Smart Brief

Benefits of Converting Norblo™ Reverse Air or Shaker Dust Collectors to Pulse-Jet Collectors with Pleated Filter Elements

Abstract

This paper will analyze the concept and implementation of converting a Norblo reverse air dust collector into a pulse-jet collector utilizing BHA® PulsePleat® filter elements. This conversion process has been accomplished successfully in many facilities worldwide, resulting in decreased emissions, increased airflow, lowered energy costs, reduced maintenance, and better production rates. The basic theory and explanation of the conversion will be presented, followed by an actual case study. While many of these conversions have been made in the cement industry, this concept is believed to offer equally impressive results for other industries as well.

Introduction

Norblo reverse air or shaker baghouses are commonly found in various applications in cement plants throughout the world. Finish mills, raw mills, coal mills, silos, transfer points, truck load-outs, bagging stations, and pneumatic conveying systems are only a few of the many areas where Norblo dust collectors are used.

There are many common problems associated with these baghouses used in cement plant applications. Those most often encountered include:

- Low air volume
- Emissions - Poor media filtering efficiency
- Intensive maintenance
- Loss of production due to bag changeout downtime
- Overloading of filter bags
- High interstitial velocity between filter bags

Many of these problems are caused by aggressive air-to-media designs or new demands from increased production or ventilation volume. Aggressive design air-to-media ratios, which are the critical factor in sizing baghouses, do not allow for the increase in total filtration area needed without additional compartments, or in some cases the purchase of an entirely new baghouse. These problems can be solved with a pulse-jet conversion.

Why a Conversion to Pulse-Jet?

Reverse air and shaker collectors rely on less efficient means of cleaning versus the use of high pressure compressed air as in pulse-jet dust collectors. Converting these collectors to pulse-jet cleaning systems can increase air volume while still using the existing housing, ductwork, and hopper(s).

There are other advantages of a pulse-jet cleaning system. It is typically easier to maintain since there are few moving parts and the parts that may need adjustment (i.e., valves) are located outside of the baghouse compartment for easy accessibility. Filters are installed conveniently from the clean side (top) of the tubesheet. Also, locating failed filters is much easier with top access, pulse-jet, designs.

Traditionally, pulse-jet collectors used filter bags and support cages with a metal venturi to direct cleaning air from the blowpipe. Many new collectors and conversions now use innovative one-piece pleated filter elements designed to increase total available filter media and to further reduce installation time. The BHA PulsePleat filter elements maximize the amount of filter area available per tubesheet hole. Filter elements only one meter (3.28 ft.) in length have the same amount of filter area as three 2-meter standard filter bags. By converting the Norblo unit, **more filtration area can be installed in the same housing**, allowing for increased air volume without adding compartments. Many times not all of the compartments are required when using the compact design of the PulsePleat filter element. Complete discussion of pleated filter technology follows later in this paper.

Pulse-jet cleaning is the design of choice throughout the world. Many plants are converting their shaker and reverse air style baghouses to a pulse-jet style. Most baghouse OEMs now offer pulse-jet collecctors as a main part of their product line.

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Scope of Work

The goal of this project is to convert the existing Norblo reverse air baghouse to a top load pulse-jet baghouse with a walk-in clean air plenum (Fig. 1). This unique and simple conversion design requires two to 10 days to complete, depending on the size of the collector. The conversion does not require housing or ductwork to be changed. The filter bags, tubesheet, and bag support structure are replaced with new tubesheet, cleaning system components, and filters inside the existing housing. The new tubesheet provides a 6 ft. (1.83m) high walk-in clean air plenum with a 48 in. (1.22m) distance below the tubesheet to the top of the existing hoppers for 42 in. (1.72m) filters. The walk-in clean air plenum provides quick and easy access for filter changing or maintenance. The existing side platform provides easy access for maintenance of the pulse valves and solenoids.

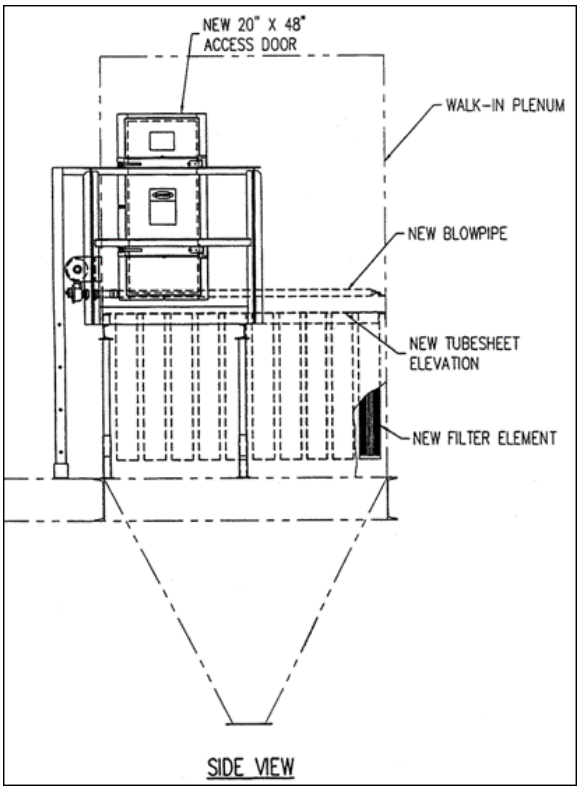

Fig. 1 Norblo converted to Pulse-Jet Collector

Conversion Components

The following is a list of the components involved in a proposed conversion:

- Panelized Construction
- On-Line Pulse-Jet Cleaning System
- Pulse-On-Demand™ Controller
- Compressed Air Filter Kit with Regulator and Auto Drain
- Magnehelic® Gauge
- 11/2" (45mm) Double Diaphragm Pulse Valves
- NEMA 4 Solenoid Enclosures
- Pulse Valve Air Header
- Automatic Purge Drain Valve
- Surge Valve
- Slip-Fit Removal Blowpipes
- Nipple Plates/Blowpipe Supports
- Precision Tubesheet Fabrication
- Tubesheet Support
- Side Access Platform with Handrails
- Ladder Assembly
- Paint System
- Dampers

Using Pleated Filter Elements

Total filtration area in a pulse-jet collector is achieved by installing PulsePleat filter elements.

The unique spunbond media utilized in PulsePleat 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 supporting backing material like felt cartridges. The unique filtration media can dramatically lower differential pressure and increase airflow through a collector. The tough spunbond filter media reduces emissions without sacrificing airflow and helps virtually eliminate bleedthrough problems.

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An example of common bag sizes and the increase in filtration area that can be achieved with pleated elements is provided in the chart shown in Fig. 2.

Problems Solved by PulsePleat Filter Elements

A common problem experienced in dust collectors is bottlenecking. This condition slows production due to high differential pressures and reduced airflow. In these situations, expanding the amount of available filtration area could require increasing the size of the existing system by adding compartments. Rather than a costly addition of another compartment of filter bags and extending or adding additional hoppers and other material handling equipment, the installation of PulsePleat filter elements will dramatically increase the total filtration area. Lower differential pressures will allow the existing fan to pull its design airflow, thus maximizing the draft of the operation. Many times this can result in increased production that pays for the elements in a matter of days, not years.

Norblo filter bag changeouts can be cumbersome, labor intensive, and time consuming. Converting the collector to utilize one-piece filter elements in the place of filter bags will reduce filter change-out time substantially (generally half the time needed to change standard bags/cages). PulsePleat filter elements offer a unique design that provides a positive tubesheet or venturi seal, further easing installation. No filter cage is needed since the PulsePleat has a built-in integral support core.

Conclusion

The reverse air to pulse-jet conversion has proven to be a highly successful way to improve dust collection efficiency without major capital expense and without requiring lengthy downtime. Any plant with an undersized reverse air collector should consider this conversion as a cost-effective option to reduce emissions, increase gas volume, and reduce overall maintenance costs.

Fig. 2 Filtration Area Traditional Filter Bag vs. 0Pleated Filter Element

BAG DIMENSIONS	FILTRATION AREA	BHA PULSEPLEAT® FILTRATION AREA	INCREASED FILTRATION AREA
4.92" x 96.06" (125 m x 2,440 m)	10.76 ft.^{2} (1 m^2)	22.6 ft.^{2} (2.1 m)	110%
5.91" x 143.7" (150 m x 3,650 m)	16.15 ft.^{2} (1.5 m^2)	36.6 ft.^{2} (3.4 m^2)	125%
5.91" x 167.32" (150 m x 4,250 m)	21.53 ft^2 (2 m^2)	45.21 ft.^{2} (4.2 m^2)	110%

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Case Study

Benefits of Converting Norblo™ Reverse Air or Shaker Dust Collectors to Pulse-Jet Collectors with Pleated Filter Elements

Cement Plant; Midwestern U.S.

Norblo Dust Collector Primary Crusher

This cement plant was experiencing perfor-mance problems with their Norblo reverse air dust collector. The original Norblo reverse air dampers were not providing adequate isolation and cleaning energy, and the tubesheet corroded to the point where replacement was essential. In addition, the filter bags were failing due to insufficient tensioning.

Two options for improvements were evaluated by the facility:

1) **Rebuild** the existing unit by replacing the tubesheet, filter bags, and hardware and install a new upgraded damper on each compartment.

2) **Convert** the unit to a pulse-jet style collector utilizing PulsePleat filter elements.

Plant personnel opted for a conversion of the unit to a pulse-jet collector. Not only was the cost of **converting the unit less expensive than the rebuild option**, but plant personnel preferred the **pulse-jet technology because it was more efficient and reliable** than the former reverse air operation. This plant chose Parker Hannifin to perform the conversion.

Scope of Work

The existing tubesheet was removed and a new tubesheet was installed approximately half-way up the housing. A new access door was installed above the tubesheet for access to the clean air plenum. The top load PulsePleat filter elements installed were one-meter in length, and the new clean air plenum provided sufficient clearance for handling and installing the filter elements.

Six months following the completion of the project the performance of the dust collector was evaluated and it was reported that the collector was operating virtually maintenance- and emissions-free. Plant personnel is extremely happy with the results of this conversion.

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