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BAGHOUSE DUST COLLECTORS WORKING PRINCIPLE : A REVIEW

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ABSTRACT

Air treatment devices are widely used in industry for accurate cleaning of ventilation air from dust particles, as well as for industrial and sanitary cleaning of gas emissions. Baghouse dust collectors are regarded as the most widespread in the industry for dry air treatment of gas emissions from impurities.

The baghouse dust collector for ventilation and air treatment is one of the most effective air treatment devices capable of catching air pollutants and used for cleaning gases and gas mixtures. The air treatment system can be used both as part of an internal ventilation system that returns air to the premises and for removal dust contaminants from the air from buildings.

The design and principle of baghouse collector operation offer several functional and technological advantages:

- easy installation and operation of the air treatment system;
- continuous operation as part of the ventilation system;
- easy maintenance and minimal maintenance costs;
- effective air treatment from pollution with simultaneous and cyclical cleaning of the dust collector from accumulated material.

These advantages explain the prevalence of baghouse dust collectors in the industry. Catching and removing air pollutants ranging in size from 0.1 to 100 micrometers in the circulation or output mode is an opportunity to ensure the maintenance of a safe mode operation and reduce the impact on the environment.

INTRODUCTION

The design of the baghouse collector is developed to allow a large amount of air or gas passing through it, which is sent to the baghouses of dust collectors that hold dust particles. Depending on the type of installation, the baghouse dust collectors can also be installed horizontally so that the maximum amount of air passes through them. Dust, soot and other air pollutants pass through the tissue and do not pass further, in the direction of the outlet for clean air.

The vast majority of bag type air treatment devices consists of several modules:

- body frame with filter elements;
- inlet shutter for air-gas mixture;
- groups of baghouses or individual baghouses;
- outlet shutter with automatic pressure monitoring;
- regeneration system - devices for quick cleaning of baghouse dust collectors from accumulated dust.

Such features as the simplicity of the design and the ability to effectively collect dust, soot, and partially small teardrop-shaped contaminants make the baghouse dust system used in industries

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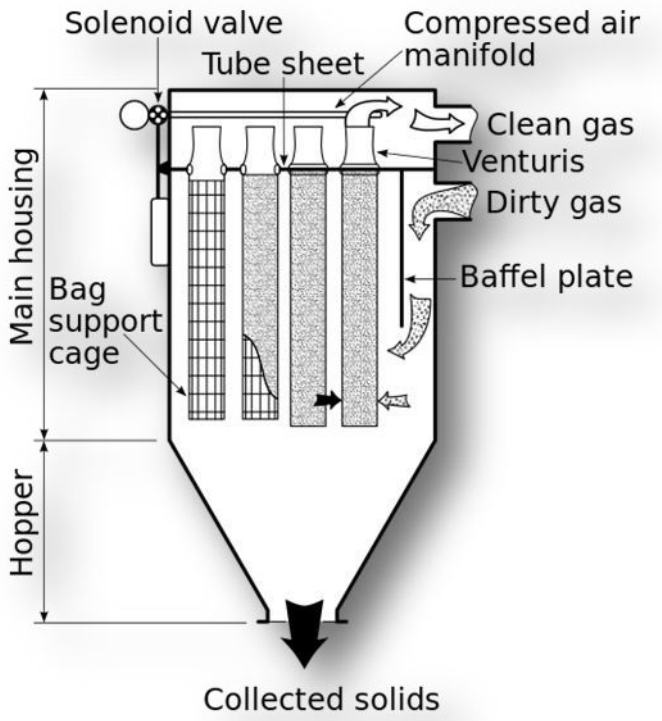

where the technological process is associated with the constant leakage of small contaminants and a dusting of air.

Fields of application and features of operation

The need for continuous air treatment from a large number of small particles from materials and products is experienced by a wide range of industries. This is the reason why baghouse dust collectors are commonly used:

- in the chemical and food industry;
- in mining and processing production;
- in foundry production, in metallurgy;
- at flour mills, elevators and other enterprises where the processing and storage of raw materials remains a source of dust;
- on production sites and in painting shops.

Depending on the requirements for air purity and the characteristics of technological processes, baghouse collectors can be equipped with baghouses from different materials - these are both natural and synthetic woven and non-woven cloths rolled into baghouses. The effectiveness of air treatment from certain types of air pollution can be improved by using porous materials or fabrics with relieved fibers and its synthetic analogs.

Baghouse collector design allows its installation in different ways. As a rule, the service life of one baghouse dust collector lasts several years. In the absence of aggressive air pollution that destroys the structure of the fabric, the regeneration system copes with its task and maintains the throughput of the dust collector throughout the entire operation cycle.

Baghouse collector cleaning or baghouse regeneration can be performed using two principles of action to accumulated particles. Depending on the dust types, it can be removed in two main ways:

1. intensive shaking of the baghouse, in which the particles fall and are sent to the hopper for removal;
2. pulsed blowdown of the baghouse dust collector with a reverse current of air or a gas-air mixture, "knocking out" particles from the pores of the fabric.

A combined technique can be used in individual air treatment systems, but this is not always effective; the choice of solution depends on the characteristics of production and the properties of pollutants.

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The regeneration of the baghouses turns on automatically - as dust accumulates on the surface of the dust collector, its throughput decreases, the air pressure at the outlet drops, and the sensing system responds by activating a reverse blow or a shaking mechanism. The most effective technique is the baghouse arrangement, it means that there are three baghouses in the active zone of the collector, herewith, one of the dust collectors is regenerated, and two other continue to operate in the cleaning mode.

Efficiency and productivity of baghouse dust collectors

The general design and principle of baghouse system operation for air treatment allows organizing a consistent process. Several baghouses are installed in series, catching various types of air pollution. If we take into account that such a system is usually mounted at the stage of mechanical air treatment, then its effectiveness determines the success of the whole air treatment systems in industries.

Baghouses for dust collector are manufactured at specialized enterprises and are regarded as standardized parts. They can be selected by capacity, degree of treatment, size of filtering pores and fibers, design of the fastener. Baghouse dust collectors are designed to treat dust and gas flows with temperatures up to +260 ° C and initial dust content of up to 100 g/m³.

These dust collectors belong to the "dry" type of dust-collecting equipment. Baghouse collectors demonstrate a higher efficiency of gas treatment in comparison with any types of electrostatic scrubbing systems and gas wet scrubbers. The residual dust content at the outlet after baghouse dust collectors is usually not more than 10 mg/m³ (there are modifications of dust collectors with a lower residual dust content up to 1 mg/m³). Baghouse collectors can be equipped with filter bags made from high-temperature filter materials (polytetrafluoroethylene, polyimide) with operating temperatures up to +260 °C.

The dust collectors are designed for both flue gas air treatment and aspiration emissions from enterprises in various industries:

- ferrous metallurgy;
- nonferrous metallurgy;
- building materials industry;
- engineering;
- foundry;
- metalworking;
- glass industry;
- chemical industry;
- mining industry;
- food industry;
- woodworking and furniture industry;
- energy.

Baghouse dust collectors are the most universal type of dust and gas air treatment devices, as they are able to reliably and efficiently operate in almost all dust-emitting technological processes. Baghouse systems are able to operate continuously and do not require constant maintenance.

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The versatility of baghouse collectors can also include the fact that a dust collector with specified characteristics can be manufactured in several designs, with different overall dimensions. In most cases, it is possible to select (or develop) the design of a baghouse collector, taking into account the size and limitations of the existing space for installing the scrubbing system.

The air treatment material and its processing (antistatic, water-oil-repellent, etc.) are selected depending on the operating conditions of the dust collector and the properties of the captured dust.

Two designs of the baghouse dust collector are applied:

- round design (Ø135 mm) for collectors with vertical baghouses;
- the elliptical design used for both horizontal and vertical baghouses.

The service life of baghouses in baghouse dust collectors averages 2-3 years, and in some cases can reach 6 or more years of effective operation. Timely replacement of baghouses is a guarantee of the effective dust collector operation, and the emergence of more modern air treatment materials helps to ensure the relevance of the baghouse dust collectors while reducing environmental standards for residual dust in the future.

The autonomy of the operation and the performance of baghouse collectors are provided by a regeneration system of treatment elements.

The disadvantages of baghouse dust collectors include:

- high cost compared to cyclone scrubbers;
- the complexity of the air treatment device, which requires qualified service personnel;
- operation in conditions of limited dust concentrations in the air stream;
- variable hydraulic resistance. Nevertheless, this disadvantage is compensated by effective methods of regeneration (cleaning) of air treatment elements.

Therefore, wet scrubbing systems remain the most commonly used air treatment devices that allow complying with air pollution control regulations. If you search the best air treatment device to improve air quality at the industry, you can buy a high-tech completely new type of wet air scrubber – a Multi-Vortex wet air scrubber produced by Optromix company.

Optromix is a fast-growing vendor of wet air scrubbers. The multi-vortex scrubber can remove gas emissions, dust, vapors, and other pollutants from a gas stream. It is an innovative technology created to save water that makes it more cost-efficient and differs from other types of scrubbers. If you have any questions or would like to purchase a multi-vortex wet air scrubber.

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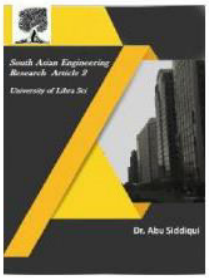

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