

20 Economical Ways to Improve the Performance of a Baghouse Dust Collector

Many baghouses do not offer adequate technology to accommodate today's aggressive production demands. This paper outlines cost-effective solutions that can have an immediate impact on overall performance, without the need for a full rebuild of the baghouse. The paper will also discuss upgrading to higher-performance accessory items.

Understanding one's options, along with the benefits of each, can enable a decision maker to discover solutions that provide maximum impact at minimal cost.



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The baghouse dust collector is an integral component to many industrial processes. However, many baghouses in operation do not offer adequate technology to accommodate today's aggressive production demands. Thus, plant operators and owners are faced with one of three possible decisions concerning their inefficient baghouse:

- Allow the baghouse to continue operating without modifications.
- Buy a new baghouse or upgrade the baghouse to a new, more efficient design, such as a pulse-jet, that can take advantage of high-efficiency pleated filter elements instead of filter bags and cages.
- Make minor modifications and/or employ modestly priced devices and tools to improve the operation of the existing baghouse.

This paper will focus on the last item and outline many cost-effective methods that can have an immediate impact on overall performance, without the need for a full rebuild of the baghouse.

Some of these solutions involve the mechanical parts of the baghouse, suggesting ways to improve performance of the existing design or upgrading to newer technology. Topics for discussion will include ductwork configuration, rotary valve operation and particulate buildup in hoppers. Each of these areas can inhibit overall dust collection effectiveness and must be addressed so

that other modifications to the baghouse will have maximum benefit.

The paper will also discuss upgrading to higher-performance accessory items such as pleated filter elements, fabric finishes and door seal. These inexpensive devices are offered in many styles to fit a variety of original equipment manufacturer (OEM) designs and are engineered to overcome original design flaws that lead to short bag life, improper filtering/cleaning, and emissions. Included in these suggestions are tips for correct filter bag installation in various styles of baghouses.

These and other ideas are presented to provide the baghouse owner a full range of options in which to enhance dust collection performance. Understanding these options, along with the benefits each offers in terms of time savings, reduced energy consumption and filtration enhancement, can enable a decision maker to discover solutions that provide maximum impact at minimal cost.

Discussion

1. Proper Design of New Equipment —

Many baghouses in operation today were improperly designed from their inception, which may cause problems during the entire life of the baghouse. Some of these units were not engineered properly or were sized too small to save money in a budget decision. One of the most important aspects in design that is sometimes overlooked is a proper air-to-cloth ratio. This ratio is an expression that shows how

much air volume is being handled versus how much cloth area is available in the baghouse.

Pulse-jet baghouses that utilize felted material and clean while on-line can operate at higher air-to-cloth ratios. Shaker and reverse-air units that use woven material and clean off-line require more filter area. The air-to-cloth ratio is a very important factor to consider in the design and operation of a baghouse. Improper ratios can contribute to inefficient operation of the baghouse. Operating at an air-to-cloth ratio that is too high may lead to a number of problems, including high pressure drops, insufficient cleaning and inadequate ventilation at the pickup point.

Shaker and reverse-air systems should not be sized to operate above a 2.5-to-1 air-to-cloth ratio. Most pulse-jet systems should be sized at no more than a 6-to-1 air-to-cloth ratio (and much lower on units that utilize fiberglass filter media). The correct design from the initial installation will definitely save money over the life of the unit.

2. Optimize Differential Pressure — Proper operation of a baghouse dust collector requires the use of differential pressure gauges on the entire collector. Magnehelic® gauges measure differential pressure by installing one port on the clean side and one port on the dirty side of the baghouse or plenum. By indicating a sudden decrease in pressure, a system leak can be detected. A sudden rise in pressure denotes the filter bags are becoming “blinded” or caked with particulate. Magnehelic gauges are available for point-of-use or remote installation. U-tube manometers can also be used for the same purpose as Magnehelic gauges, but they are less technically advanced. These can also help identify problems with dampers and bags by indicating the difference in pressure across the baghouse.

3. Utilize Clean-On-Demand Systems

— Differential pressure gauges should also be used in conjunction with gauges that can set the cleaning system to “clean-on-demand.” Photohelic® gauges use pressure sensors to monitor coordinates to determine cleaning cycles. The gauge is manually set to operate between a high and low pressure point. When baghouse differential pressure changes to reach the high pressure point, the cleaning cycle is automatically activated. When the low pressure point is reached, the cleaning is

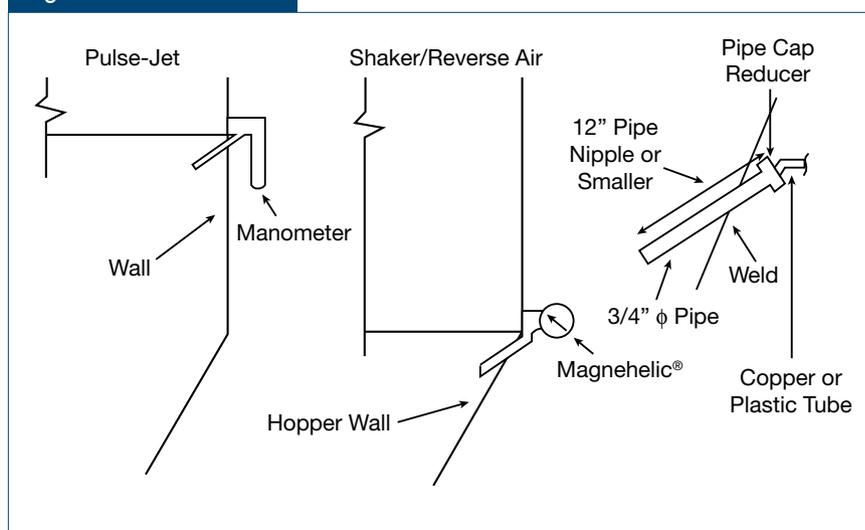
discontinued. The ideal spacing between the high and low setpoints should be no more than 1 inch with the ideal setting of 1/2 inch between the two points. These settings help to control the system by not cleaning too much material off of the filter bags, which can cause a slug of material to exit the system.

Sequential controllers enhance the prevention of over- and undercleaning of the filter bags, which causes a decrease in airflow, production levels and filter bag life. The Photohelic gauge sequential controller is used to automatically or manually activate, as well as discontinue, the baghouse cleaning using pre-set high and low pressure points. The system automatically adjusts the cleaning cycle to match the baghouse load to prevent overcleaning of the filter bags. An LED sequential controller operates in the same manner as the Photohelic unit, but provides a 4–20 mA signal. This signal enables an external monitor or recording device to be used for remote monitoring or connection to a programmable logic controller (PLC).

The reverse-air/shaker sequential controller automatically sequences through a close damper–reverse-air (or shake)–settle time–open damper cycle. The cycle will repeat for all compartments and return to the first compartment. The active cleaning cycle is indicated on the timer panel. Cleaning can be scheduled on either a continuous or on-demand cycle.

All of these gauges will help improve control of the system. They are all fairly easy to install and inexpensive in comparison to the benefits received. They also help in recordkeeping to pinpoint problem areas and how to correct them.

Figure 1



The correct installation for the gauges. A 2.5-inch pipe cap reducer attached to a 0.25-inch hose helps to reduce the potential of pluggage.

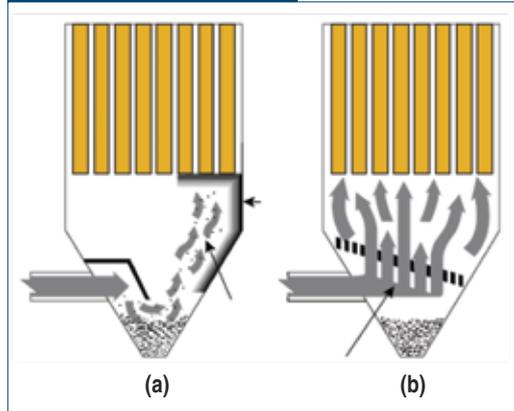
4. Proper Inlet Design

— The importance of proper inlet design is extremely significant as it relates to the operation of a baghouse dust collector. Many baghouses are of a standard design and use “off the shelf” products. These products are delivered to the end user with the inlet already installed in the hopper. Some of these designs incorporate a baffle over the inlet duct opening that directs incoming air downward into the hopper area. This airflow into the bottom of the hopper area can cause particulate in the hopper to swirl upward and to be re-entrained into the filter media. When combined with the incoming material, the material re-entrained from the hopper produces a higher grain loading on the filter bags. If the incoming material is directed straight across a narrow hopper, excessive wear from abrasion is likely to occur on the sidewall opposite the inlet.

Enlargement of the inlet duct prior to the hopper can reduce the inlet velocities on entry. Inside the hopper, the installation of “ladder vane” baffling creates a more uniform velocity profile in the hopper. The ladder vane baffles are installed to evenly distribute the inlet plenum gas stream, reducing turbulence and uneven grain loading. Better distribution of inlet air minimizes the re-entrainment potential and reduces the amount of material carried to the filter bag surface. These baffles are inexpensive and easy to install for most baghouse designs.

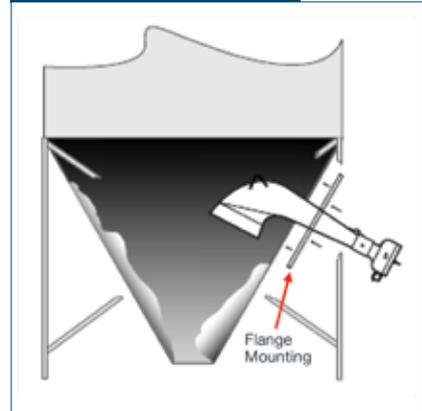
5. Don't Use the Hopper for Material Storage — Many problems can occur when the hopper in a baghouse dust collector is used for storage of material. The primary purpose of a hopper is to be used as an inlet into the baghouse, and for facilitating the removal of material into a bin or screw conveyor for further transportation. When material is stored in the hopper and not removed, it can cause severe problems by allowing the re-entrainment of material into the filter bags. This re-entrainment may shorten filter bag life, caused by abrasion on the lower portion of the filter bags. Material that is cleaned off of the bags should be removed from the hopper as soon as possible to prevent this re-entrainment problem. The material can be removed continuously by the use of an airlock or dump valve that removes the material into the collection system.

Figure 2



Ladder vane baffles, as shown in (b), more evenly distribute airflow.

Figure 3



Acoustic horn throat flange mounted in hopper.

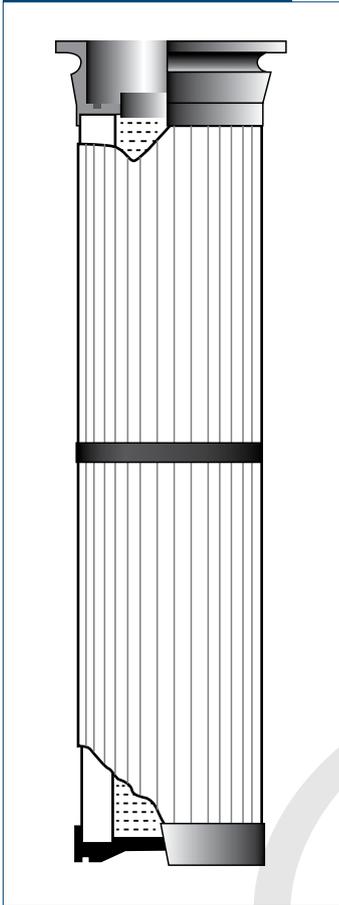
Even if the hopper is not used for storage, there can still be problems with material building up on the sidewalls or bridging over the outlet of the hopper. These situations can cause the same problems as listed previously when the dust re-entrains onto the filter bags, or causes slugs of material to be emptied all at once instead of a steady, even flow.

Acoustic horns have shown to be an inexpensive way to prevent bridging and buildup by helping to fluidize the material with the use of sound waves that do not let the materials adhere to each other. These acoustic devices can be installed easily with a throat or a flange mounting system that causes minimal damage to the hopper and will not cause the hopper walls to warp or crack at the seams.

6. Utilize Pleated Filter Elements to Improve the Operation of Pulse-Jet Units — Pleated filter elements provide a simple retrofit for upgrading existing dust collection systems and improving problem systems. A pleated filter element is a one-piece pleated product of spun-bonded polyester media and is a direct replacement for traditional filter bags and cages. This media resists surface penetration of particulate, dramatically increasing efficiencies while operating at significantly lower differential pressures than felted or woven materials.

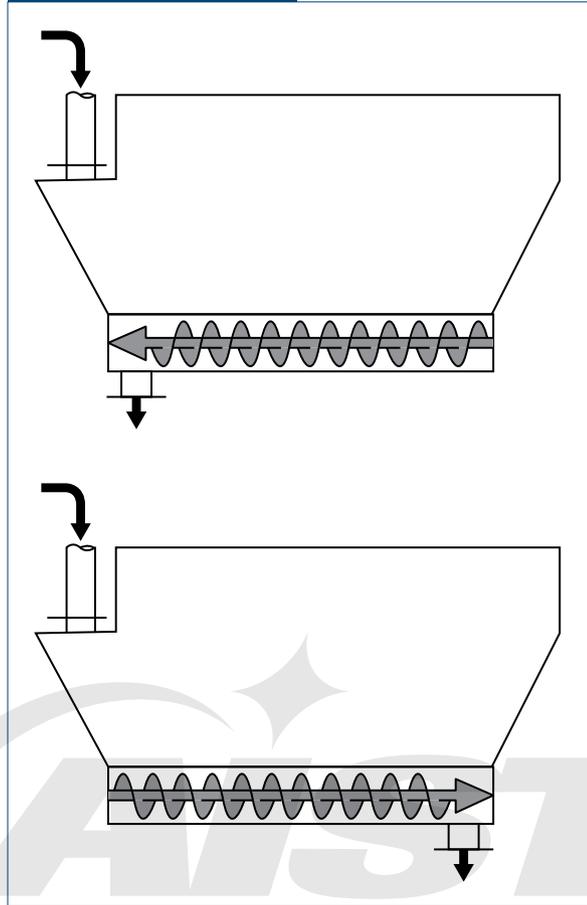
The media is pleated and molded into a filter element, increasing filtration surface area over bags by 100% to more than 200%, depending on existing bag sizes. The unique spun-bonded media used in the manufacture of pleated filter elements is unlike traditional felt fabric. It has a tight pore structure and rigid physical properties that allow it to hold a pleat without the need for supporting backing material. Because of this, as much as three times more filtration area can be installed in the same tubesheet hole to replace a conventional bag and cage.

Figure 4



Top-loaded pleated filter element.

Figure 5



Trough hopper screw conveyor.

Because of the ability to increase filtration area so dramatically within the existing dust collection equipment, pleated filter elements provide a very economical alternative to having to purchase new equipment or spend significant capital funds. They also provide other substantial benefits, which makes this a very cost-effective way to improve the performance of existing equipment without the need for major changes.

7. Correct Trough Hopper Screw Conveyor Direction — On collectors with a trough-type hopper and hopper inlet, dust can be re-entrained by high inlet gas velocity. On these units where the screw conveyors move the material toward the gas inlet of the hopper, there is a greater potential for dust re-entrainment. By design, material collected in the screw conveyor must be moved to a single discharge point, and as the collector loads the screw conveyor, the material depth in the screw conveyor increases. When this mass of material is moved toward the dirty inlet (the point of highest velocity in the hopper), it often becomes airborne and is carried back to the filter bags. This increases

the recirculating load in the collector and creates artificially high pressure drops.

An easy solution to this problem is to reverse the screw conveyor and move the discharge point to the opposite end of the collector. The mass of material collected is now moved away from the gas entrance and eliminates the recirculation of collected materials. By not re-entraining material, greater gas flow and extended bag life are achieved. Screw conveyor wear is also reduced, resulting in less maintenance needed on the equipment.

8. Screw Conveyor Leakage and Discharge — Airlocks on hoppers and screw conveyors are a necessary evil. Airlocks can be double-dump valve design, rotary airlock feeders or other style. The 8-, 9-, 10- or

12-inch diameter rotary airlocks should not run faster than 20 RPM. It is possible for the pockets of the rotary airlock to move too fast for material to fall out and be removed from the collection area. In this case, the rotary airlock can act more like a fan than a true airlock.

The relationship of revolutions to capacity is linear for a rotary airlock up to about 10 RPM. At 10 RPM, this relationship is at 93% efficiency to about the 20 RPM level. Above 20 RPM, this relationship will drop to 65% efficiency. In order to obtain the required 20 RPM, a double reduction drive, either in a drive unit or through sprockets, must be used.

The screw conveyor feeding the rotary valve can also create problems. Dust trapped in the hopper has the potential of being re-entrained and conveyed back to the bag. Any screw designed for a dust collector should be sized as a feeder. The screw should be sized at 100% full. Most problems occur when the screw is sized at 30–60% loading. Due to slugs or surges of material being removed from the compartments through cleaning, the screw can easily run 100% full,

complicating the dust removal system and overloading the airlock or rotary valve.

Conveyor screw flighting should be cut back to where there is no flighting over the airlock because it will drive the material directly through the gasketing and seal. The flighting should be cut back so that the material does not pack and build up.

9. Proper Sealing of Access Doors — Access doors allow for maintenance personnel to enter the baghouse equipment for leak detection, filter bag changes and proper identification of operational problems. These doors need to create a positive seal to reduce baghouse air inleakage and heat loss on all negative systems. They also need to seal properly to reduce condensation that can cause bag failure and severe corrosion.

Care needs to be taken to ensure a positive contact between the door seal and the door pan to prevent air infiltration. Door seal material is used to help prevent the problems of metal corrosion and filter bag damage caused by inleakage of ambient air into the baghouse. There are various designs to meet all specific needs of many doors and applications based on gas chemistry, temperature, and door configuration.

The proper use of door seal is a very inexpensive and easily installed fix that can prevent many problems from occurring. All doors should be inspected and analyzed to determine the materials are needed to properly seal the doors. This evaluation should be done on a periodic basis and whenever the baghouse equipment is down for repairs or changeouts.

10. Modulating Damper Installation — The dustcake that collects on the filter bags presents a variable static resistance to the ventilation system. As dust builds on the bags, the resistance to flow increases. After the filter bags clean, the resistance is lower. In many applications, the fan operates against high resistance and produces lower volume as grain loading rapidly builds the dustcake on the bags. When the load is completed and the grain loading is reduced, the fan suddenly runs against lowered resistance and the air volume increases. The resulting high velocity can cause small particulate to penetrate the fabric, leading to blinding and bleedthrough emissions. The cycle would then repeat as the next cycle begins.

A good recommendation is to install a modulating damper on the fan that adjusts to pressure changes. The damper maintains a more regulated volume to the baghouse, which protects the fabric from impingement. A control based on static pressure measured at the inlet of the baghouse will cause the damper to restrict

airflow to compensate for the reduced resistance of clean bags. This will open wider to allow more volume as the static resistance builds.

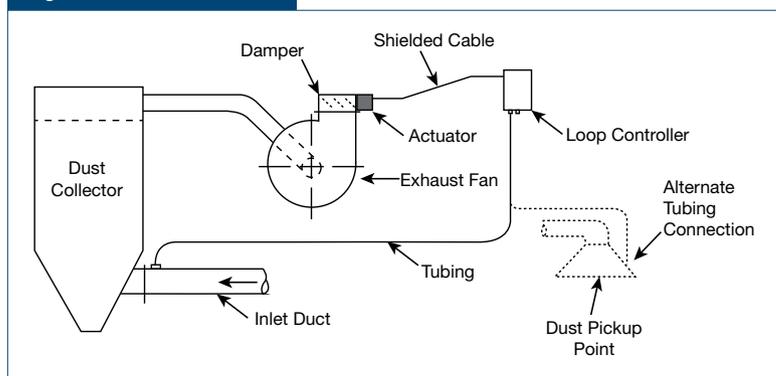
The use of a modulating damper will help the operator of the equipment to have a better handle on the process. This control should lead to much better filter bag life because of the constant state of the airflow and dustcake on the bags. There are different styles of these modulating dampers that are available and should be evaluated based on the particular aspects of the process.

11. Correct Filter Bag Installation — Correct filter bag installation is important to maximize the life of the fabric. The recommended procedure for installing bags in pulse-jet collectors is to position all bag seams facing the same direction. This can provide a reference point that helps to identify problems that result from inlet abrasion. This can be a very useful troubleshooting technique that provides a history on bag failures.

Bags with flanges or cuffs that fold over the tops of their support cages should be checked for smoothness around the edge to prevent leakage and bag abrasion. Seam placement on bottom-load bags should be 180° from the split or gap in the cage collar. The clamp on these bags should be installed 90° in relation to the seam on the bag and positioned on the groove in the cage. Snapband bags for top access pulse-jet units should be installed with the seams all facing the same direction. This allows for identification of areas where problems are occurring and improved troubleshooting of the unit.

Filter bags installed in reverse-air collectors should have the seams positioned at a 45° angle to the walkway and access door, which allows for easy verification that seams are installed straight and plumb. This also ensures the bags are the maximum distance apart, reducing the potential for bag-to-bag abrasion.

Figure 6



Modulating damper installation schematic.

Proper tensioning is also a critical element in bag performance. Loose, unsupported bags do not provide for proper collection, and the resulting bag-to-bag abrasion can cause premature failure. Overtensioned bags will lead to stress on the filter bag and reduced bag life. The use of proper tensioning tools ensures equal and adequate tension to all bags, eliminating guesswork that can cause damage during baghouse operation.

On shaker collectors, it is recommended that the shaker log be rocked to one side, allowing all bags in that row to be installed taut. Once that row is installed, the shaker should be rocked in the opposite position and the other row of bags installed in a similar manner. Utilizing this method will not put any additional strain on the shaker bearing, bushing, or other parts, and will not leave the bag too loose to cause bottom bag abrasion or the possibility of the bag pancaking shut.

12. Clean Air in Compressed Air Lines — The problem of moisture, oil and dirt in compressed air lines can affect the cleaning ability of pulse-jet-style dust collectors. When compressed air that cleans the filter bags is contaminated, it can cause many problems. Premature wear on pneumatic components can result because these components were manufactured to be used most effectively with clean compressed air. The pressure drop across the system can also rise because dirty air does not clean the filter bags properly. The contaminants are pulsed down into the filter bag, which can cause reverse blinding of the bags and a possible increase in material buildup on the bags due to moisture.

The problems of dirty compressed air can be cured fairly inexpensively with the use of filtering systems installed directly on the compressed air lines. Some of these systems can eliminate oil and water in the airstream with an efficiency of 99.97% of particles above 0.7 micron. With this type of production, equipment operation can be drastically improved with just a small investment.

13. Utilizing 1.5-Inch Pulse Valves — In pulse-jet-style systems, a pulse action for cleaning the filter bag is a function of shock to the filter bags, not a function of air volume. The “shock wave” developed in the bag by the instantaneous release of pulse air must be strong enough to travel the full length of the bag in order to clean down completely.

A 1.5-inch double-diaphragm pulse valve is significantly more effective at accomplishing this cleaning than a single-diaphragm valve or any smaller-sized valve. The first reason for this is that a single-diaphragm valve must release all of the air that is holding the diaphragm closed. This occurs by the air traveling the length of the pilot tubing and escaping

Figure 7



Installing filter bags correctly helps in troubleshooting equipment.

through a small vent port in the pilot solenoid valve, which slows the release of the pulse air into the blowpipe. A double-diaphragm valve must only release a comparatively small volume of air that is holding the small diaphragm closed through the vent port in the pilot solenoid valve. At the same time, the air pressure holding the main diaphragm closed is released through a large vent port in the pulse valve, which allows an immediate release of the pulse air into the blowpipe.

The second reason for superiority is that a 1.5-inch pulse valve and blowpipe contain a 1.76-inch² cross-sectional area. A 1-inch pulse valve and blowpipe contain a 0.88-inch² cross-sectional area. In comparison, 15³/₈-inch diameter blowpipe orifices contain a combined cross-sectional area of 1.65 inches². This shows that the 1.5-inch pulse valve will provide sufficient area for the pulse air to flow unimpeded to all blowpipe orifices. In contrast, a 1-inch pulse valve or smaller imposes a restricted area which impedes the flow of air to the blowpipe orifices.

A double-diaphragm valve produces a crisp, instantaneous pulse and results in a stronger shock wave being developed in the filter bag. This, in turn, provides much more effective cleaning. This change to a 1.5-inch pulse valve is fairly easy to accomplish and should save a significant amount of money in regard to bag changeouts and possible loss of production due to insufficient cleaning of the filter bags.

14. Pulse-Jet Cleaning Setup — In pulse-jet collectors, the cleaning function not only removes the collected dust, but it rearranges the remaining dustcake structure on the bag, resulting in a change in differential pressure. In a unit with high upward gas velocities, mechanical separation of the fine sub-micron dust can occur, creating a dustcake structure that is very dense. A dense dustcake creates a resistance to airflow and higher differential pressures.

The cleaning sequence can play an important part in lessening the re-entrainment of material. Pulsing one row right next to another row (in sequential order) can cause the fine sub-micron material to migrate to the cleaned row. Staggering the order of

rows to be pulsed can improve the dustcake for optimum filtration. An example would be to pulse row 1, then rows 4, 7, 10, 13, 16, 2, 5, 8, 11, 14 and so on until the entire system has been cleaned.

The cleaning cycle for pulse-jet collectors should be designed so the pulse duration produces a short, crisp pulse in order to create an effective shock wave in the bag. This duration is generally set to fire for 0.10 second. The frequency of pulse-jet cleaning is also vital to proper dustcake retention. This frequency can vary from 3 to 30 seconds or more and is adjusted by means of a potentiometer on the timer panel. The frequency should be adjusted so that the differential pressure across the collector ranges from 3 to 6 inches w.c. (75–150 mm).

On pulse-jet collectors, the pulse frequency can be increased, but the next pulse should not be programmed to fire until the compressed air pressure in the header is regained. This allows the same force of pulse for each row cleaned. The regain of air pressure is dependent on the capability of the compressed air system tied to the baghouse and the size of the compressed air piping to the header tank.

15. Bag-to-Cage Fit — A major cause of failures in pulse-jet systems is improper fit of the filters to the support cage. For proper performance of the pulse-jet filters, the fit relationship between the bag and cage is critical. Filters that are too loose or too tight will severely limit collection efficiency and lead to premature failure.

A related area is the importance of the proper support cage to support the filter bag. There are many types of cages in the marketplace, but proper care must be taken to ensure that the cage construction will properly support the filter bag as well as optimize cleaning and efficiencies. The variables that are important for review include the number of vertical wires used and what type of ring spacing should be employed to operate properly in the dust collection equipment.

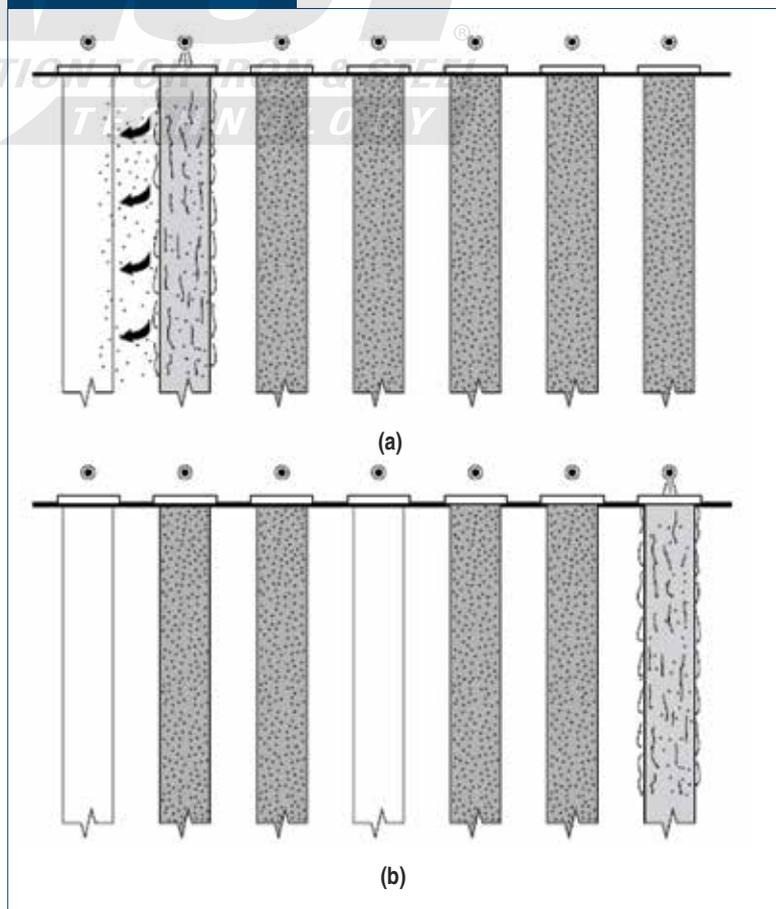
16. Blowpipe Alignment — One major cause of filter bag failure in pulse-jet-style cleaning dust collection units is the improper alignment of the blowpipes in the cleaning system. The blowpipes serve to provide the compressed air cleaning, which sends air into the top of the filter bag and cage assemblies. If the blowpipe holes are not aligned properly over the filter bags, then the proper cleaning of the filters will not occur.

If the blowpipe holes are not properly centered, holes may develop in the top portion of the filter bags due to the excessive force that is seen by the fabric. These holes will eventually cause the bags to fail and need replacing. Another potential problem is that the pulse-jet cleaning energy is reduced and the filter bags may not be cleaned properly due to the lack of cleaning seen by the bottom portion of the filter bags. If the holes are not aligned through the center of the filters, then not as much extra cleaning air is added to be able to create the proper shock wave in the filters.

A thorough review of the blowpipe installation and how they are aligned in respect to the filters should be undertaken and changes made to ensure the proper operation of the equipment. This is a very quick fix that is easy to change, and it can also produce significant improvements in the system.

17. Conditioning of New Bags — Conditioning agents are injected into a baghouse to establish a porous control layer on the filter bag surface. This protects the bags from particulate bleedthrough, blinding, and problems caused by hydrocarbons and moisture carryover. Conditioning agents should be utilized to pre-coat all

Figure 8

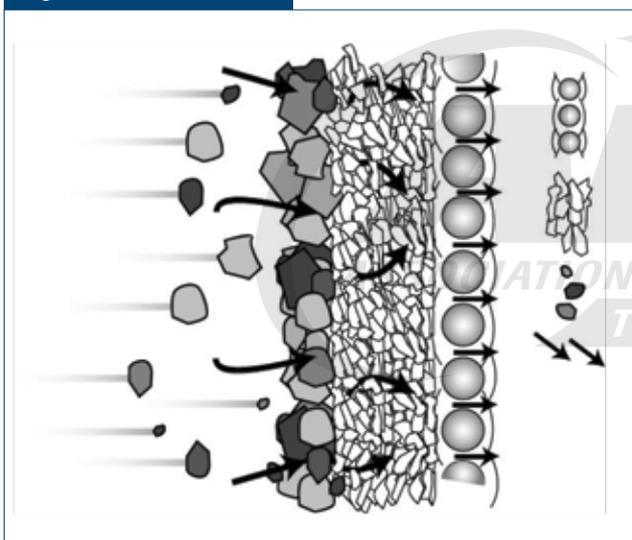


Incorrect (a) and correct (b) sequencing in pulse-jet systems.

Table 1

<i>Nominal Recommended "Pinch"</i>		
Fabric	Pinch	Rec. cage/ring spacing
Felted materials	0.25–0.75 inch (6.4–19 mm)	Any/any
PTFE membrane on felted materials	0.25–0.5 inch (6.4–12.7 mm)	20-wire/6 inches (15.24 cm)
Fiberglass	0.125–0.375 inch (3.2–9.5 mm)	20-wire/6 inches (15.24 cm)
PTFE membrane on fiberglass	0.0625–0.25 inch (1.6–6.4 mm)	20-wire/6 inches (15.24 cm)
Ryton®/Procon®	0.25–0.5 inch (6.4–12.7 mm)	10-wire/any
P84	0.125–0.375 inch (3.2–9.5 mm)	20-wire/6 inches (15.24 cm)
Teflon®	0.375–0.625 inch (9.5–15.9 mm)	Any/any

Figure 9



Pre-coating agents establish a proper dustcake for filtration.

filter bags after an entire changeout and can even be used on an ongoing basis to improve the operation of a baghouse.

The best available agents consist of multi-shaped particles that are used to develop an initial control layer on the filter bag. The varying particle sizes allow air passages to remain open, keeping pressure drop minimized and airflow maximized. Proper agents can also improve dustcake release by allowing the dustcake to break away from the bag during the cleaning cycle rather than compacting into a permanent mass. The results will be prolonged bag life, higher airflows, and decreased emissions and pressure drops.

There are also conditioning agents available that are specifically designed for applications where spark

carryover can lead to baghouse fires. These agents are of similar composition to the standard agents, but with the addition of spark-retarding chemicals. As a spark comes into contact with the agent, a chemical reaction occurs that extinguishes the spark. Injection procedures should be available for all agents and should be followed exactly to ensure proper installation. This simple process will improve efficiencies and prolong filter bag life once in service.

18. Using Leak Detection Powder — Many plants in the past, as well as today, spent time inspecting each filter bag manually for tears, holes, and leaking seams which took many hours and was often inaccurate. In addition, structural air leaks in the system, such as weld cracks and ill-fitting metal enclosure covers, could not be detected unless they were clearly visible.

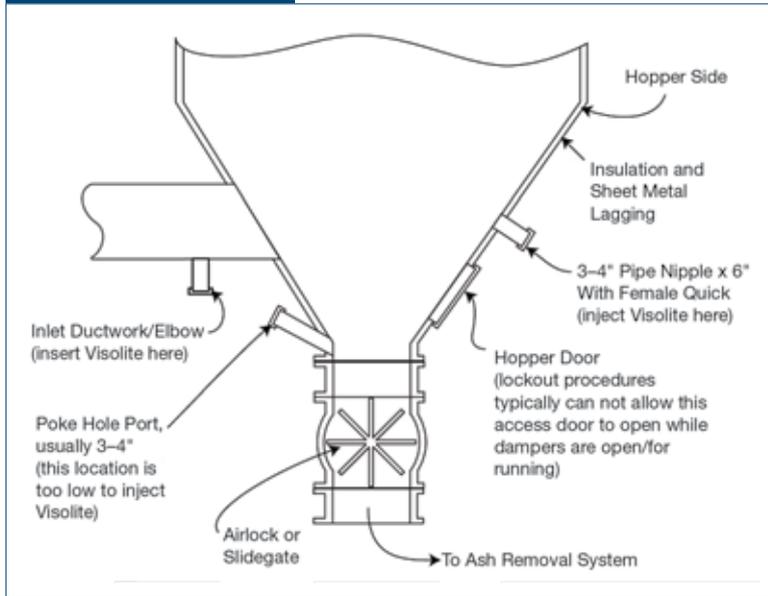
A better way to test for all of these possible leaks is by the use of a leak detection powder. Leak detection powders are inexpensive, lightweight fluorescent powders that are injected into a baghouse. Because the powder takes the path of least resistance, the tracer will accumulate around the source of leakage to pinpoint the location of the leak and its severity. A monochromatic light is then used to locate the areas of accumulated powder. When a leak has been spotted, the fluorescent powder glows brightly under the light. Once leaks are found and repaired, a second test should be run with a different color to determine if all leaks have been eliminated.

It is important to note that a leak detection powder should be used that incorporates varying particle sizes to minimize fabric bleedthrough. This ensures that all leaks will be found, regardless of their size, for proper leak identification. There are usually four colors that are available that work better in varying degrees, depending on the application and dust being collected. It is very important to choose the appropriate color for each specific application.

19. Maintenance and Recordkeeping — Proper maintenance and recordkeeping play a vital role in the operation of a baghouse. The information gathered can assist in implementing an effective preventive maintenance program. The documentation of inspections, observations, and maintenance will help determine the baghouse operating efficiency and prevent a plant from reaching non-compliance status.

Areas that require monitoring and careful documentation include changes in baghouse operation, production processes, grain loading or fuels. All of these variables can have a substantial impact on

Figure 10



Recommended injection points for leak detection powder.

baghouse performance. Pressure drop fluctuation, cleaning cycle adjustments, and emission levels should be monitored and recorded as well.

Recordkeeping consists of both information that is recorded regularly and information that is recorded on specific events. Records that should be kept regularly include chart recordings that track baghouse pressure drop and inlet temperature. System chart recordings should be maintained to be used in comparison to current baghouse data. System operation reports may be maintained on an hourly basis during original system start-up to establish initial operating criteria. After the system has been operating for some time and there is greater familiarity in its operation, these reports can be reduced to once or twice per shift. Event records are kept at specific times, such as start-up, shutdown, bag inspection and during periods of malfunction.

All of this information is very easily obtained and very inexpensive to maintain at the plant. Some specific documents that are useful include baghouse fact sheets, failed bag charts, baghouse maintenance reports and emergency worksheets.

20. Filter Bag Testing and Analysis — The only way to accurately analyze how a filter bag has performed while in operation is a filter bag analysis conducted by a reputable testing organization. Bags removed from the collector must be kept in their actual removal state so that accurate test results can be completed. The used filter bag should then be sealed completely in a

proper container and sent to the testing laboratory.

Properly equipped laboratories will provide troubleshooting for fabric filters by doing complete lab testing on weight, breaking strength, permeability, mullen burst, flex cycles, and chemical analysis of the fabric and dust. Test reports should also be written in clear and concise language, complete with well-organized conclusions and recommendations. This information will then need to be evaluated against the current operating parameters of the equipment to make proper adjustments.

Some labs also offer testing procedures that help in selecting the proper filter media for a baghouse. A sample of dust particulate from the baghouse can be fully evaluated for micron distribution with mass volume, population counts, and surface area dust expanding both sub-micron and micron sizes. Testing chambers

can then be used to generate exact inlet concentrations and various fabrics operated under the system's designed air-to-cloth ratio. The collection efficiency and operating differential pressure performances are continuously monitored throughout the test. This evaluation, along with a chemical analysis, allows for proper filter media selection and eliminates the need for extensive trials.

Discussion

When optimizing a baghouse, there are many variables that need to be considered. Each baghouse is unique based on its application, temperature, dust loading, micron distribution, chemistry, air-to-cloth ratio, can velocities, etc. When sizing or evaluating a system, it is important that all the parameters are considered. Gathering data and documenting that data over a period of time can be valuable in troubleshooting the system when a problem does arrive.

Conclusions

This paper showed that the proper maintenance and upkeep of baghouse dust collection equipment is inexpensive and easy to implement with the correct plan of attack. Most of the hints given are inexpensive and will definitely help with the proper operation of the equipment. ◆

