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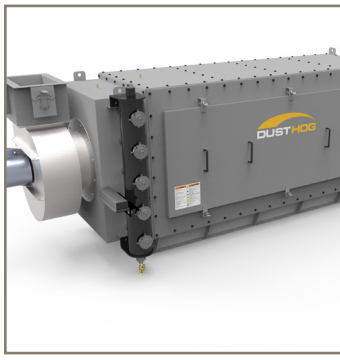
Dust Particle Capture

Unacem, One of the Largest Cement Plants in South America, a White Paper, Finding Creative Solutions for One of the Most Common Issues in a Cement Plant



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When it comes to ventilating auxiliary equipment and transfer belts, more vent points often lead to more intricate and elaborate ductwork, adding complexity to the whole system.

Day-to-day activities of a cement plant take the focus away from achieving efficient, simple and practical point venting systems. In many cases, plant personnel react to the latest problem but can rarely spend enough time to analyse their ventilation system, determine the weak areas and decide how to tackle them.

Generally, designing and installing a medium- or small-size dust collection system to specifically ventilate a transfer point is not given the consideration it needs. This often leads to undersized baghouses and poorly ventilated transfer points. Sometimes, even though initially the points might be very well ventilated, over time – through reaction- driven improvisations – the systems are continuously modified to accommodate increasing ventilation requirements. This obviously leads to a series of complex duct runs, mostly leading to one single baghouse and the end result is a further undersized dust collection system.

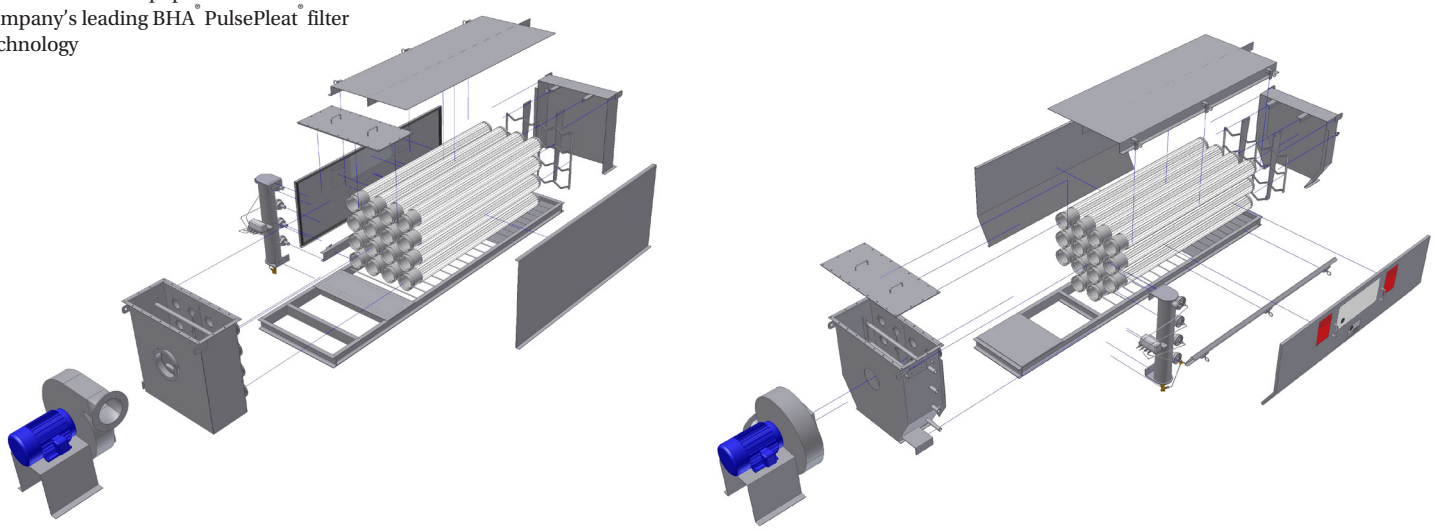
Figure 1: size perspective of the DustHog® Conveyor Filtration System dust collector equipment

Parker Hannifin (formerly GE Environmental Services), engineers designed a simple and practical solution to solve dust collection problems for auxiliary equipment and material transfer devices.

The basic concept is to specifically ventilate the transfer point with a ccompact horizontal collector unit, the Conveyor Filtration System (CFS). Once the point has been isolated it can be ventilated easily with one of these units. In fact, every transfer point in the plant can be isolated with its own dedicated CFS. Not only is it more practical, but it also eliminates the need for ductwork, especially in cases where the distances from one point to the baghouse are too large.

Another benefit of this approach is that the existing baghouse that was then undersized and oversaturated, can now be dedicated to its original purpose or be relocated to another area where it could be more useful.

Figure 2: exploded view of the Conveyor Filtration System dust collector equipment dedusting system for conveyors, elevators, clinker tunnels and areas with overhead restrictions. This equipment is fitted with the company's leading BHA® PulsePleat® filter technology



Cement plants worldwide strive to find ways to simplify and optimize their assets, resources and overall operations. When it comes to dust collection equipment like baghouses, simplicity is not usually what comes to mind. In fact, more often than not complexity seems to be the norm in dust collection systems.

Figure 3: CFS dust collector over conveyor belt underneath clinker silo with overhead restrictions

The CFS's are relatively economical, and simple to install and maintain. They are compact in size and come fitted with the Parker Hannifin's exclusive high efficiency BHA PulsePleat pleated filter elements. The main purpose of the collector is to confine the transfer point that needs to be ventilated and keep a slight negative pressure that keeps fugitive dust particles within the enclosure.

These CFS units can be custom made to meet the existing transfer belt dimensions and available space. They can also be shipped in parts and assembled on site in situations where the available room is very tight such as clinker tunnels.

The CFS's sit on top of the transfer belts and do not require hoppers. When the filters clean, the collected material falls right back onto the belt.

Each unit has its own fan and damper so there is no need to balance multiple points for one single collector. This is another added convenience that makes the CFS a practical and cost-effective solution.

Case study –
Unacem Planta Atocongo, Peru
About six years ago, Unacem, one of the largest cement plants in South America had a few non-conformance issues related to environmental requirements in various critical areas to comply with ISO9000 certification. This customer turned to Parker Hannifin for its technical expertise in air pollution control equipment to address the areas of concern.

After analyzing the four different applications and their specific challenges, Parker Hannifin recommended the installation of CFS to confine and ventilate efficiently at each point.

The following is a summary of the projects done at this plant.

Cement transfer belts: packing area
This plant has two separate process areas divided by a public road. The clinker and milling areas are located on the east side of the street. The cement storage silos, packing and dispatch areas are on the west side of the road. Finished product is transported from one side to another by two long parallel transfer belts, which are scheduled to operate 24/7.

Initially, in order to vent the discharge points of these two belts on to different air slides and then on to cement silos, one collector with several pick up hoods was installed. A disadvantage to this approach was the suction in all the venting points, even when there was no material being transported. This represented a source of wasted energy and inefficient dust collection for this plant.

Parker Hannifin recommended the installation of two CFS's at the belt head of each of the discharge points. Each filtration system operates only when needed. In addition, no ductwork and dust handling equipment are required, which is a vast improvement over having to install ductwork on top of a 30m high silo. These two dust collectors were installed in 2004 and have been operating successfully since then. The technology has met the customer's expectations and helped achieve their pollution emission regulation requirements.

Cement bucket elevators: packing area
About three months after successfully proving the ease of use and practicability of the horizontal collectors, the customer turned its attention to another critical area where other challenges had been identified.

In this case the areas that needed to be isolated and ventilated effectively were the cement elevators in the packing area. As was the case with the previous example, there were several small baghouses ventilating various pick up points on the elevators, silos and air slides.

Due to the lack of enough ventilation capacity, there were dust emission problems at various points. Another challenge for the plant was the fact that the collectors would run continuously even when cement was not being transported, thus resulting once again in wasted energy.

Figure 4: bucket elevators with the CFS's on top

Figure 5: CFS dust collector over conveyor belt underneath clinker silo with overhead restrictions

The approach here was very similar to the first implementation. The idea was to isolate the ventilation of the elevators from all other auxiliary ventilation systems and install CFS's at each elevator. The existing collector was dedicated to the ventilation of other not so critical areas.

The CFS's collectors were installed on top of the bucket elevators and were operated only when needed. In order to size the gas flow (Am3/h), standard industrial ventilation guidelines were used. Once again it was not necessary to install long ductwork runs for ventilation of the top and bottom sections of the elevators, which translated into significant savings for the customer.

Discharge transport belts: clinker silos In most cement plants, horizontal ductwork usually causes headaches. Horizontal duct runs demand constant and labour-intensive maintenance to keep them clean and ensure good ventilation on the pick-up points. Without maintenance horizontal ducts eventually plug up. The ventilation point loses suction, thus increasing the emissions in the pick up points. Unfortunately, many cement plants have not been designed to allow sufficient overhead space to avoid the need to install horizontal ducts.

This plant tried to ventilate several clinker silo discharges to a conveyor belt with a conventional dust collector. This meant that one of the collectors was installed on the fifth floor and ran a vertical duct down to the first floor. Then, several metres of horizontal ductwork was set down to reach all the ventilation points. The results were not satisfactory and the customer faced several challenges in this area as a result of the ductwork configuration. After evaluating the situation, the customer decided to install the CFS that fit in the overhead restriction of 1.8m from the conveyor belt to the roof.

The installation of several horizontal collectors underneath the clinker silo allowed this plant to have a clean environment around this area, improving their productivity (no shutdown time), as well as improving the overall safety of the area (more visibility and less dust).

On all previous cases so far, the customer has also successfully eliminated the inadvertent mixing of various types of materials that were once transported from several vent points over to a single
baghouse. With the isolation of each vent point this problem no longer exists.

Cement transfer belts: finish mill area
This is the latest implementation of the CFS at this plant and it is being completed at the time of writing this article. As in previous cases, the idea is to isolate specific pick-up points and ventilate only when necessary to eliminate horizontal ductwork runs, clean the work area and eliminate dust emissions.

One of the challenges was in having a single collector venting different transfer belt points handling various materials such as clinker, gypsum and puzzolane. The problem was determining what to do with the collected mix of materials in the dust collector. Further, the area was congested with ductwork, making it difficult to walk and work around.

The installation of one CFS in each venting point makes the area easier to work in and all the dust collected at each venting point is recycled back onto the belt. This has translated into considerable savings and a safer work environment.

Once this latest project is completed, the customer will be looking at other trouble areas in which to replicate the success they have had so far with the use Parker Hannifin's CFS technology.

Conclusion
The team at Parker Hannifin combines a creative spirit and can-do attitude with innovative technologies to make a difference to customers. It took a lot of work and imagination on the part of our design team to come up with this novel concept for one the most common problems in cement plants. CFS technology is a practical and cost-effective solution for applications such as transfer belts and bucket elevators. The many successful installations of Parker Hannifin's horizontal collectors worldwide confirm it as a viable and effective solution to dust collection challenges in small to mediumsize auxiliary applications in cement plants.

As complex as a problem might be, Parker Hannifin shows that sometimes solutions come in simple, compact packages.

DUSTHOG®

Providing Clean Air Solutions

Parker Hannifin is committed to providing clean air solutions that protect your employees, improve plant performance and enable you to realize your operating goals.

State-of-the-Art Labs and Advanced Filtration Research for Optimized Performance. Purpose-built labs and test facilities with the latest equipment allow our engineers and technicians to quickly and accurately assess filter capabilities and develop innovative new medias.

High Performance Filters & Specialized Equipment Solutions. With decades of experience manufacturing high performance original equipment and aftermarket filters to meet a variety of system types and configurations, we can satisfy whatever requirement is needed including customized solutions.

World-class Manufacturing Processes with a Global Footprint. We produce top quality filtration solutions through stringent manufacturing processes.

Application Expertise for Any Filtration Challenge. Our ability to design a solution to fit your application begins with engineering expertise proven by hundreds of global installations.

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- Cement
- Chemicals
- CNC Machining
- Coal-Fired Boilers
- Cold Heading
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- Food Processing
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- Metals
- Metalworking
- Pharmaceutical
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