It's all in the bag

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A correctly selected air pollution control system will not only control emissions to air successfully, but will also contribute to the cement plant's overall efficiency.

The poor performance of pollution control equipment at a cement plant can be caused by changes in process or raw materials, increases in temperature, air flow or velocity, poor maintenance or improper filter media selection. An analysis of the complete process system is likely to reveal the root cause and possible solutions. But often, changing the filter media and customising these to the system will improve overall performance. Experience shows that carefully-crafted, high-quality filter bags translate into better performance in the field.

Solving issues associated with the kiln, clinker cooler, finish mill and coal mill present compelling benefits in terms of longer service life, reduced costs of operation and, of course, lower particle emissions.

The kiln

Fibreglass is the most common media for filter bags in kiln filters for good reason. Its temperature resistance of up to 260˚C (500˚F) can withstand the hot gases of the kiln, providing flexibility to plant operations as higher temperature ratings allow for improved throughput and production. However, fibreglass bags are relatively fragile and must be handled very carefully, especially during installation. Consequently, it is recommended that installation of fibreglass bags is left to experienced, qualified personnel.

A potential drawback of fibreglass bags is their relative inability to withstand 'over-pulsing' or excessive cleaning. Here, efficient and careful cleaning of the bags is an important factor in preventing failure. An excessive amount of cleaning pulses will often lead to premature failure, so it is necessary to find the optimal frequency to ensure the longest possible service. Qualified fabric filter technicians can provide best-practice recommendations.

AFT fibreglass filter bags – installed in kiln filter (inset)

FLSmidth clinker cooler filter

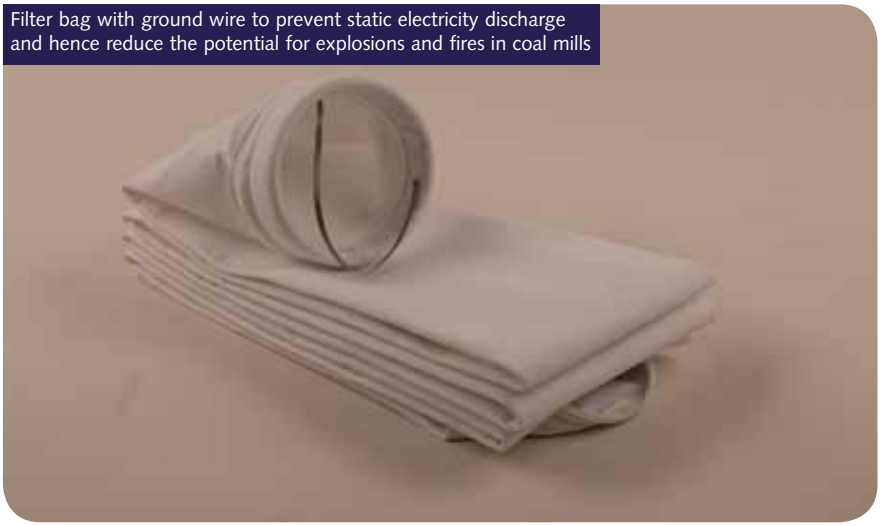
Clinker cooler

The typical media for clinker cooler filters is aramid. This sets a maximum temperature limit of 204˚C (400˚F) and a constant of 190˚C (375˚F) since above this, aramid bags will fail.

Bag failures can lead to unnecessary stoppages of the clinker cooler, because the defective bags need to be located and exchanged. A particularly useful device is a broken bag detector that can alarm the plant operators in the event of a broken bag as well as pinpoint the location. This minimises production loss and provides better conditions for finding and replacing the bags efficiently and safely.

In addition, if fabric filter performance is not cost effective, several filter media upgrades are available.

Filter bag with ground wire to prevent static electricity discharge and hence reduce the potential for explosions and fires in coal mills



Finish mill

In finish mill filters, polyester is one of the most widely-used media because of its high availability and low cost. However, hydrolysis is a common problem for this process. Polyester becomes brittle when exposed to moisture and temperatures around dewpoint, approximately 100˚C (215˚F). A better option is an acrylic filter bag because it operates well in high-moisture applications. Other benefits of acrylic filter media are:

- good resistance to moist mineral and most acids
- excellent resistance to organic solvents.

Coal mill

Typical filter media for coal mill dust collectors include polyester, acrylic and aramid. With a stainless steel scrim, these new and improved media replace the traditional, blended fabric with carbon fibres, also known as epitropic filters. The conductive scrims dissipate static consistently throughout the filter bag at a lower cost.

Static electricity in the coal mill filter could ignite coal dust and cause a fire or explosion. Safety measures preventing static electricity discharge therefore need to be in place to reduce the potential for explosions and fires. These measures include using stainless steel or copper grounding wires sewn to the filter bag or semiconductor filter bags.

Secondary dedusting

It is not uncommon to see undersized dust collectors in applications such as silos, pack houses, belt transport and conveying systems. High differential pressure issues in these units, designed for a specific grain loading, are usually caused by system overloading as production expands. The issue can be solved by retrofitting the design, increasing the size of the collector or using a pleated filter bag design instead. This last option can be the most cost-effective because the same housing and other components are used.

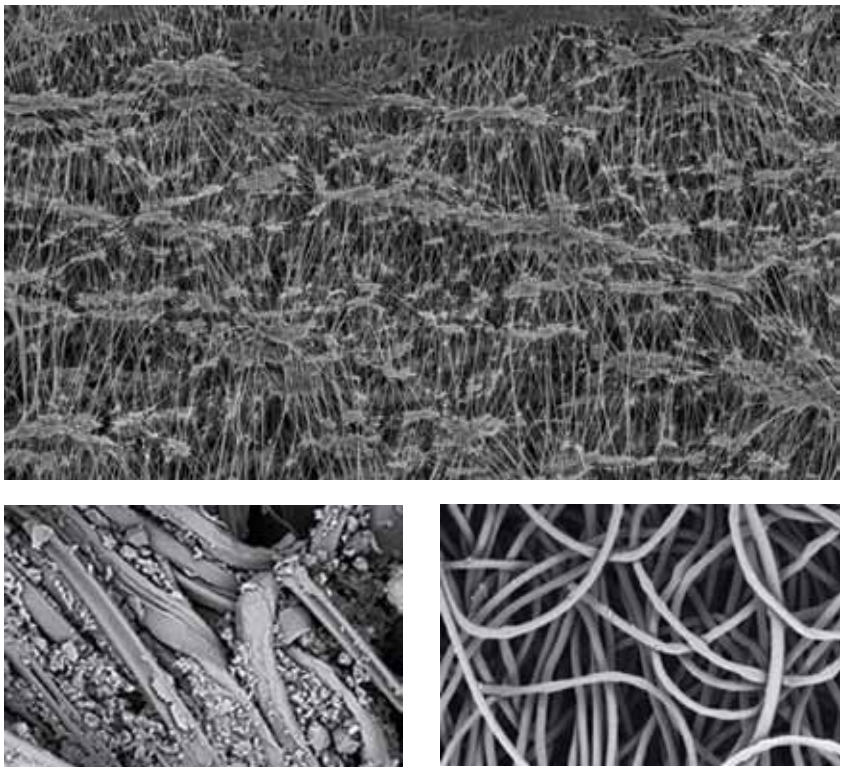
Expert knowledge

Having the right equipment is often not enough. To ensure that the fabric filter meets operational goals and complies with environmental regulations, the equipment needs to be supported by associated services, including qualified technical support, filter training, lab testing, spare parts, make and hold agreements, and ongoing customer service. This requires an experienced solution provider who has both operational know-how and technological manufacturing competencies. Filter bag engineers should be able to evaluate all process conditions, including:

- gas temperature
- air flow
- volume
- dewpoint
- dust loading
- particle size
- abrasiveness
- potential for process upset
- expected life
- the mechanical design and control system of the fabric filter.

From its base in Evans, Georgia, USA and its Asia-Middle East branch plant in Chennai, India, FLSmidth manufactures high-quality, robust filter bags with its state-of-the-art manufacturing equipment and proven fabrication techniques. Today, FLSmidth AFT supplies filter bags and related accessories to different industries around the world.

Different types of fabric used in fabric filter (clockwise from top): ePTFE membrane, microdenier fabric and fabric with chemical treatment



Fabric Mullen burst testing at FLSmidth AFT's laboratory

Based on 8000 air pollution control installations and 130 years of experience in the cement and minerals industries, the company's filter bag specialists and engineers have extensive knowledge and field experience. They offer practical application expertise and can help select the best media according to specific requirements, applications and conditions.

Advanced research

FLSmidth also conducts extensive research into developing new filter media for specific needs. Some of the readily available, new media under the spotlight include next generation ePTFE membrane and microdenier filter media. These are fast becoming cost-effective solutions for capturing fine particles and reducing emissions for challenging applications in any cement plant dust collector. Other benefits include higher throughput and lower differential pressure. The company is also developing new chemical finishes and heat treatments that can be customised for specific needs.

From advanced test facilities in Evans, and Dania (Denmark), FLSmidth operates state-of-the-art laboratories. Air pollution control testing encompasses issues such as determining remaining filter bag life and root cause of failures for troubleshooting fabric filter problems. This is ultimately useful in helping customers with their media selection.

FLSmidth AFT's fabric filter laboratory uses ASTM standard testing methods for felt and fibreglass fabrics. These include visual inspections on filter bags and microscopic fibre tests, including Mullen burst, tensile strength, MIT (Massachusetts Institute of Technology) flex and permeability, which aid technicians in developing appropriate solutions for specific customer requirements.

At FLSmidth's R&D Centre Dania, the largest in the industry, the development of the next generation of air pollution control technologies and equipment takes shape. Cleaning efficiency and internal bag pressure is being tested at multiple levels in a 28-bag unit 10m filter bag test rig. Testing of emissions in various filter media and bag lifetime is also performed at Dania, which also has a complete test rig for controlling fabric filters to ensure trouble-free control of filter and bags.

Manufacturing quality

FLSmidth AFT's manufacturing process ensures strict quality control measures at every stage: from order placement to delivery. It covers high-standard raw materials, modern manufacturing equipment, skilled craftsmanship and complete control over each step of the production line.

Engineers review every individual customer order to ensure proper bag-to-cage fit, taking into consideration the specific process requirements and features of the filter media and equipment. A proper fit is paramount in obtaining the longest possible service life.

Service is provided by FLSmidth AFT's experienced service team, who can provide inspections to evaluate the current state of air pollution control equipment, highlighting potential issues and suggesting solutions.

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Helping ever-larger cement plants to reduce emissions

Today, many plants need to reduce dust emissions while increasing capacity and for most, this means investing in new, higher-performing equipment. FLSmidth AFT works with customers to develop a total emissions strategy that also improves plant efficiency. The strategy includes a preventive programme, personnel training, and supply of filter bags and spare parts. It is efforts such as these, involving a complete filter bag refit and optimising filter media, materials and construction that are often required by cement plants in the US as they prepare for new NESHAP environmental regulations.

10m filter bag test rig at FLSmidth's R&D facility in Dania, Denmark