Designing and Sizing Baghouse Dust Collection Systems

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How to Design and Size a Baghouse Dust Collection System

Guide to designing your dust collection system and avoiding the pitfalls of under-sized systems.

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Purpose of This Guide

KEY POINTS OF THIS GUIDE

1. Many So-called "Baghouse Experts" know little about proper dust collection design and operation
2. OEMs and sales reps frequently undersize systems to win contracts - Leaving customers with a system that does not work
3. Educated clients can determine the general size they need and use it as a basis to compare quotes
4. Understanding principles of dust collection system design enables facilities to make better decisions regarding baghouse maintenance, operation and safety

Dust collection systems play a vital role in many commercial and industrial facilities. Whether part of a system process, used to capture harmful pollutants from furnaces/boilers, to convey dry bulk product or to maintain a clean and safe work environment, dust collection systems need to function at near constant peak efficiency for facilities to operate safely and productively.

While maintenance and proper operation play a large role in keeping these systems running properly, many facilities face challenges due to improper system design and engineering. Many users rely on outside vendors or so-called "experts" with little to no actual dust collection experience to design and engineer a system for them. Other times vendors may purposefully undersize a system in order to undercut other potential suppliers regardless of how it actually performs in the end for their customer. Still others design their own system in-house thinking it an easy process that just any engineer can accomplish with little to no outside guidance. These cases frequently end with an inadequate dust collection system that cannot meet the needs of the process, resulting in high emissions, lowered productivity, hazardous work environments or all three!

So what can facilities do to ensure they do not encounter these same issues? In our experience, an educated user benefits the most and becomes best customer. With that in mind, we have prepared this guide to assist users in designing and properly sizing a dust collection system. By following the direction in this guide closely, you can effectively estimate what kind of system you require and then use this information as a basis for gathering quotes and additional assistance.

This guide is NOT an exhaustive course on dust collector design. Each system presents unique circumstances that affect the general operation of a baghouse system. As such, the guidelines present in this guide should be used only to estimate the sizing of your system. A qualified, and experienced dust collection system OEM should be consulted before purchasing any equipment or making design changes

The Four Key Baghouse System Design Variables

For a dust collection system to function adequately engineers must design and operate the system to maintain the (4) key design parameters of CFM, FPM, Vacuum Pressure and Air to Cloth Ratio (or A/C). Changes to any of these key system parameters will result in systemwide performance issues. All four of these parameters are fluid and directly affect the others. Maintaining all at proper levels requires careful engineering, operation and maintenance.

Lets review these four parameters one by one.

Airflow in CFM (Cubic Feet per Minute)

What Is it?

1. How much air the system moves is measured in Cubic Feet per Minute or CFM. Often, baghouses are sized using CFM.
2. In general, the larger the space being vented or the greater the number of pickup points in the system the more CFM required.
3. The CFM generated by the system fan can be fixed or adjusted (Variable Frequency Drive or VFD Fans). However, total CFM generated by a fan can be affected changes in altitude, ductwork restrictions and sizing as well as resistance to flow created by the system (ductwork + filters).

Why Important?

Without sufficient CFM the sources will not be vented adequately. Poor venting directly causes damage to equipment, high emissions, loss of reclaimed product and hazardous environment (especially of concern in facilities handling combustible dusts or hazardous materials). Low CFM can also negatively affect air velocity, air to cloth ratio, and vacuum pressure, other key design parameters.

Vacuum Pressure (Suction) & Static Pressure (Static Resistance)

What Is It?

1. Vacuum pressure or suction is measured in inches of water gauge, w.g. and is the basis of a properly functioning dust collection system.
2. The system fan must supply enough suction to pull the materials from the collection point(s) all the way through the ductwork to the baghouse and then through the filters and out to exhaust.
3. To do that it must overcome the resistance to flow created by the filters and the ductwork.
4. Conversely, static pressure or static resistance is a measurement of resistance generated by the ductwork and the filters in baghouse. This also is measured in inches of water gauge.

Why Important?

If the vacuum pressure generated by the fan is not sufficient to overcome the static resistance of the ductwork and of the filters (called differential pressure or DP) several problems will arise. The system will suffer a loss of suction at the collection points (creating inadequate venting) and the air speed in the ductwork will drops causing product dropout (See section: Air Velocity: Why Important?). After the entire system is layout with equipment and ductwork connections mapped out the static pressure or static resistance must be calculated to determine how much vacuum pressure is needed for the system to function.

Air Velocity and Minimum Conveying Velocity

What Is It?

1. Air velocity within the system is measured in feet per minute, or ft/m.
2. The system must be carefully engineered to keep the air speed within an acceptable range to prevent two major issues.
3. Air speed is related to CFM as follows: ft/m = CFM ÷ cross sectional of duct (i.e. size of duct).

Why Important?

High air velocity can quickly wear holes the ductwork by means of abrasion (especially abrasive dusts like metals, ceramics, etc.) or can break up delicate conveyed products such as processed foods (cereals), pharmaceuticals, and others.

Of greater concern is **low air velocity**, which can cause dust buildup within the ductwork and lead to poor dust capture at inlets. For a dust to travel suspended in air it must most at or above the minimum conveying velocity for that product. If it drops below that minimum speed at any point in the ductwork the dust will begin to settle or dropout of the airstream, which then accumulate into large piles that eventually choke off the duct.

These **accumulations of dust within the ductwork** create major safety hazards. When combined with an ignition source (such as a spark or ember) they provide ample fuel for a combustible dust fire or explosion, which then can propagate throughout the entire system, being continually fed by dust accumulations further downstream until it reaches the dust collector. Additionally, these accumulations can eventually become so large that the duct collapses under the added weight.

Air to Cloth Ratio

What Is It?

1. The ratio of gas volume (ACFM) to total cloth area (sq. ft.) of the baghouse.
2. First calculate the total cloth area of your collector by calculating the total filter area of each filter (bag diameter x 3.14 x length ÷ 144 [for number of inches in a square foot] = filter cloth area) and then multiply that figure by the total number of bags in the collector.
3. Take the CFM of the system and divide it by the total filter cloth area to get your air to cloth ratio.

Why Important?

For the baghouse to capture the dust from the airstream the unit must have a sufficient number of filters. As you push more air through the same amount of filter material the collection efficiency goes down. Maintaining an adequate air to cloth ratio enables the baghouse to operate at peak efficiencies, collecting more than 99.9% all dust particles that pass through it. For most applications, anything less than near peak efficiency will result in excessive emissions, violating pollution regulations and creating hazardous environment for workers and neighbors.

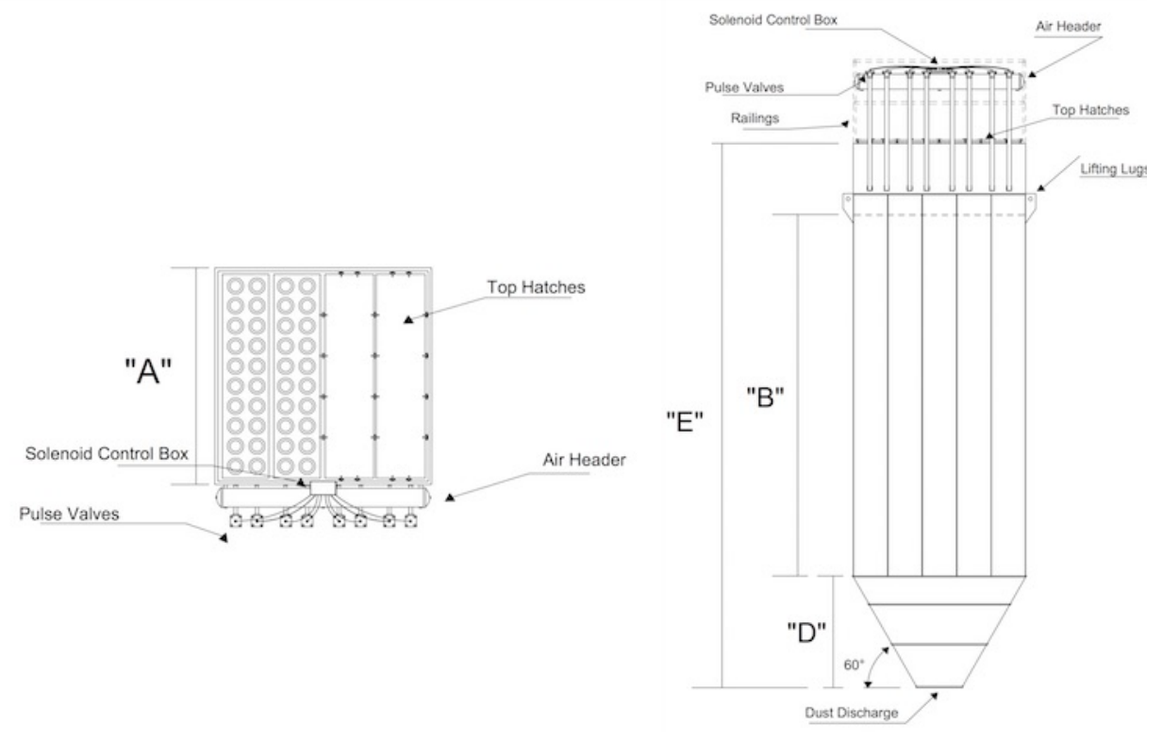
Now that we have discussed the 4 key design considerations, we will now see how to design a baghouse dust collection system so as to maintain all 4 of these parameters within acceptable ranges to ensure proper operation.

Sizing Your Dust Collection System (Design Process)

This process can be divided into two stages. The first stage involves sizing your duct work for adequate volume (CFM) and velocity (ft/m) for the type of dust you will be handling. Then in the second phase you calculate the static pressure (SP) of your system to determine the size of your baghouse (how many filters and what size) and power of your system fan.

If you already have a ductwork system and want simply to replace an existing baghouse/fan combo, you still need to calculate the CFM and static resistance from the existing ductwork system to properly size the baghouse and/or fan.

Model Number	Filter Length	Total Filter Area Est. (sq ft)	A (width sq)	B (Tubesheet to Hopper Break)	C (Top to Hopper Break)	D (Hopper Break to Discharge)	E (Top to Discharge)	# of Valves	Number of Filters
9S - TA - 6	72"	88	29"	78"	96"	21"	117"	3	9
9S - TA - 8	96"	117	29"	102"	120"	21"	141"	3	9
16S - TA - 6	72"	156	37"	78"	96"	28"	124"	4	16
16S - TA - 8	96"	208	37"	102"	120"	28"	148"	4	16
25S - TA - 6	72"	243	45"	78"	96"	35"	131"	5	25
25S - TA - 8	96"	325	45"	102"	120"	35"	155"	5	25
25S - TA - 10	120"	406	45"	126"	144"	35"	179"	5	25
36S - TA - 8	96"	467	53"	102"	120"	41"	161"	6	36
36S - TA - 10	120"	584	53"	126"	144"	41"	185"	6	36
49S - TA - 8	96"	636	61"	102"	122"	48"	179"	7	49
49S - TA - 10	120"	795	61"	126"	146"	48"	194"	7	49
49S - TA - 12	144"	954	61"	150"	170"	48"	218"	7	49
64S - TA - 8	96"	831	69"	102"	122"	55"	177"	8	64
64S - TA - 10	120"	1039	69"	126"	146"	55"	201"	8	64
64S - TA - 12	144"	1247	69"	150"	170"	55"	225"	8	64
81S - TA - 10	120"	1315	79"	126"	146"	64"	210"	9	81
81S - TA - 12	144"	1578	79"	150"	170"	64"	234"	9	81
100S - TA - 10	120"	1623	87"	126"	146"	71"	217"	10	100
100S - TA - 12	144"	1948	87"	150"	170"	71"	241"	10	100
121S - TA - 10	120"	1964	95"	126"	146"	78"	224"	11	121
121S - TA - 12	144"	2357	95"	150"	170"	78"	248"	11	121
144S - TA - 10	120"	2337	105"	126"	146"	87"	233"	12	144
144S - TA - 12	144"	2805	105"	150"	170"	87"	257"	12	144



Step 1 - Find the Minimum Conveying Velocity (ft/m)

Minimum Conveying Velocities For Common Products Table 2-1		
TYPE OF DUST	BRANCH VELOCITY	MAIN VELOCITY
Metalworking	5000 ft/m	4500 ft/m
Wood Dust	4500 ft/m	4000 ft/m
Plastics	4500 ft/m	4000 ft/m
Coal, powdered	5500 ft/m	4500 ft/m
Coffee	4000 ft/m	3500 ft/m
Paper Shavings	5000 ft/m	4500 ft/m
Corn	5000 ft/m	4500 ft/m
Wheat	5800 ft/m	5800 ft/m
Sugar	6,000 ft/m	6,000 ft/m
Aluminum Dust	5,000 ft/m	4,500 ft/m
For larger list visit https://baghouse.com/		

Determine from a reputable source the minimum conveying velocity for the material the system will handle. The box on the left lists several common materials and their recommend conveying velocities. Most materials require between 3,500 ft/m to 5,000 ft/m. A more extensive list can be found on Baghouse.com

Step 2 - Identify Total Number of Primary and Secondary Sources

Primary or Secondary - Classifying Equipment

1. Take care to correctly classify each piece of equipment
2. Classifying all sources as **primary sources** will result in an unnecessarily large system, increasing initial installation costs and making it more costly to operate in the long run.
3. Classifying too many sources as **secondary sources** will result in an undersized system, resulting in insufficient capacity for normal operations. This will produce production bottlenecks or inadequate venting leading to health/safety hazards.

Sizing your system requires you to determine how many much airflow you need at each location. Begin by making a list of all the equipment you plan to vent with the dust collection system. Identify your primary and secondary sources that you will connect to the system.

Primary Sources need constant venting whenever system is running. Some facilities may have only one large source to vent (e.g. a single boiler, furnace, etc.). Others may have many different systems but each one requires its own system as the different equipment cannot be connected for some reason (e.g. gypsum plants, cement plants, process applications)
Secondary Sources do not always run concurrently without primary sources and sometimes shutdown completely. Secondary sources are common in wood/metal milling, fabrication and manufacturing shops. For example, a woodworking shop uses several different pieces of equipment such as saws, lathes and sanders requiring dust collection. While the large saw and lathe run continuously everyday (*primary*), a small specialty-use sander and a planner are only used once or twice a week (*secondary*) and never at the same time as each other. In this example, you would size your system to handle the two primary sources (saw and lathe) and only one of the two secondary sources (sander and planer) as they will never run at the same time.

Plan with the objective of defining the heaviest use scenario so you can size your system to meet it. Incorporating pickup points that see limited or infrequent use may result in an oversized the system, which increases its total cost to purchase, operate and maintain. Plan wisely, as increasing capacity post installation is nearly impossible. A good rule of thumb is to oversize the system by roughly 10% to ensure proper operation and accommodate any future expansions. (Example in **Section 3 - Calculate Total CFM for Each Branch**)

Step 3 - Calculate Total CFM Required for Each Branch

CFM Per Duct Diameter at 3 Common Velocities Table 2-2			
DIAMETER	3500 FPM	4000 FPM	4500 FPM
3”	277	316	356
4”	305	348	392
5”	477	546	614
6”	686	784	882
7”	935	1068	1202
8”	1222	1396	1570
9”	1546	1767	1988
10”	1909	2182	2455
12”	2749	3142	3534
14”	3742	4276	4810
For larger duct sizes see appendix			

In the next step, determine how much CFM you need at each branch of your system. If your source equipment has a built in collar or port identify the diameter (if rectangular calculate the total cross sectional of the duct and convert to round equivalent). On larger sources such as kilns, furnaces or process equipment or for sources with custom-designed venting determine CFM required by consulting with the equipment OEM or by using industry-best practice methods. (Consult a dust collection expert experienced in the specific application for advice.) Finally, using the chart in this section find your duct size and match to column with the required conveying velocity to find the needed CFM for each branch.

Determining CFM for Each Branch in Our Example System

To illustrate we have prepared a sample system layout for consideration of this design step (See illustration on next page). We will continue to use this same example throughout the following 3 sections.

Here we have a woodworking shop with a total of (5) pickup points. We have a sander, backdraft table, planer and two floor pickups. Next we determine the CFM required for each branch by duct diameter and then matching it to the appropriate conveying velocity required for wood (see chart in previous section)

(1) Sander = 4” OD @ 4,000 ft/m = 350 CFM (rounded)

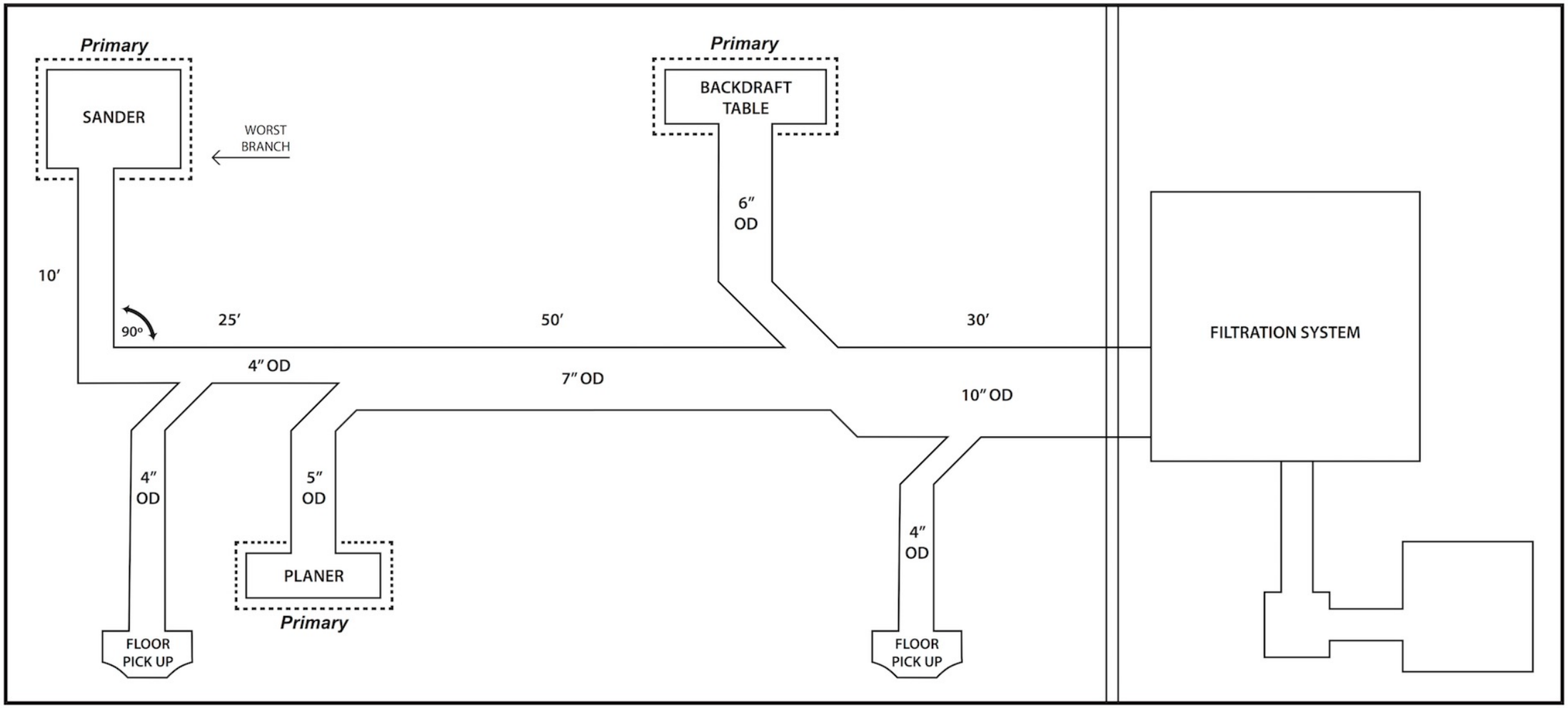
(1)Planer = 5” OD @ 4,000 ft/m = 550 CFM (rounded)

(1)Backdraft table = 6” OD @ 4,000 ft/m = 780 CFM (rounded)

(2) Floor pickups = 4” OD @ 4,500 ft/m = 400 CFM (For reference only, secondary sources are not counted towards final total.)

Baghouse.com Expert Tips:

Many types of equipment come with built-in connections for dust collection. These ports are sized by the manufacturer to provide sufficient ventilation while operating the equipment. Simply confirm the diameter of the port to calculate the required CFM (using chart in this section) for the unit.



Step 4 - Create a System Layout and Size Your Main Trunk

Steps to Layout Your System and Size Your Main Trunk

1. Make rough floor plan showing the location of each piece of equipment
2. Sketch layout of ductwork connecting each piece of equipment together and running all the way back to the dust collector
3. Where two primary branches meet combine the CFM require by each branch (using figures from previous step) and calculate the duct size needed to provide sufficient CFM for both branches at the required air velocity (where needed round up to next largest duct size)

Make Floor Plan of Equipment

Take your primary and secondary sources and make a rough floor plan of every piece of equipment. Once you have every source in its approximate location map out the ductwork connection each piece back to the collector. Try to locate your dust collector in a central, convenient location. Safety regulations covering applications involving combustible dusts (e.g. wood, metals, grains, etc.) may mandate placing the baghouse outside or on an exterior wall (along with explosion venting to the outside).

Create Rough Layout of Ductwork System

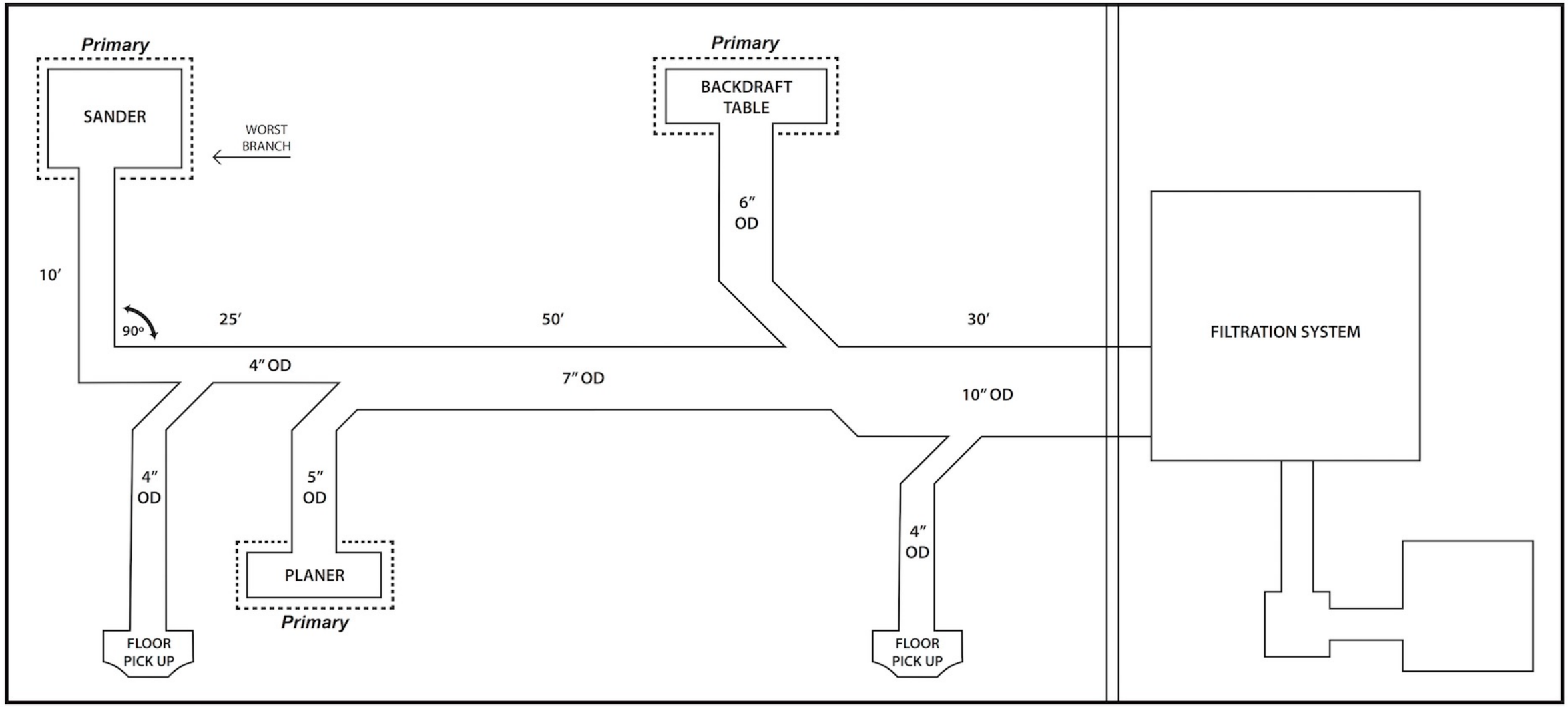
Now each piece of equipment needs to be connected together and run back to the baghouse. Start at the source farthest away from your collector. Using the CFM requirements you calculated for each branch in the previous step, note the diameter of the duct required and map it out running towards the collector to the point where the next branch connects. Additionally, note the length of each run of duct (important for next step).

Where the next branch connects add the CFM of both lines together and determine what size duct you need for that amount of CFM at the required velocity in ft/m. Increase the size of the duct accordingly and continue mapping the trunk forward. Repeat the process and increase the duct size *only at each spot where a primary source connects* to the main trunk. Con-

tinuing mapping your main trunk (making sure to connect to all primary and secondary sources) until you reach the collector.

Determining Duct Size for Each Branch and Main Trunk in Our Example System

First, we begin with the farthest source the sander. Its built in connection port is 4”, so we begin with a 4” duct leading out of it. Then we continue running it where it connects with the 5” duct coming from the planer. (NOTE We do not increase the size where it meets the Floor Pickup, as this is a secondary source.) By combining 4” duct requiring 350 CFM and the 5” duct requiring 550 CFM, we get 900 CFM +/- at 4,000 ft/m (see previous section for more details). Where these two combine we need a duct to handle at least 900 CFM@ 4,000 ft/m. According to our chart, this falls between a 6” and 7” duct. *Per best practice, we will move up and oversize the duct slightly*



to ensure sufficient airflow and allow for possible expansion later.

Continuing on the 7” duct next combines with the 6” duct running from the backdraft table. The 6” duct requires 780 CFM +/- and the 7” duct requires 1068 CFM. Again, the total combined CFM falls in between the 9” and 10” OD duct, so we size up to 10”. Finally, with all the primary sources connected, the system requires at least 1,680 CFM @ 4,000 ft/m.

Now we have sufficient CFM for all of our primary branches. We also have a safe amount of oversizing to ensure adequate operation and provide a cushion for any possible future expansion. To accommodate the other secondary branches we can install blast gates on all the branches and close off other lines.

Baghouse.com Expert Tips:

Try to keep the largest equipment closest to where you will place your dust collector.

Try to run your ductwork in the shortest possible route.

Always size up if the required CFM falls between two duct sizes. This allows for future expansion.

Only increase the duct size when a primary source branch connects, but do not forget to run trunk so that all the secondary sources can connect as well.

Consult fire/safety regulations may require the dust collector be located on an external wall or outside.

Step 5 - Calculate The Static Pressure (i.e. Static Resistance) of Your System

Steps to Calculate System Static Pressure (i.e. Static Resistance)

1. Identify the branch with the highest static pressure (Worst Branch)
2. Calculate the SP of the main trunk line
3. Determine SP of dust collector

Static pressure or static resistance (measured in inches of water w.g.) refers to the amount of resistance to airflow created friction and channeling of air through the ductwork. For the system to work the system fan must overcome the resistance created by the ductwork and the baghouse. Accurately calculating the static pressure or SP of the system is crucial for the system to function correctly.

To determine the total SP of your system you must add the SP generated by following three elements together:

1. The branch with the great SP (also known as the Worst Branch)
2. The SP of the main trunk line, including any fire protection/prevention devices
3. The resistance created by the dust collector(s). This would include any precleaners (cyclones, knockout chambers, etc.) as well as the filters within the baghouse.

Calculate the SP of all your branches and identify the one with the greatest amount of resistance in w.g. (Likely the branch farthest from the unit with have the highest SP, but not always.) Only figure the SP of the worse branch into your calculations for the entire system's SP.

Next, move on to the main trunk line. Calculate the resistance created by the duct diameter and the length of each section, along with any elbows, splits, or other connections.

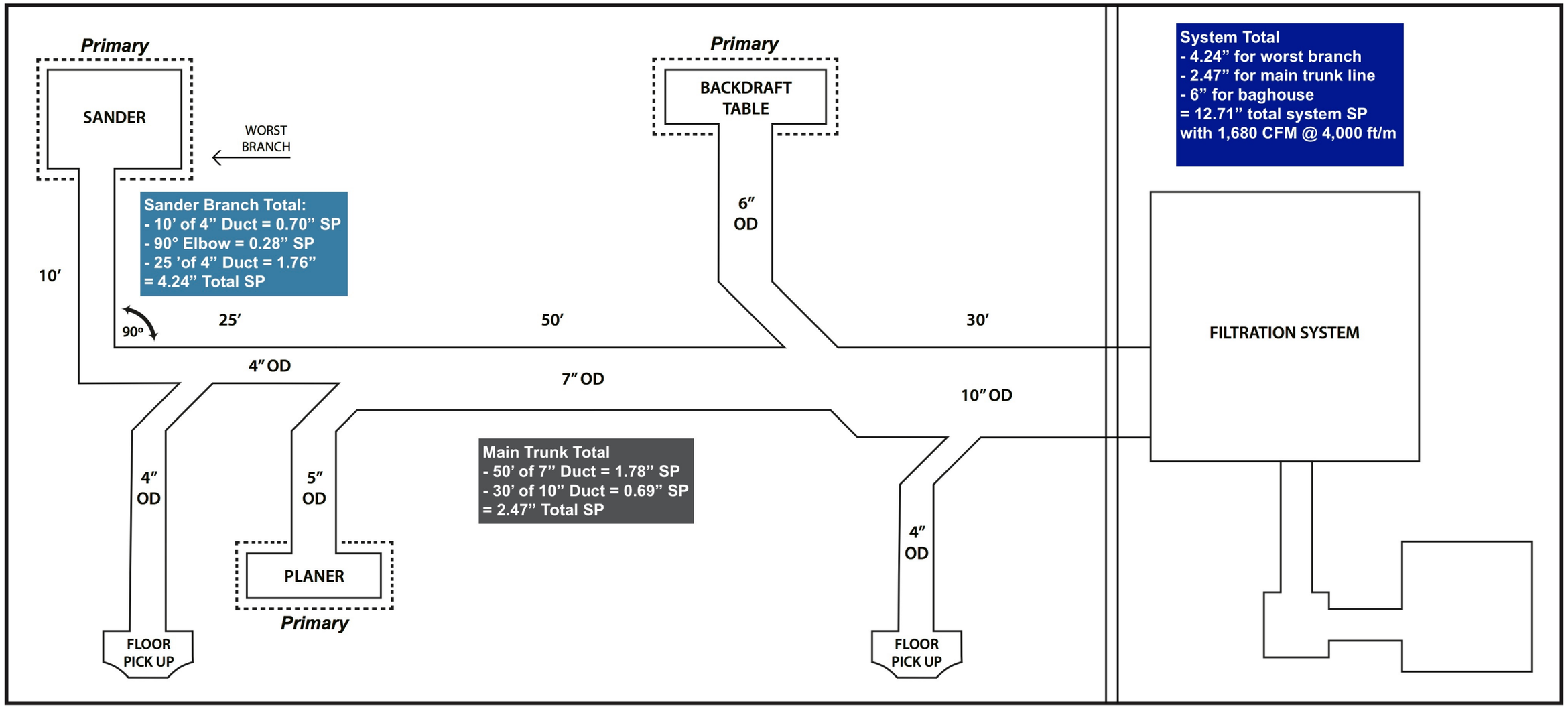
Finally, identify the SP generated by the dust collector(s), which in most cases will be only a baghouse. For most baghouses plan on a maximum of 5”-7” of resistance (most baghouses should run between 3”-5” differential pressure, but sizing slightly above this figure is conservative and allows for some flexibility).

Determining Static Pressure for Each Branch, Main Trunk and The Baghouse in Our Example System

Step 1 - Find the Branch with the Highest SP

Starting at each piece of equipment work back through to the main trunk and determine the total SP of each branch. In our example, ***the sander branch has the great resistance.***

- Entry loss at equipment adaptor of 1.5” (constant)
- 10’ of 4”OD duct
    - Reference **Table 2-3** shows 100’ of 4” OD duct @ 4,000 ft/m = 7.03”



- 10’ = 7.03 x .1 (for 10’ feet out of 100’) = 0.70” SP

- (1) 90° elbow
  - Reference **Table 2-4** shows (1) 90° elbow of 4” OD is equivalent of 6’ of straight pipe
  - 6’ of 4 OD = 0.28” SP
- 25’ of 4” OD duct
  - Reference **Table 2-3** shows 100’ of 4” OD duct @ 4,000 ft/m = 7.03”
  - 25’ = 7.03 x .25 (for 25’ feet out of 100’)
  - = 1.76” SP

1.5” + 0.70” + 0.28” + 1.76” = **4.24” Total SP for sander branch**

Step 2 - Calculate SP of Main Trunk Line

In our example our ductwork has 50’ of 7” OD duct, followed by 30’ of 10” OD duct at 4,000 ft/m.

- 50’ of 7” OD duct
  - Reference **Table 2-3** shows 100’ of 7” OD duct @ 4,000 ft/m = 3.55”
  - 50’ = 3.55 x .5 (for 50’ feet out of 100’) = 1.78” SP
- 30’ of 10” OD duct
  - Reference **Table 2-3** shows 100’ of 10” OD duct @ 4,000 ft/m = 2.30”
  - 30’ = 2.30 x .3 (for 30’ feet out of 100’) = 0.69” SP

1.78” + 0.69” = **2.47” SP Total SP for main trunk line:**

Step 3 - Calculate SP for Dust Collector

Each type of dust collectors generates different SP. For this figure, it is best to consult with an experienced baghouse OEM such as Baghouse.com. For our example we will assume a SP of 6” for a baghouse dust collector.

Note: Baghouses are normally designed to operate between 3” - 5” of differential pressure. Baghouse.com recommends being conservative with this estimate and designing in extra capacity to provide a cushion for normal operational ups and downs.

6” Total SP for baghouse

Total SP for our example dust collection system:

- 4.24” for worst branch
- 2.47” for main trunk line
- 6” for baghouse
- = 12.71” total system SP

Now we have all the data needed for completing our system.

The dust collection system must provide a **minimum of 1,680 CFM** through a **10” trunk** duct at **4,000 ft/m** with a **static pressure of at least 12.71” w.g**.

Static Pressure (Friction Loss) per 100' of Duct - Table 2-3				
Duct Diameter	Air Velocity FPM			
	3,500 f/m	4,000 f/m	4,500 f/m	5,000 f/m
4"	5.46	7.03	8.88	10.75
5"	4.16	5.36	6.70	8.19
6"	3.33	4.29	5.36	6.55
7"	2.76	3.55	4.44	5.43
8"	2.34	3.02	3.78	4.61
9"	2.03	2.62	3.27	4.00
10"	1.78	2.30	2.88	3.51
12"	1.43	1.84	2.30	2.81
14"	1.18	1.53	1.91	2.33
16"	1.01	1.30	1.62	1.98
18"	0.87	1.12	1.40	1.72
20"	0.77	0.99	1.23	1.51
22"	0.68	0.88	1.01	1.34

Equivalent Resistance in Feet of Straight Duct for Each 90 Degree Elbow Table 2-4				
Duct Size	90°	60°	45°	30°
3"	5	3	3	2
4"	6	4	3	2
6"	12	8	6	4
8"	13	9	7	4
10"	15	10	8	5
12"	20	13	10	7
14"	25	17	13	8
18"	36	24	18	12
22"	46	31	29	19
30"	74	50	37	24

Equivalent Resistance in Feet of Straight Duct for Each 30 and 45 degree Branch Entry Table 2-5					
Size	**30°**	**45°**	**Size**	**30°**	**45°**
3”	3	4	**16”**	15	23
4”	4	6	**18”**	17	26
5”	5	7	**20”**	18	28
6”	6	9	**24”**	20	31
7”	6	10	**26”**	22	34
8”	7	11	**28”**	24	40
9”	8	13	**30”**	28	43
10”	9	14	**34”**	31	48
12”	11	17	**38”**	35	54
14”	13	20	**42”**	39	60

Static Pressure (Friction Loss) per 100’ of Duct Table 2-6				
Duct Diameter	**Air Velocity FPM**			
	3,500 f/m	4,000 f/m	4,500 f/m	5,000 f/m
24”	0.61	0.79	0.99	1.21
28”	0.51	0.65	0.82	1.00
32”	0.43	0.56	0.70	0.85
36”	0.37	0.48	0.60	0.74
40”	0.33	0.42	0.53	0.65
44”	0.29	0.38	0.47	0.58
48”	0.26	0.34	0.42	0.52
52”	0.24	0.31	0.38	0.47
56”	0.22	0.28	0.35	0.43
60”	0.20	0.26	0.32	0.39

Additional Considerations

Common Additional Considerations

1. Recirculating air back into facility
2. Balancing system with blast gates
3. Combustible and toxic dust
4. Filter styles
5. Dust discharge (manual or automatic)

In this guide we have reviewed a relatively simple system with few variables. Even at this level it is still recommend to consult with an experienced dust collector OEM before making any equipment purchase. There may be additional factors to consider before determining the final sizing, design, construction and installation of a dust collection system. A few of these possible factors include:

Recirculating Air Back Into The Facility

Recirculating air from the dust collector exhaust can prove practical in areas with cold climates to conserve heat. Make sure to include a ambient air return line to balance the airflows and prevent carbon monoxide poisoning. Additionally, any return duct needs to be sizes at least 2 inches larger than the main duct entrance and its SP added to the system total.

Additionally, OSHA and other applicable safety regulatory bodies require any recirculated air to pass through a HEPA after filter.

Combustible Dust and/or Toxic Compounds Hazards

Many types of dust, including many woods are toxic, so take special care to choose a filtering system that will provide optimal safety.

Facilities that handle combustible dusts must take special precautions to avoid potentially serious safety hazards from forming within their dust collection system. The National Fire

Code issued by the NFPA (National Fire Protection Agency), OSHA combustible dust emphasis program, and the OSHA General Duty Clause and many other similar local and state regulations now require a combination of explosion/fire prevention and/or protection devices for any dust collection system handling combustible dusts.

Prevention devices include spark arrestors, abort gates, high-speed sprinklers, inert gas or injection systems, and more. Protection devices include explosion vents, high-speed sprinklers and dry extinguishing injection systems.

Fire experts should be consulted for any system potentially handling combustible dusts.

Balancing System Using Blast Gates

Blast gates should be installed on all branch lines to maintain system balance. Their proper use should also be part of regular training for dust collector operation.

Clean Out Traps

If your system has areas where long slivers of material could possibly hang-up and cause a clog, install a clean-out near that area.

Determining Required Capacity For Secondary Lines

After adding all primary lines together determine how much extra capacity you want to install for secondary lines. If secondary branches are run sparingly then its possible to not include them in the calculation. When they need to be used you can divert some of the capacity from the primary branches (by shutting them down and blocking those ducts using a damper valve). Be realistic when calculating your needs and size appropriately.

Filter Styles

Bags, cartridges or pleated elements are three common filter styles used in baghouse dust collectors. Cartridges are rarely used in new systems except for a handful of OEMs due to high cost and difficulty sourcing replacements.

Bags and cages are the most versatile being able to work in the widest range of applications including temperatures up to 500F.

In newer systems, pleated filter elements (sometimes called pleated filters) provide a much larger filter cloth area in a smaller space compared to bags (usually 3 times as much filter in half the space). They are widely manufactured and are only marginally more expensive than bag and cages. In addition, they provide superior performance, require less cleaning energy (i.e. compressed air) and provide less pressure drop over a longer service life. And due to their smaller size, collector units can be made smaller.

Best Practices to Increase efficiency and Reduce Size

- Try to capture dust as close as possible to source to reduce size requirements.
- More directed venting better solution than venting large area as volumes increase rapidly when venting entire spaces
    - e.g. Venting one machine at 600 CFM = 6 bag unit vs. venting entire room of 30' x 30' x 10' = 9,000 cubic feet of air = 125 bag unit @ 3:1 ratio

Oversizing for future expansion

Good idea to size in additional 10% capacity for later. Minimal added costs upfront to add additional capacity, resizing later much more expensive (10:1 ratio roughly)

Consider Variable Frequency Drive (VFD) Fans

Allows for more control over system performance and potential energy savings when loads constantly change.

Dust Discharge Options

The most basic discharge is a manual slide gate, that is activated manually by personnel. If dust loads are light or the system is infrequently used this may be the most economical option. However, failure to keep the baghouse hopper clean and result in major operational problems and damage the filters.

Another option is for a rotary airlock that automatically cleans the hopper. This eliminates the need for a technician to manually clean the hopper, but comes at a price tag in the $2,000 - $3,000 range.

Conclusion

With this guide you should be able to make an educated estimation of what size dust collection system your facility needs.

Additionally, Baghouse.com experts are ready to help if you have any questions. Please feel free to call at (702) 848-3990, email us at info@baghouse.com or visit our website https://www.baghouse.com/ for more helpful dust collector information in the form of Articles, How To Guides, FAQs, Case Studies and more!

Thanks for reading!

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