

Baghouse Conversion to Pleated Filter Elements From Standard Bag and Cage Setup - Cost Benefit Analysis

Prepared By Dominick DaSanto

Table of Contents

Summery	3
Introduction	1
What is a Pleated Baghouse Filter Element?	1
What are The Advantages of Pleated Elements Vs. Standard Filter Bags and Cages?	1
Potential Drawbacks	2
Potential Cost - Benefit Comparison For NAME WITHHELD	3
Conclusion	4

Summery

This report will outline how **NAME WITHHELD** can see substantial savings associated with the operation and maintenance of their dust collection systems by switching from their current filter bag and cage technology to newer pleated filter elements in their baghouse dust collection systems.

Primarily, **NAME WITHHELD** would see reductions in purchases made on replacement filters every maintenance cycle, and a reduction in total man-hours needed to replace the filters in each of the main collectors. Additionally, operations of the various units will be improved and capacity for the entire system could easily be increased to account for increased demand from production at the plant.

In total, **NAME WITHHELD** would begin to see returns on this investment within 3 - 6 months. From their the savings will only increase as filter life and maintenance costs decrease and performance and capacity increase.

Introduction

What is a Pleated Baghouse Filter Element?

Pleated filter elements are the latest and most advanced industrial air filtration technology on the market today. A great number of industries, from power generation and cement to minerals and chemicals are switching en masse to pleated technology from traditional bag and cage technology. Pleated filter elements are essentially filter bags that are arranged to have many different folds of fabric in a smaller area than a traditional bag. Pleated elements also combine the bag and cage into a one-piece construction that removes the need for separate cages.



What are The Advantages of Pleated Elements Vs. Standard Filter Bags and Cages?

The main advantage of pleated elements carry over traditional bags and cages is that they offer on average 2 - 3 times the filter cloth area of a standard bag at half the average length of a standard bag and cage. Example: you have a standard 5.75" diameter filter bag that is 100" long (a very common size, one that is found on several large collectors at **NAME WITHHELD**). If you were to cut the bag open and lay it flat you would have approximately 12.6 sq/ft of fabric. If you were to take a pleated element of the same diameter and only 41" inches long, you would have approximately 24.6' sq/ft of filter area. This means that for less than half the length you get more than double the filter area compared to a standard bag.

This has dramatic implications for operating and maintaining these systems. With more filter area you need less pleated elements to do the same work as bags. You can often replace bags with elements at a 2:1 ratio of bags to elements.

With more filter area the elements also load dust better and are easier to clean. This means less cleaning cycles, which means you use less expensive compressed air to run the baghouse. Reductions of 30% - 50% in air use are common when converting to pleated elements. Further, since the bags are cleaned less, they experience less wear and tear overtime, meaning that pleated elements tend to last anywhere from 20% - 100% longer than filter bags in the same application. This means you replace your filters less often than traditional filter bags.

One of the greatest cost saving benefits of pleated elements is the ease of replacing them compared to traditional filter bags and cages. With traditional bags and cages, much effort is needed to remove the cage and bag assembly from the baghouse, and then replace the long cumbersome assembly back into the baghouse, and down into the tubesheet hole. With pleated elements all of this is eliminated. Compared to the complicated bag and cage assembly, the one-piece element is easy to handle and takes between a quarter to half the time to change compared to a traditional filter bag. And since on average, you use one pleated element for every two filter bags, your people have less to change. With the

Baghouse.com

extensive amount of safety precautions needed to do a baghouse changeout these projects can take up valuable manpower at the plant and end up costing thousands in lost production while the system is down and in labor costs.

Another great advantage of pleated elements is the ability to replace several different types of filter bags with only one pleated element for use in several collectors. For example, imagine you have four collectors that all use a 5.75" diameter filter bag, but each one is a different length. This means the plant needs to keep on hand four different bag types for these collectors, and must have different pricing for all four. With a pleated element, you could easily replace all four filter styles with one pleated element. This would mean you need only stock enough to replace one collector at any time (emergency requirement) and that you could avoid bottlenecking the system if you need to replace an entire unit. This also frees up warehouse space at the facility and reduces the work when ordering replacement filters.

Finally, using pleated elements is a great way to improve operations of your baghouse. With pleated elements, you can effectively increase the capacity of your baghouse by as much as 200%. This means you can combine systems into one unit and shutdown others that are no longer needed. Or you can increase production on the line without having to incur the large capital expenditure of a new baghouse to avoid production bottlenecks. Or, you can use less filters to improve performance and reduce energy usage by turn the system fan to a lower setting. Pleated elements also on average have better emissions than traditional bags, an ever-increasing need with tougher Federal and State environmental regulations coming into effect soon.

Potential Drawbacks

With all the above benefits what drawbacks are there to pleated filter elements? Pleated filter elements cannot be used in every dust collection application. They are sensitive to very high temperatures and certain corrosive gases. Additionally, certain applications require special construction materials that can end up making pleated elements much more expensive than comparable bag technology.

The good news is that for applications like those found at **NAME WITHHELD**, these issues are not applicable! With relatively lower temperatures throughout the process and no difficult to collect dusts or corrosive gases, pleated filter elements can be deployed comparatively easy into these applications.

Potential Cost - Benefit Comparison For NAME WITHHELD

My recommendation would be for the plant to look to convert in two stages. The first would involve all the "low temperature" baghouse units. These are the main systems in the plant and are vital to running the production line. Converting to pleated elements on these would be relatively simple and the elements would not be much more expensive than the current filter bag and cage setup currently in place. The second would be the three "high temperature" kettle units. These would require a little bit more engineering to get the right filter element. Further, the high cost of high temperature elements would place the return on investment for these units further out into the future. For this report I will only analyze the low temp units.

#Low Temp Filters & Cages	1,277
# High Temp Filters & Cages	432
# Pleated Elements Needed To Replace Low Temp Filters	639
# Pleated Elements Needed To Replace High Temp Filters	216
Labor Per Man Hour - Estimated	\$30
Compressed Air Costs	.14467 per 1,000 cubic feet
Average Cost Per Filter & Cage	\$50
Estimated Cost Per Pleated Element (Low Temp)	\$65
Estimated Cost Per Pleated Element (High Temp)	\$125

Low Temp Units

Operating Costs	Bag & Cage	Pleated Elements
Replacement - New Bags	Every 2 years - $1,277 \times \$50 = \$63,850$	Every 3 years - $639 \times \$65 = \$41,535$
Replacement - Labor	4 bags per man hour $\times 1,277 = 319.25$ man hours = \$9,577.50	8 bags per man hour $\times 639 = 79.875$ man hours - \$2,396.25
Cost Over 6 Years	\$191,550.00 + \$28,732.50 Total: \$220,282.50	\$83,070.00 + \$4,792.50 Total: \$87,862.50

Additional Benefits	
Additional Operational Benefits	
Air Usage	Between 30% - 100% reduction
Warehousing	200 elements on hand vs. 770 bags and cages
System Capacity	If replaced at 1:2 ratio capacity could increase by 15% Additional savings to be had by expanding capacity at certain units and consolidating others systems into less units.
Emissions	Along with system repairs reductions of PM 2.5 emissions by 10% or more are possible

Conclusion

By converting to pleated filter elements, **NAME WITHHELD** potentially could see a cost savings of an estimated \$132,420.00 every 6 years. These estimates do not include the potential savings from decreased air use, less system downtime due to less frequent changeouts, reduced energy costs associated with operating the baghouses, or the benefits of increasing production levels and lower emissions. When these are included the benefits could potentially reach \$1million or more.

The estimated time it would take to recoup the initial investment to convert to pleated elements would be essentially immediately as the cost of replacing the filters and cages is likely greater than the cost of the pleated elements.

Baghouse.com already has the needed technical information to begin work on this conversion. Similar conversions are likely possible in many of **NAME WITHHELD** plants. The potential savings from all of these conversions likely would compound the benefits seen at **NAME WITHHELD**.

Sincerely,
Dominick DalSanto
Dust Collection Expert & Sales Director
Baghouse.com