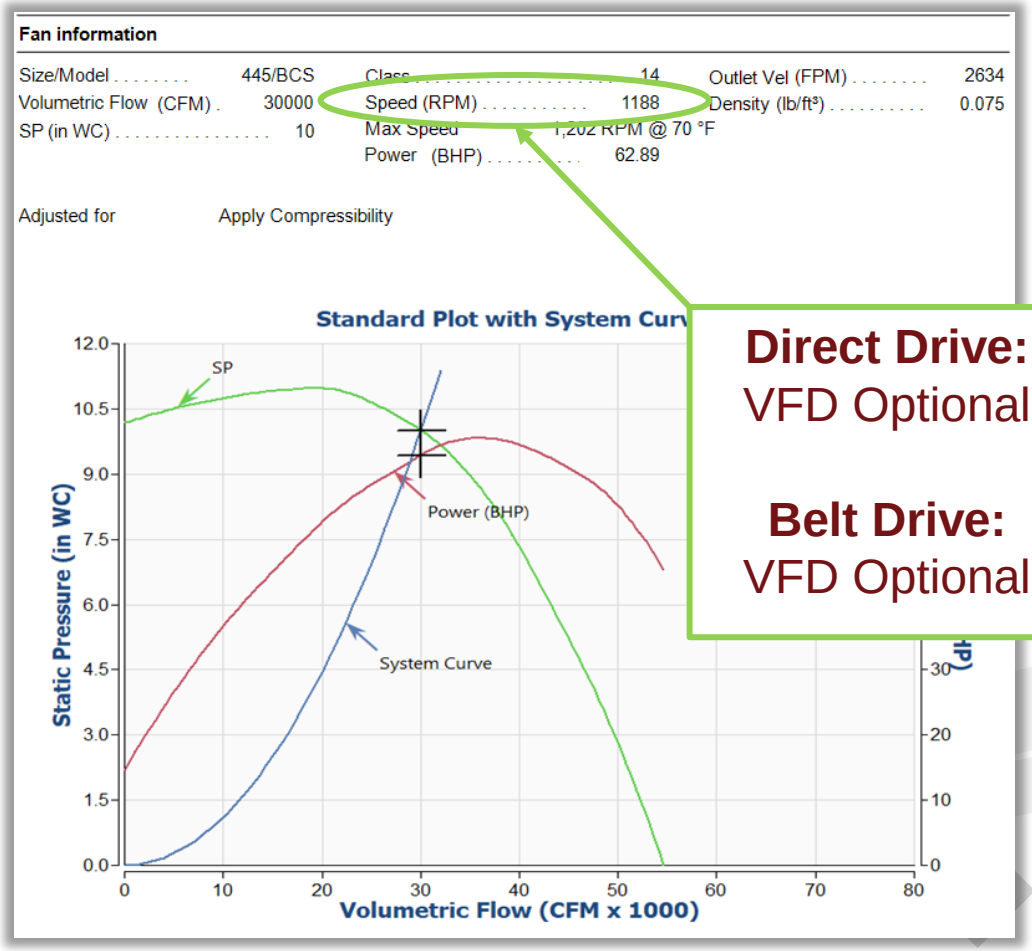


Direct Drive:
VFD Required

Belt Drive:
VFD Optional

Option 2

Backward Curved Size 445



Direct Drive:
VFD Optional

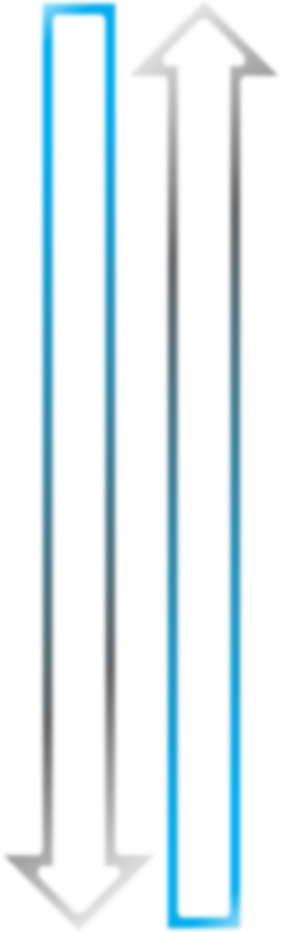
Belt Drive:
VFD Optional

Turn Down vs. Turn Up

Turn Down

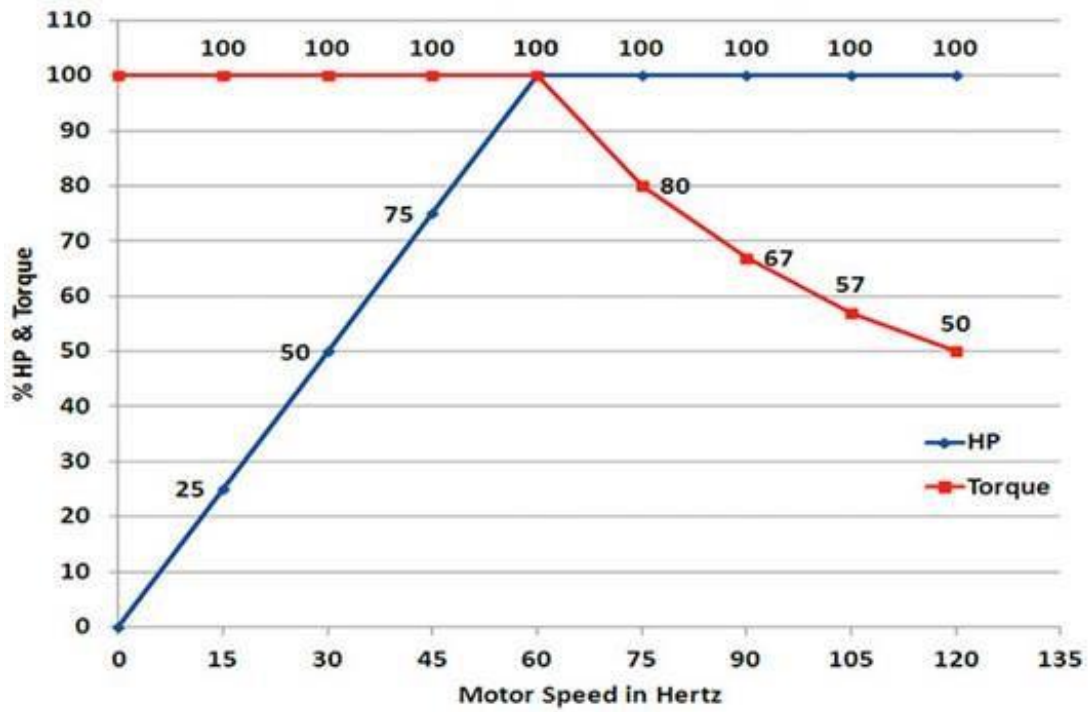
1:1 Loss of HP

1800 RPM | 1 HP
1350 RPM | ¾ HP
900 RPM | ½ HP



Turn Up

Loss of Torque



Direct Drive or Belt Driven?

Option 1

Backward Incline Size 365

Fan information

Size/Model	365/BC-SW	Class	III	Outlet Vel (FPM)	3916
Volumetric Flow (CFM)	30000	Speed (RPM)	1510	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,707 RPM @ 70 °F		
		Power (BHP)	65.42		

Adjusted for

Direct Drive:

VFD Required

(1510 RPM (Fan Speed) / 1760 RPM (Motor Synchronous speed)

x 75 HP (rated HP of Motor) = 64.34 HP Remaining

64.34 HP (remaining HP) < 65.42 BHP (HP required to operate fan)

Size Up Required - 100 HP (~+$3,500)

Belt Drive:

VFD Optional

75 HP

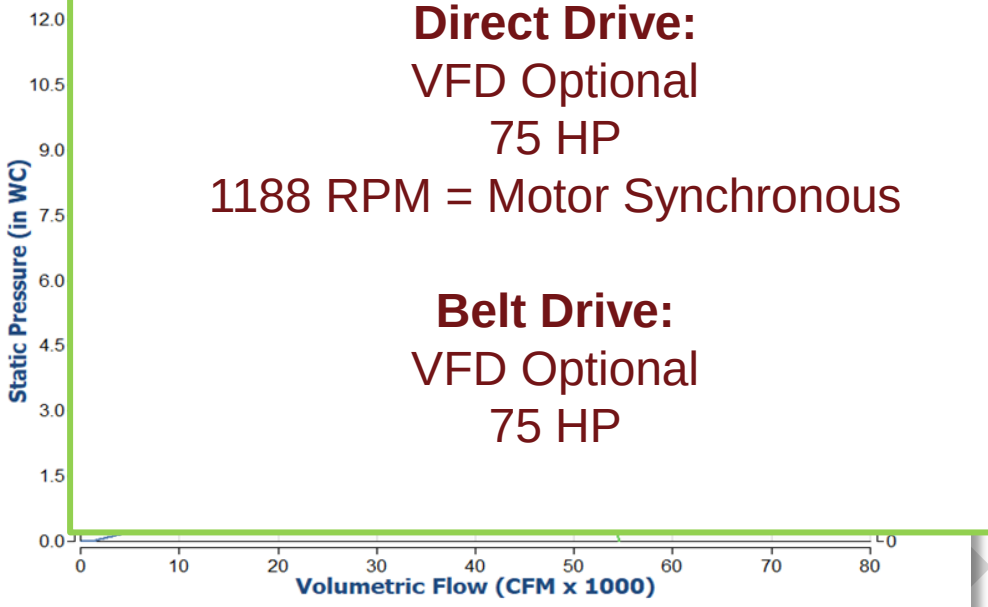
Option 2

Backward Curve Size 445

Fan information

Size/Model	445/BCS	Class	14	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1188	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,202 RPM @ 70 °F		
		Power (BHP)	62.89		

Adjusted for Apply Compressibility



Direct Drive:

VFD Optional

75 HP

1188 RPM = Motor Synchronous

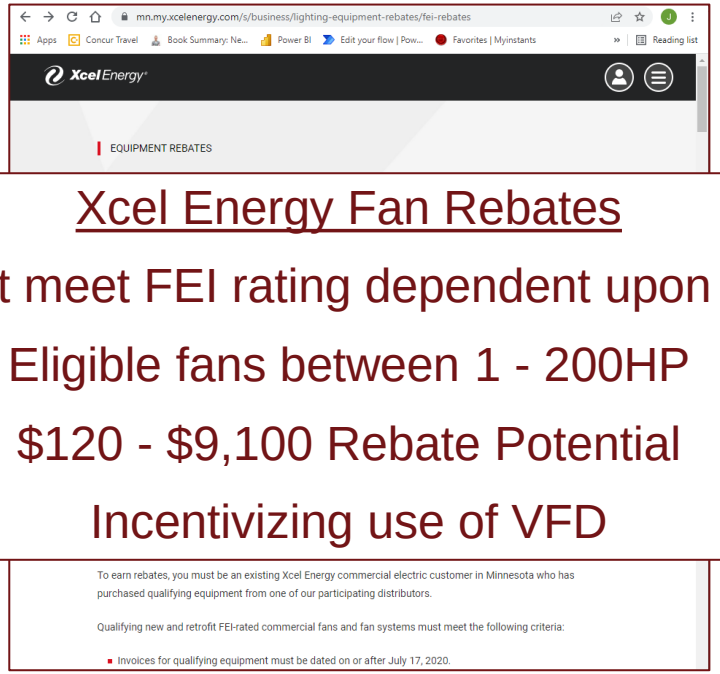
Belt Drive:

VFD Optional

75 HP

Direct Drive or Belt Driven?

Xcel Energy℠



Xcel Energy Fan Rebates

Must meet FEI rating dependent upon HP

Eligible fans between 1 - 200HP

$120 - $9,100 Rebate Potential

Incentivizing use of VFD

Direct Drive or Belt Driven?

	Direct Drive	Belt Drive
VFD	- $3000	*Optional : - $3000*
Drive Package		- $850
SGR	- $1000	*Optional : - $1000*
Energy Rebate	+ 5,540	

Xcel Energy℠

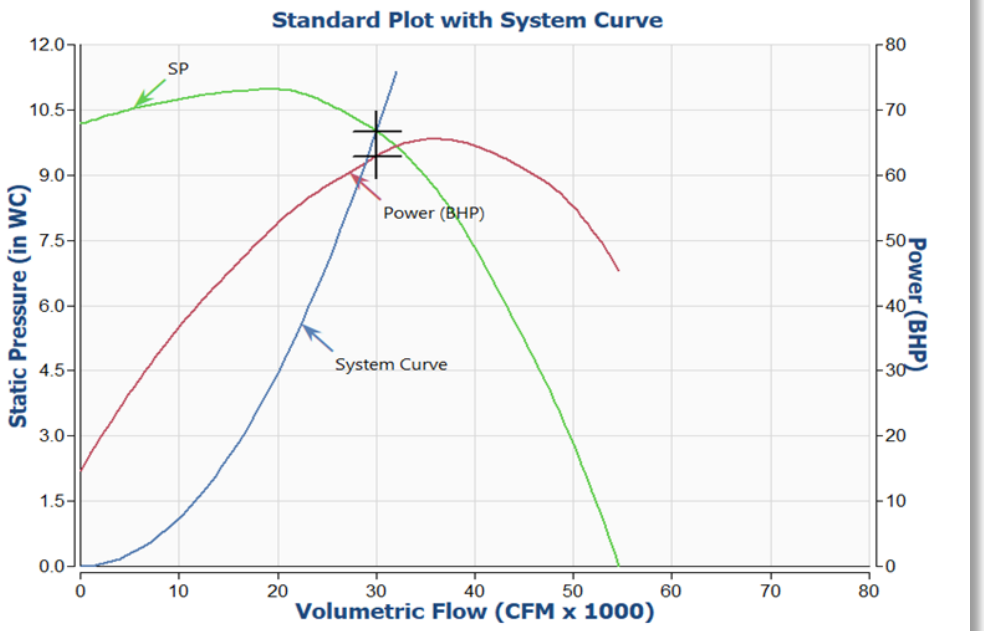
Rebate levels for fans only			Rebate levels for fans with an integrated VFD		
Fan hp	Minimum FEI rating	Rebate amount	Fan hp	Minimum FEI rating	Rebate amount
1	1.12	$120	1	1.12	$520
1.5		$160	1.5		$560
2		$180	2		$580
3		$200	3		$600
5		$220	5		$820
7.5		$240	7.5		$990
10		$260	10		$1,260
15	1.22	$300	15	1.22	$1,550
20		$320	20		$1,920
25		$360	25		$2,360
30		$380	30		$2,780
40		$420	40		$3,420
50		$460	50		$3,960
60		$500	60		$4,500
75	1.27	$540	75	1.27	$5,540
100		$600	100		$6,600
125		$640	125		$7,640
150		$820	150		$7,820
200		$1,100	200		$9,100

Direct Drive or Belt Driven?

Fan information

Size/Model	445/BCS	Class	14	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1188	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,202 RPM @ 70 °F		
		Power (BHP)	62.89		

Adjusted for Apply Compressibility



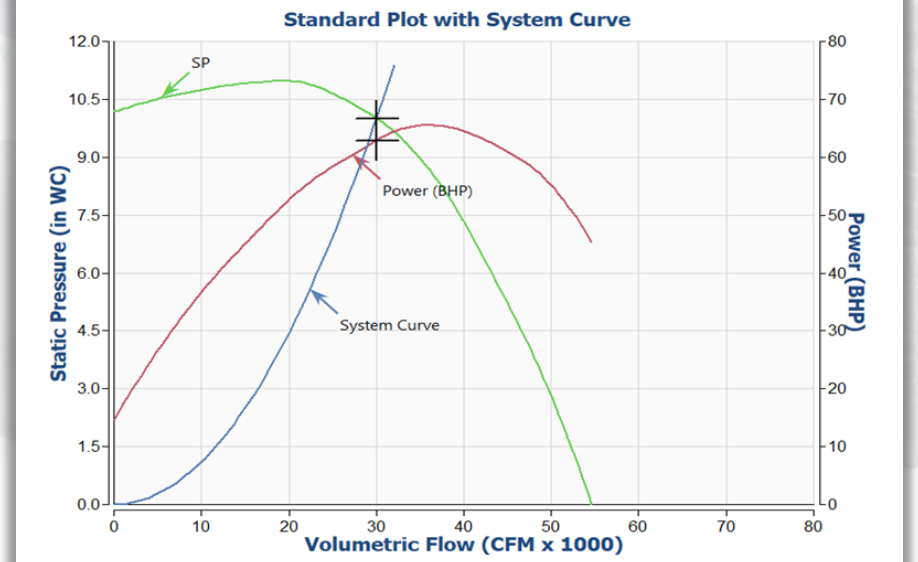
What Motor?

TEFC

Fan information

Size/Model	445/BCS	Class	14	Outlet Vel (FPM)	2634
Volumetric Flow (CFM)	30000	Speed (RPM)	1188	Density (lb/ft³)	0.075
SP (in WC)	10	Max Speed	1,202 RPM @ 70 °F		
		Power (BHP)	62.89		

Adjusted for Apply Compressibility



75 HP | 1200 RPM | 460V

What Arrangement?

Arrangement 4
Direct Drive
Impeller Mounted to Motor Shaft

75 HP | 1800 RPM | 460V = 1200+ lbs.

What Arrangement?

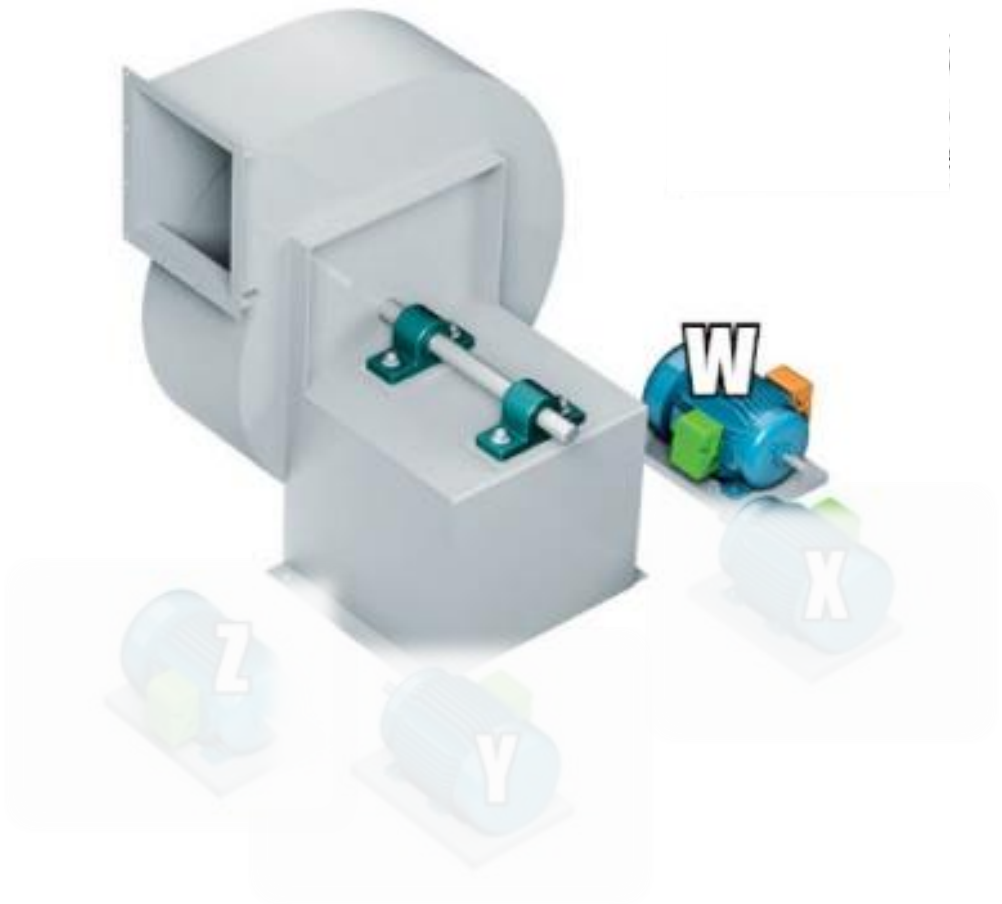
Arrangement 1
Direct Drive or Belt Driven
Motor Mounted on Floor or Fan Base

Arrangement 3
Belt Driven
Motor Mounted on Floor or Fan Base

Arrangement 9
Belt Driven
Motor Mounted on Pedestal

75 HP | 1800 RPM | 460V = 1200+ lbs.

What Motor Position?



Arrangement 4
Direct Drive
Impeller Mounted to Motor Shaft

Do We Need a Base?

Unitary Base

Isolation Base

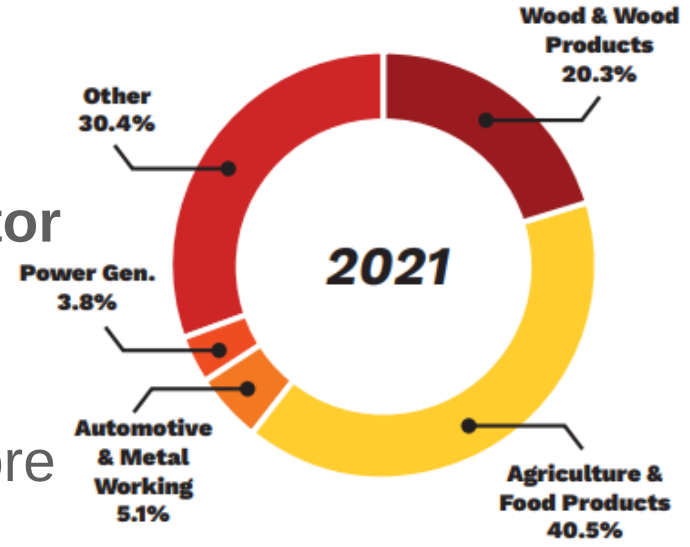
Is Dust Dangerous?

2016 – Abbotsford, BC

Is Dust Dangerous?

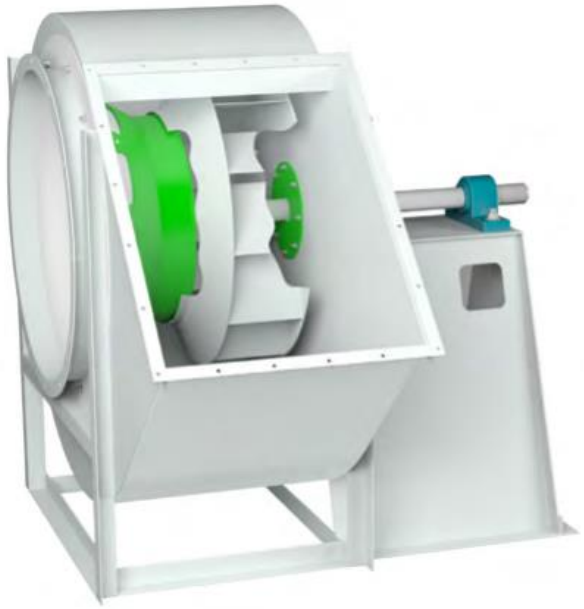
Recent Explosions Caused by Dust

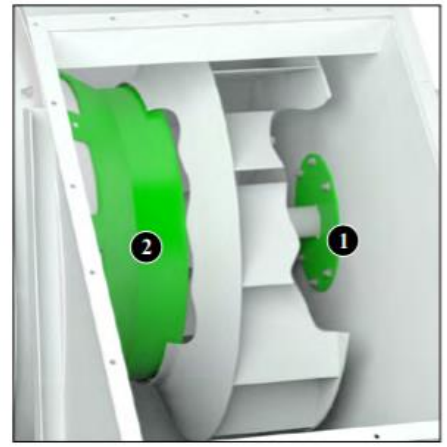
- May 2017 – Cambria, WI
  Didion Milling Facility
- May 2018 – Sioux City, NE
  Andersen Farms Grain Elevator
- January 2021 – Brooks, AB
  Grain Elevator Fire
- February 2021 – Tuas, Singapore
  Stars Engrg – Fire Protection Equipment
- March 2021– Silverton, OR
  Crop preparation plant



Is Dust Dangerous?

AMCA Type B
in this case ~25% Add





Type C

AMCA Type C
in this case ~5% Add

Special Material / Coating

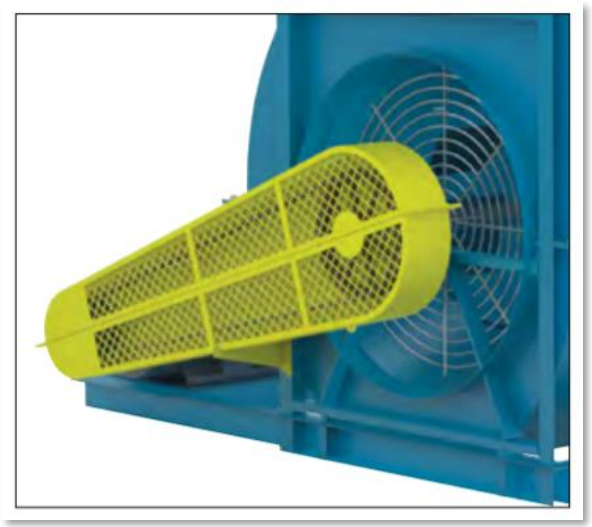
What is in the airstream?

Where is the fan located?

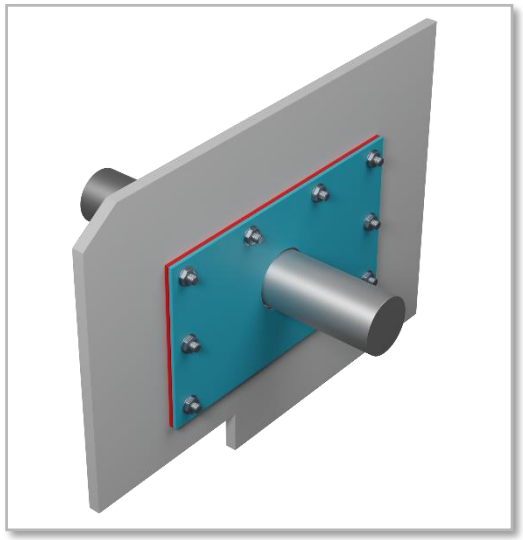
What is the air temperature?

What Accessories Do We Need?

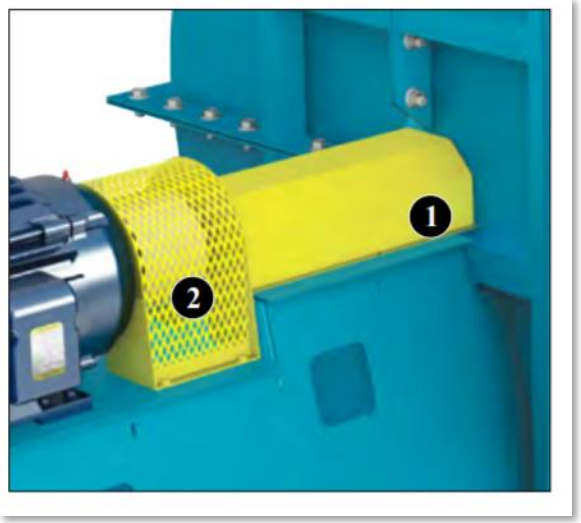
Access Door



Belt Guard

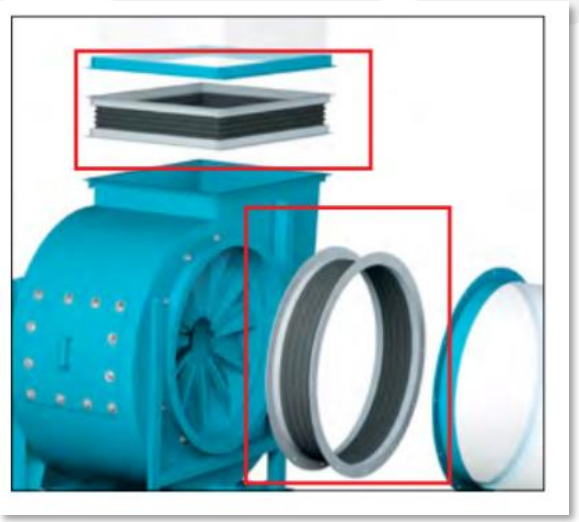


Shaft Seal

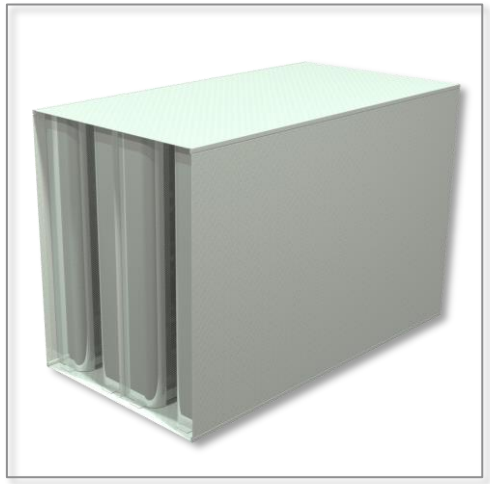


Shaft and
Bearing Guard

What Accessories Do We Need?



Flex Connectors

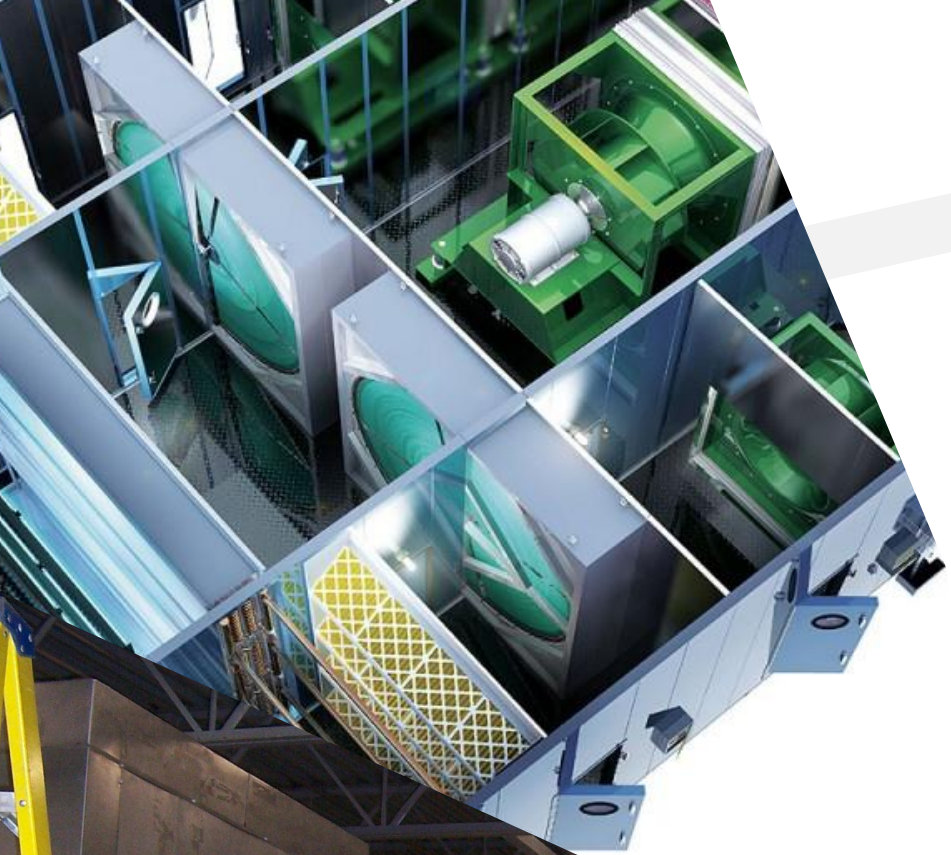


Silencer

Outlet Damper

Drain

Congratulations!



Some Other Centrifugal Applications

Air Handling Units

Aeration Systems

Roof Exhaust

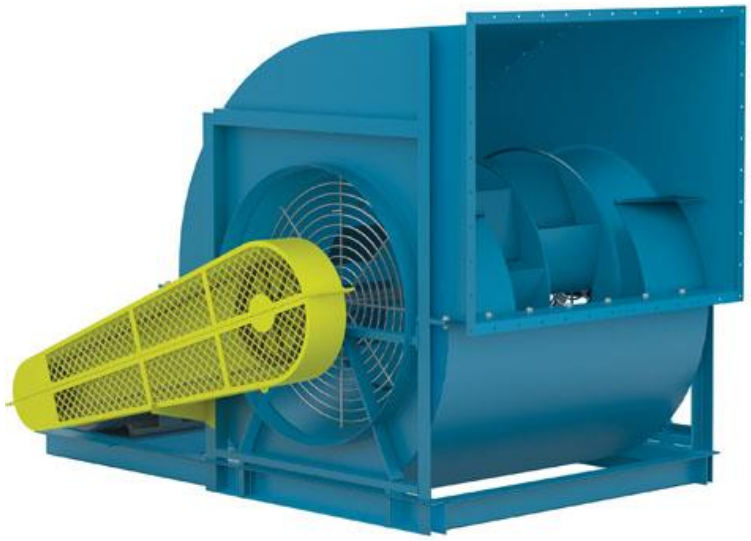
Drying / Ovens

Pneumatic Conveying

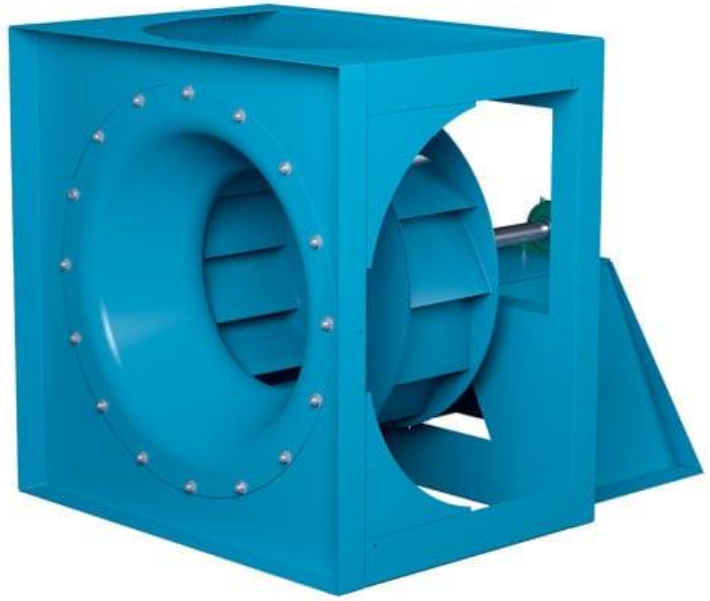
Pollution Control

Air Handling Units – Supply Fans

Double Wide



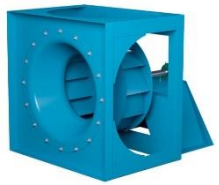
Plenum Fan



Plenum Fan Array

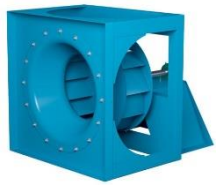
40,000 CFM @ 6.5” WC

Air Handling Units – Fan Compare

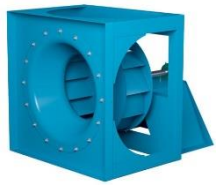
Metric	Double Wide	Single Plenum	4 Fan Array	16 Fan Array
Fan BHP				
System BHP				
Static Efficiency				
Total System FEI				
Individual Fan FEI*				
System FEP (KW)				
System LwA (db)				
EQ FLH				
KWH				
Elec Rate				
Operating Cost				
Delta				
System Cost				

Air Handling Units – Fan Compare

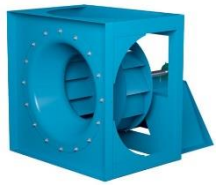
Metric	Double Wide	Single Plenum	4 Fan Array	16 Fan Array
Fan BHP	51.68	55.43	14.69	3.77
System BHP	53.75	55.43	58.76	60.32
Static Efficiency	79.3%	74.0%	69.8%	68.0%
Total System FEI	1.27	1.27	1.25	1.22
Individual Fan FEI*	1.27*	1.27*	1.28*	1.34*
System FEP (KW)	44.04	45.41	46.13	47.35
System LwA (db)	103	96	96	99
EQ FLH	6000	6000	6000	6000
KWH	240,585	248,104	263,009	269,992
Elec Rate	.12	.12	.12	.12
Operating Cost	$28,870	$29,772	$31,561	$32,399
Delta	Base	$902	$2691	$3529
System Cost	1.15	1.0	1.58	3.23

Air Handling Units – Fan Compare

Metric	Double Wide	Single Plenum	4 Fan Array	16 Fan Array
Fan BHP	51.68	55.43	14.69	3.77
System BHP	53.75	55.43	58.76	60.32
Static Efficiency	79.3%	74.0%	69.8%	68.0%
Total System FEI	1.27	1.27	1.25	1.22
Individual Fan FEI*	1.27*	1.27*	1.28*	1.34*
System FEP (KW)	44.04	45.41	46.13	47.35
System LwA (db)	103	96	96	99
EQ FLH	6000	6000	6000	6000
KWH	240,585	248,104	263,009	269,992
Elec Rate	.12	.12	.12	.12
Operating Cost	$28,870	$29,772	$31,561	$32,399
Delta	Base	$902	$2691	$3529
System Cost	1.15	1.0	1.58	3.23

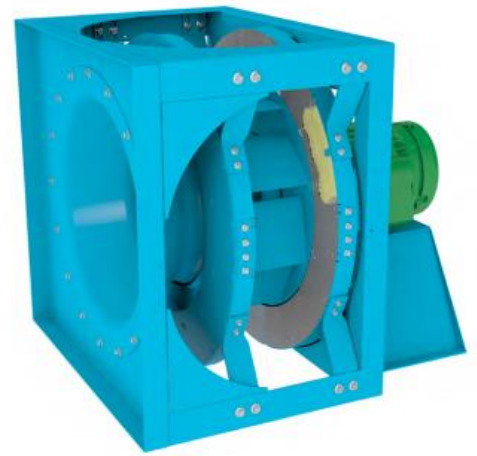
Air Handling Units – Fan Compare

Metric	Double Wide	Single Plenum	4 Fan Array	16 Fan Array
Fan BHP	51.68	55.43	14.69	3.77
System BHP	53.75	55.43	58.76	60.32
Static Efficiency	79.3%	74.0%	69.8%	68.0%
Total System FEI	1.27	1.27	1.25	1.22
Individual Fan FEI*	1.27*	1.27*	1.28*	1.34*
System FEP (KW)	44.04	45.41	46.13	47.35
System LwA (db)	103	96	96	99
EQ FLH	6000	6000	6000	6000
KWH	240,585	248,104	263,009	269,992
Elec Rate	.12	.12	.12	.12
Operating Cost	$28,870	$29,772	$31,561	$32,399
Delta	Base	$902	$2691	$3529
System Cost	1.15	1.0	1.58	3.23

Air Handling Units – Diffuser Tech

Metric	Single Plenum	Single Plenum w/ Diffuser
Fan BHP	55.43	52.90
System BHP	55.43	52.90
S.E.	74.0%	77.5%
Fan FEI	1.27	1.33
Fan FEP (KW)	45.41	43.34
System FEI	1.27	1.33
System FEP (KW)	45.41	43.34
System LwA (db)	96	96



Estimated Sound Pressure

Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	87	83	79	74	71	92
Outlet dB	98	99	98	94	91	86	80	74	96

Estimated Sound Pressure

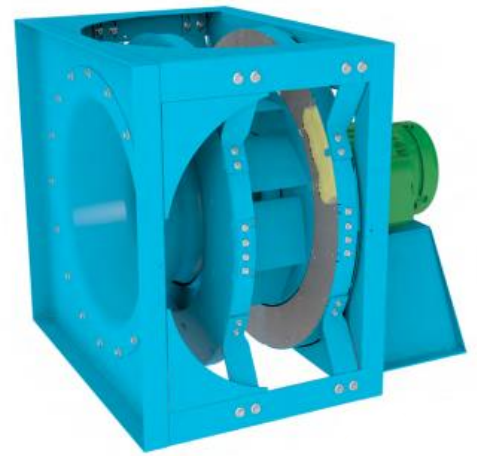
Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	88	84	80	74	71	92
Outlet dB	98	99	99	94	89	82	75	72	96

Air Handling Units – Diffuser Tech

Metric	Single Plenum	Single Plenum w/ Diffuser
Fan BHP	55.43	52.90
System BHP	55.43	52.90
S.E.	74.0%	77.5%
Fan FEI	1.27	1.33
Fan FEP (KW)	45.41	43.34
System FEI	1.27	1.33
System FEP (KW)	45.41	43.34
System LwA (db)	96	96



Estimated Sound Pressure

Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	87	83	79	74	71	92
Outlet dB	98	99	98	94	91	86	80	74	96

Estimated Sound Pressure

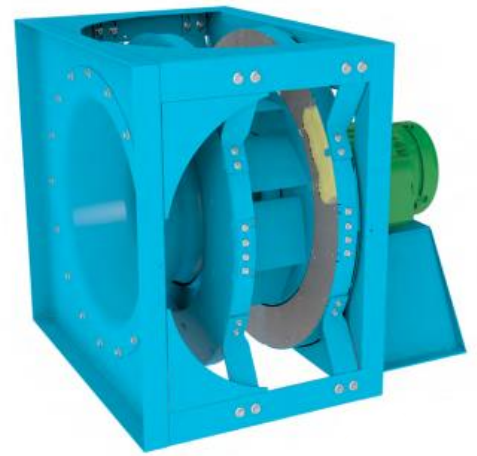
Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	88	84	80	74	71	92
Outlet dB	98	99	99	94	89	82	75	72	96

Air Handling Units – Diffuser Tech

Metric	Single Plenum	Single Plenum w/ Diffuser
Fan BHP	55.43	52.90
System BHP	55.43	52.90
S.E.	74.0%	77.5%
Fan FEI	1.27	1.33
Fan FEP (KW)	45.41	43.34
System FEI	1.27	1.33
System FEP (KW)	45.41	43.34
System LwA (db)	96	96



Estimated Sound Pressure

Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	87	83	79	74	71	92
Outlet dB	98	99	98	94	91	86	80	74	96

Estimated Sound Pressure

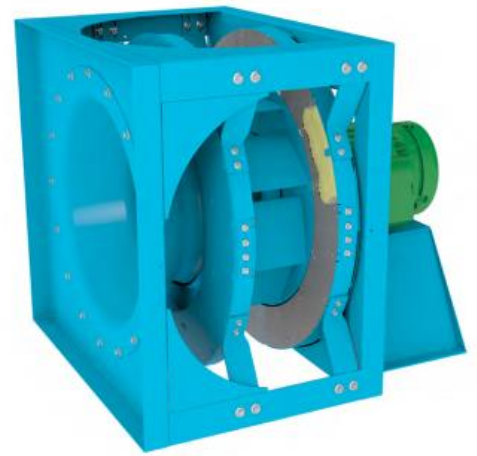
Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	88	84	80	74	71	92
Outlet dB	98	99	99	94	89	82	75	72	96

Air Handling Units – Diffuser Tech

Metric	Single Plenum	Single Plenum w/ Diffuser
Fan BHP	55.43	52.90
System BHP	55.43	52.90
S.E.	74.0%	77.5%
Fan FEI	1.27	1.33
Fan FEP (KW)	45.41	43.34
System FEI	1.27	1.33
System FEP (KW)	45.41	43.34
System LwA (db)	96	96



Estimated Sound Pressure

Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	87	83	79	74	71	92
Outlet dB	98	99	98	94	91	86	80	74	96

Estimated Sound Pressure

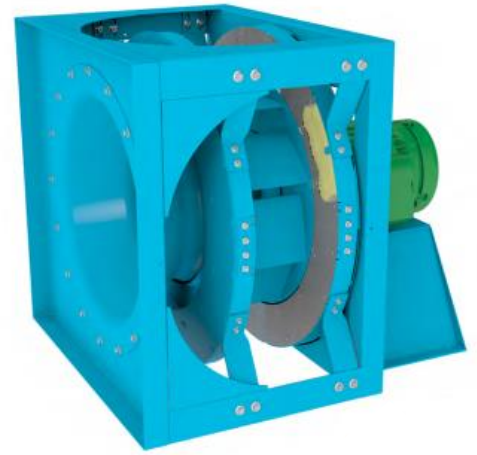
Distance	1	3	5
Inlet dBA	93	83	79
Outlet dBA	96	86	82

Sound Power Levels

Octave	1	2	3	4	5	6	7	8	LwA
Inlet dB	93	98	98	88	84	80	74	71	92
Outlet dB	98	99	99	94	89	82	75	72	96

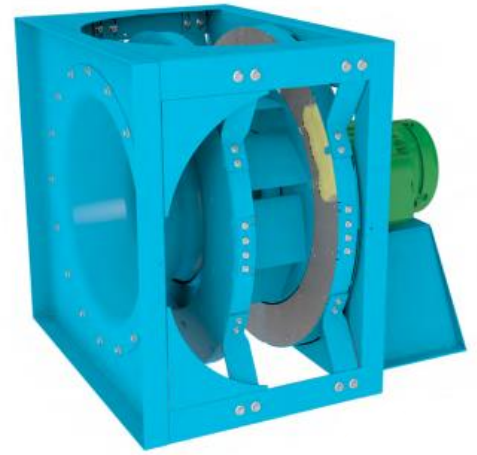
Air Handling Units – Diffuser Tech

Metric	Single Plenum	Single Plenum w/ Diffuser
Fan BHP	55.43	52.90
System BHP	55.43	52.90
S.E.	74.0%	77.5%
Fan FEI	1.27	1.33
Fan FEP (KW)	45.41	43.34
System FEI	1.27	1.33
System FEP (KW)	45.41	43.34
System LwA (db)	96	96
EQ FLH	6000	6000
KWH	248000	237000
Elec Rate	.12	.12
Operating Cost	$29,760	$28440
Delta First Cost	Base	$1,320
Cost Diffuser	-	~$1500
Payback	-	Under 14 Months



Air Handling Units – Diffuser Tech

Metric	Single Plenum	Single Plenum w/ Diffuser
Fan BHP	55.43	52.90
System BHP	55.43	52.90
S.E.	74.0%	77.5%
Fan FEI	1.27	1.33
Fan FEP (KW)	45.41	43.34
System FEI	1.27	1.33
System FEP (KW)	45.41	43.34
System LwA (db)	96	96
EQ FLH	6000	6000
KWH	248000	237000
Elec Rate	.12	.12
Operating Cost	$29,760	$28440
Delta First Cost	Base	$1,320
Cost Diffuser	-	~$1500
Payback	-	Under 14 Months



Air Handling Units – Air Velocity

Metric	4 Fan Array	4 Fan Array
Coil / Filter Velocity (FPM)	500	450
CFM	40000	40000
Static	6.5	5
Fan BHP	14.69	11.34
System BHP	58.76	45.36
S.E.	69.8%	69.5%
Fan FEI	1.28	1.30
Fan FEP (KW)	11.78	9.09
System FEI	1.25	1.27
System FEP (KW)	46.13	35.62
System LwA (db)	96	88
EQ FLH	6000	6000
KWH	263009	203,031
Elec Rate	.12	.12
Operating Cost	$31,561	$24,363
Delta First Cost	Base	$7,168

Air Handling Units – Air Velocity

Metric	4 Fan Array	4 Fan Array
Coil / Filter Velocity (FPM)	500	450
CFM	40000	40000
Static	6.5	5
Fan BHP	14.69	11.34
System BHP	58.76	45.36
S.E.	69.8%	69.5%
Fan FEI	1.28	1.30
Fan FEP (KW)	11.78	9.09
System FEI	1.25	1.27
System FEP (KW)	46.13	35.62
System LwA (db)	96	88
EQ FLH	6000	6000
KWH	263009	203,031
Elec Rate	.12	.12
Operating Cost	$31,561	$24,363
Delta First Cost	Base	$7,168

Air Handling Units – Air Velocity

Metric	4 Fan Array	4 Fan Array
Coil / Filter Velocity (FPM)	500	450
CFM	40000	40000
Static	6.5	5
Fan BHP	14.69	11.34
System BHP	58.76	45.36
S.E.	69.8%	69.5%
Fan FEI	1.28	1.30
Fan FEP (KW)	11.78	9.09
System FEI	1.25	1.27
System FEP (KW)	46.13	35.62
System LwA (db)	96	88
EQ FLH	6000	6000
KWH	263009	203,031
Elec Rate	.12	.12
Operating Cost	$31,561	$24,363
Delta First Cost	Base	$7,168

Air Handling Units – Air Velocity

Metric	4 Fan Array	4 Fan Array
Coil / Filter Velocity (FPM)	500	450
CFM	40000	40000
Static	6.5	5
Fan BHP	14.69	11.34
System BHP	58.76	45.36
S.E.	69.8%	69.5%
Fan FEI	1.28	1.30
Fan FEP (KW)	11.78	9.09
System FEI	1.25	1.27
System FEP (KW)	46.13	35.62
System LwA (db)	96	88
EQ FLH	6000	6000
KWH	263009	203,031
Elec Rate	.12	.12
Operating Cost	$31,561	$24,363
Delta First Cost	Base	$7,168

Air Handling Units – Supply Fans

3 Takeaways

1. We have a choice -
   - Increasing safety requirements
   - Energy efficiency is more important then ever
2. Regulations are here and more are coming
3. Every selection is different and important. Rely on the experts with your questions.

Q & A

Survey QR Code:

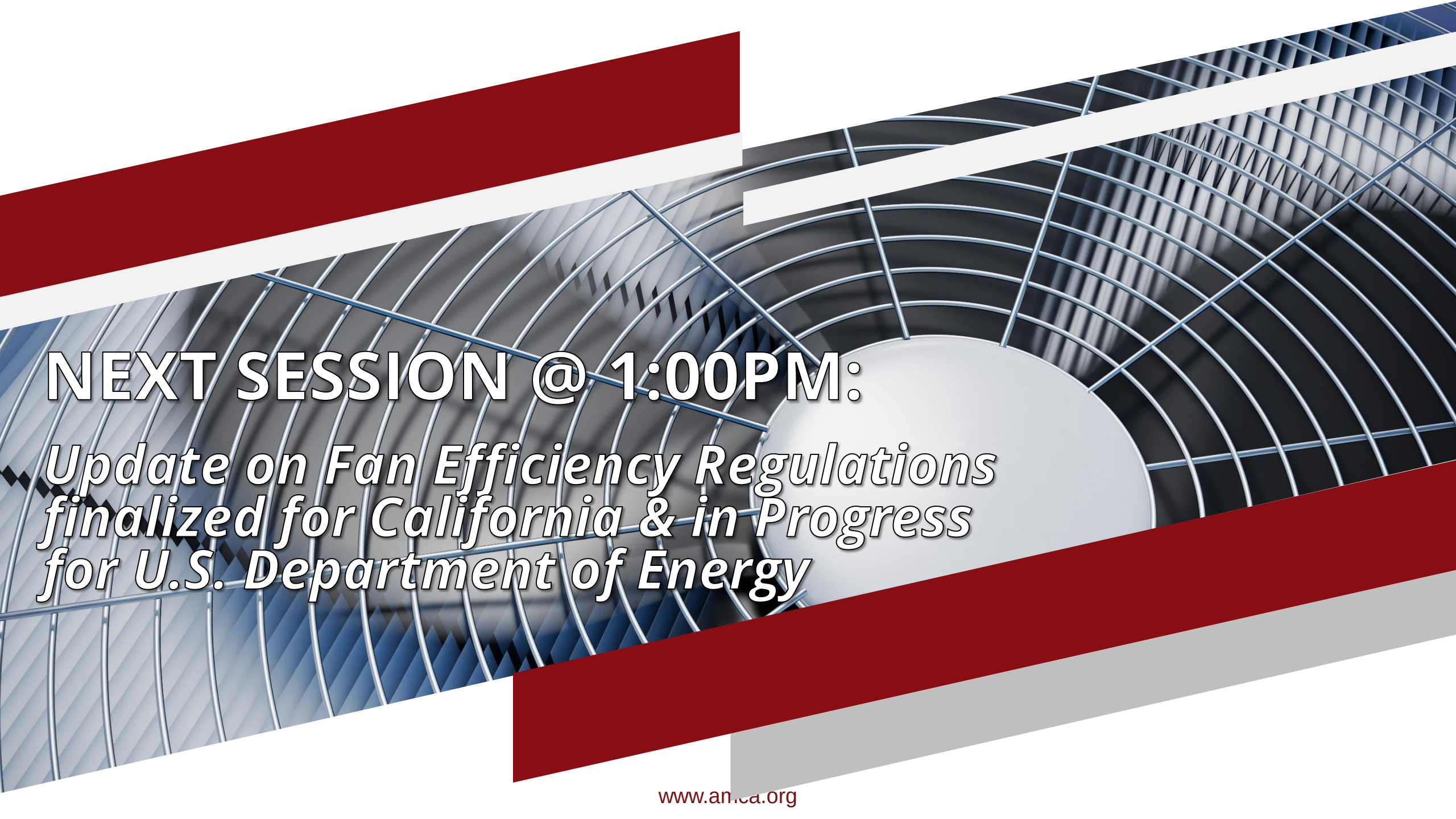
Thank you for your time!

To receive PDH credit for today's educational session, you must complete the online evaluation, either via the QR code or a link, which will be emailed to you 2 weeks of this program.

PDH credits and participation certificates will be issued electronically within 30 days, once all attendance records are checked and the completed online evaluations are received.

Attendees will receive an email at the address provided on your 2023 AHR Expo registration, listing the total credit hours awarded and a link to a printable certificate of completion.

If you have any questions, please contact Lisa Cherney, Education Manager, at AMCA International *(lcherney@amca.org)*.



NEXT SESSION @ 1:00PM:

Update on Fan Efficiency Regulations finalized for California & in Progress for U.S. Department of Energy