# Baghouse Operations

## Preventive Maintenance Prevents Disaster and Penalties

By John Johnson and Viola A. Bielobradek

*Pleated baghouse bag - upgrading a baghouse to pleated elements may triple its efficiency.*

John Johnson is the sales manager at TDC/Midwesco Filter Resources, Inc. 385 Battaile Drive, Winchester, VA 22601. John has 17 years of baghouse filtration application experience. Viola A. Bielobradek is the marketing manager at TDC Filter/Midwesco. Questions about this article can be addressed to johnsonj@midwescofilter.com and bielobradekv@tdcfilter.com or by calling 866 – 677-2822. Additional information is available at www.midwescofilter.com and www.tdcfilter.com. 'Never before has the government regulated baghouses with such scrutiny.' Baghouses have been in existence for over 80 years. However, when you ask maintenance or an environmental manager about his baghouse, you won't get much sentiment. All you may hear is a few snarls and some unique adjectives. Why? Typically, baghouses do not make money for a company. In fact, they can represent a large percentage of a plant's maintenance costs. Moreover, given the increasing environmental compliance requirements, the baghouse (if not operated correctly) can lead to monetary fines and jail time. Never before has the government regulated baghouses with such scrutiny. Most of the dust collected is labeled hazardous. Another concern is safety, as baghouses are typically considered a confined space. No wonder then that people have tried to find alternate ways of collecting dust. Despite all the more and less desperate innovations, baghouses are still the primary and most efficient manner of capturing dust.

*Standard baghouse bags are available in various types of material.*

In every industrial plant, the abatement process begins with a source that creates dust. Then there is energy to move dust to a baghouse in the form of ductwork and a large industrial fan. Next, there are the filters that collect the dust, followed by a device within the baghouse that cleans them. Last part of the abatement process is the removal equipment that makes sure the dust is removed from the baghouse. (Note: I have heard the term dust collector used when referring to a baghouse. Keep in mind that the purpose of a baghouse is to collect dust and remove it from the baghouse. The term "dust collector" is not quite precise since it only encompasses part of the baghouse purpose. If the baghouse were to only collect dust it would eventually plug up. Therefore, the dust must be continuously removed.) A standard baghouse system consists of tons of steel, air moving equipment, industrial fans and loads of dust. None of those elements, however, draw nearly as much circumspect attention as the filters, also known as filter bags or filter elements. Filters are typically made from synthetic cloth (media) that weighs less than 25 oz/square yard. Despite being the weakest link in the abatement process, a lot depends on them. If the filters break, or fail prematurely, the entire system fails. Never mind the large steel structures, massive air moving equipment, and tons of abrasive dust that is used in a baghouse process. In effect, the most common baghouse question that I've been asked in my 15+ years of experience has been: "How long will my filters last?" I have given the same boring, non-engineered, response: "It depends." It is not the most effervescent answer but it is the most honest. It does depend and on a lot of things such as:&#149 Type and size of dust being collected&#149 Total cloth of area of filters in the baghouse&#149 Chemical composition and temperature of gas-stream including moisture&#149 Type and condition of baghouse including evacuation equipment&#149 Baghouse start up and shutdown procedures&#149 Preventative maintenance procedures There is no miracle filter bag. Some filters can withstand temperature better than others, but will lose strength quicker than others due to chemical or moisture attack (hydrolysis). The key to finding the best filter bag is to know your process conditions. Only then the best filter media can be selected to construct the best filter. Membrane laminate technology is sometimes confused for that miracle bag, a baghouse panaceum of sorts. Although, membrane technology does offer the most efficient capture and premium dust release benefits, the membrane is applied to a media substrate, hence it shares in its limitations. Allow me use an analogy here: One may be tempted to install Windows XP onto an outdated PC, but it is not a good idea for obvious reasons. In other words, despite all the great filtering benefits membrane technology provides, it is still dependent of the substrate it is laminated to.

*Baghouse arrangement at a cement plant.*

Baghouses are self cleaning, which means the filters constantly clean while dirty air is directed to the filter with hopeful intent of equal distribution. The self cleaning keeps energy costs down because the filters remain permeable thus allowing air to flow through the bags while capturing and releasing dust. Permeable filters promote less restricted air flow, which requires less energy from baghouse system to move the dust from the source to the baghouse. To clean effectively, the filter must be moved or flexed. Flexing, over time, will cause the filter to weaken and lose strength, and eventually to break. This means that all filters have a shelf life. One way to improve bag life is to have a system that is efficient in capture, dedicated to effective removal of dust from the baghouse, while being minimized, or extremely efficient when cleaning (flexing) the filters. Since the filters are the weakest link in the chain, taking advantage of today's baghouse accessory technologies may effectively increase bag life while meeting all environmental compliance requirements. Below is a short list of baghouse accessories that have been significantly improved through recent technical advancements. These may add years to your filter's life, and help you record and measure your MACT data requirements.&#149 Broken Bag Detectors - technology uses AC coupled Tribo-electric to continuously monitor baghouse systems for filter media leakage. Dust concentrations of 0.01 $mg/m^3$ can be detected, regardless of composition because of the AC coupled technology at a wide range of particle density. &#149 Enhanced Cleaning System Boards - new master boards use enhanced differential pressure controls for analog, digital I/O, and full SCADA, DCS integration. Technology now allows pre-determined unique cleaning programs for on-demand or timer sequences, configurable pre-coating settings, blow-down cycles on automatic basis, tube cleaning abilities, power out memory retention, hour and cycle count recordings. The new boards send alarms for specific solenoid failure, insufficient power, circuit over temp, high DP, and low tank pressure for compressed air manifolds. Boards can be expanded to 200 outputs, push button manual triggers, and LED lights. &#149 Pleated Filters - new fabrication advancements allow for more robust designs from earlier versions. Pleated technology replaces conventional filter bags in pulse-jet applications and offers improvement in capture efficiency, pressure drop, compressed air savings, and bag life. Originally limited to low temperature applications, recent advancements in media now allow for use in high temperature applications (up to 500&#176F).&#149 Sonic Horns - new technology is more discreet and focused using acoustic energy to aid or replace inadequate baghouse cleaning systems. Sonic horns are used in hopper to assist in fluidizing dust for easy removal, and for negative flow industrial flows to eliminate build-up, which minimizes excessive vibration. Let’s not forget the human element as well. Having a pair of eyeballs to inspect the equipment to confirm that it is working properly will always be crucial. In large plants, the process baghouses typically get proper attention; the smaller secondary baghouses, however, may get ignored. That might lead to unnecessary headaches when trying to keep secondary units under compliance, and to achieve long filter life at the same time. Using your people or contractor services for specific and regimented preventative maintenance inspections on your baghouse, will help you continuously meet both environmental and filter life goals. Below are some baghouse inspection guidelines that would be considered adequate preventive maintenance. *Daily Steps* &#149 Walk through the baghouse area to check for normal or abnormal visual and audible conditions. &#149 Check the differential pressure. &#149 Monitor the gas flow rate. &#149 Check the cleaning cycle. &#149 Check compressed air and water traps on pulse jet baghouses. &#149 Monitor the discharge system by making sure dust is removed as needed. &#149 Observe the stack plume opacity. *Weekly Steps* &#149 Spot check bag seating conditions. &#149 Spot check for bag leaks and holes. &#149 Check all moving parts on shaker baghouses. &#149 Check fans for corrosion and blade wear. &#149 Check all hoses and clamps. &#149 Inspect the baghouse housing for corrosion. *Monthly Steps* &#149 Spot check bag tensioning in reverse air and shaker baghouses. &#149 Blow out (clear) the manometer or Magnehelic gauge. &#149 Verify the working order of temperature-indicating equipment. &#149 Check the compressed-air lines. &#149 Check the bag cleaning sequence to see that all valves are seating properly. &#149 Check all moving parts on the discharge system and the screw conveyor bearings. &#149 Check the drive components on all fans. *Quarterly Steps* &#149 Thoroughly inspect all bags. &#149 Calibrate the opacity monitor. &#149 Check gaskets on all doors and ducts. &#149 Inspect the paint on the baghouse and note corrosion. &#149 Inspect the baffle plate for wear. &#149 Observe the dampers for proper seating. &#149 Check the ducts for dust buildup. *Yearly Steps* &#149 Check all welds and bolts. &#149 Check the hoppers for wear. &#149 Replace high-wear parts. In addition, I would highly recommend getting laboratory reports on used filters bags. You may work with your filter supplier to determine the right time to send filters in for testing. Many plant personnel use lab testing to determine why a bag has failed. Some independent labs do a great job of finding the root cause of a failure. I also recommend using labs for preventative measures by performing autopsies on used filters. By testing a used filter, a lab can determine the strength retention of a filter and can predict remaining filter service life. The goal to meet your environmental and filter life objectives is focused on how well the filter performs. Although the filter is a main suspect when things go wrong, please keep in mind there are several related components that can cause failure and hence undesired emissions. Understanding your unique system, thus choosing the right filter, utilizing today's accessory technologies, and using regimental PM inspections are imperative to keeping the stacks clean. In regards to the old question, "how long should my filters last?", my answer will always be "it depends." Nonetheless, since you have read this article I will expound my thoughts. Most baghouses are designed so that the filters offer over four years of productive service. If, however, the process is changed, the filter life cycle will probably change. If filters are not lasting a minimum of two years, there is a good chance something is wrong. The good news is that there are probably many options to cure the problem. With today's advancements in filter construction and media upgrades through membrane and pleated technology, filters can effectively help comply with even the most stringent environmental compliance requirements. The key is to give your filters a fair chance by understanding how your process and baghouse work together, by utilizing new technologies, and by supporting the system with continuous preventative maintenance.

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