



DEVELOPMENT AND RESEARCH OF AN EFFECTIVE DUST COLLECTOR FOR CLEANING GAS STREAMS FROM FINE DUST FROM CEMENT PRODUCTION

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ABSTRACT

The productions of cement are always accompanied with abundant pileup of dust that cleared expensive multistage system pileup votively. The article presents the work on studying the regularities of the separation process of dust-air mixtures, taking place in dry fabric dust collectors x filtration action. On the example of one of the cement plants of the Fergana region of the Republic of Uzbekistan, possible options for the development and improvement of the material of construction, parameters and regeneration mode of operation in terms of increasing the efficiency of cleaning exhaust gases from fine dust to improve the quality of environmental protection in cement production. The design of a dust and gas cleaning device with an internal layout and placement of bag filters is presented. The calculations of the maximum permissible values of the hydraulic resistance of the filtering surface were made, and the optimal time interval between regenerations was determined. The possibility of replacing baghouse filter material with alternative options has been proven. As a result, preliminary conclusions and conclusions are presented.

KEYWORDS: Ecology, cement production, the eyes to TCA dust cyclones, bag filters, dust and gas streams, regeneration I, dust collectors, synthetic fabrics.

DISCUSSION

The problems of nature protection and environmental safety in Uzbekistan, as well as throughout the world, are of particular importance. This value is determined by the poor environmental situation in such naturally more densely populated regions such as the Fergana Valley, where the demographic density is 350 - 400 people per 1 square. km. Only in the Fergana region there are 5 cement plants and 3 plants are being prepared for launch. In these conditions, the Law on Environmental Protection of Uzbekistan is in force, which regulates a wide range of requirements for environmental safety in all sectors of economic activity.

As you know, the cement industry is one of the most widespread air pollutants. The processes of fine grinding, roasting, the operation of pneumatic transport, etc. require reliable and efficient operation of dust - collecting equipment, which affects the loss of fine fractions of a valuable cement product, pollution and dust content in enterprises, as well as a large surrounding air basin.

The purpose of this paper is to study the patterns of the separation process of dust and gas air mixtures flowing in dry fabric dust collectors filtration steps for developing possible embodiments improvement material, dimensions, designs, the regeneration mode operation in terms of improving the efficiency of cleaning exhaust gases from fine

dusts to increase the quality of environmental protection in cement production.

Currently, artificial filter materials are replacing cotton and wool. Among them, the most

common are synthetic fabrics with a strength 3 - 5 times greater than that of woolen fabrics. In such filters, dust from the

bags is removed by means of shaking (regeneration) mechanisms, falls into the hopper and enters the dust removal system. The particles caught in the filtration process, as they accumulate, form a dust layer in the volume of the filtering material and also become a

filtering medium for newly arriving particles. On the one hand, this increases the efficiency of dust collection, on the other hand, it leads to a gradual decrease in the gas permeability of the filter [1].

This circumstance requires q.s. Qdim periodically regenerating filter material, or peresnaryazheniya it with a new filter material.

In fig. 1 shows a general view of a baghouse filter used at the plant where our research is conducted.

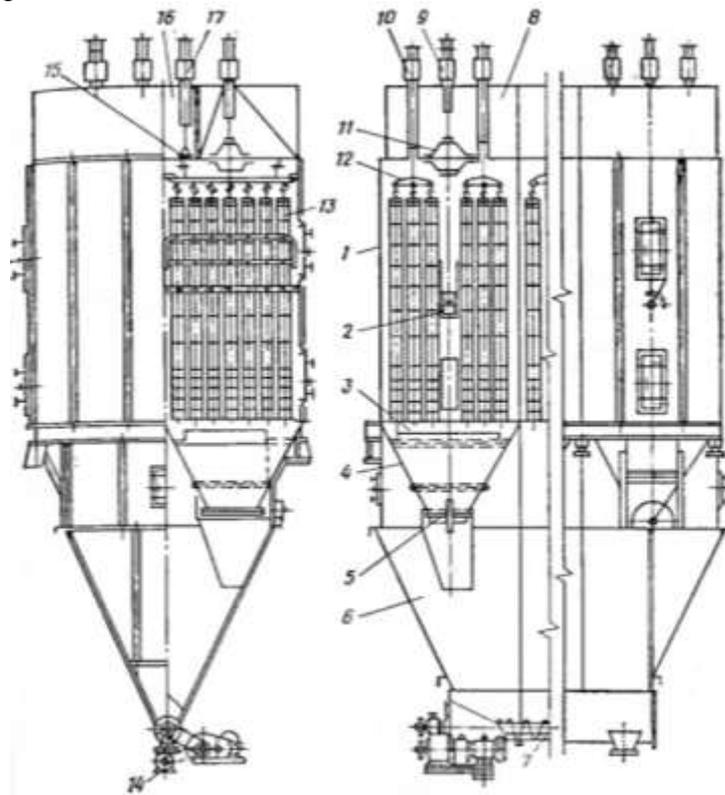


Figure: 1. General view of ukavnogo fil tra .

1 - case; 2 - ground services; 3 - gas distribution grid; 4 - bunker; 5 - airlock; 6 - common bunker; 7 - auger; 8 - clean gas collector; 9 - pneumatic cylinder for valve control; 10 - shaking pneumatic cylinder rod; 11 - valve; 12 - hoses suspension frame; 13 - sleeve; 14 - airlock; 15 - purge air valve; 16 - purge air collector; 17 - pneumatic cylinder for blowing valve control.

When on fig. 2 shows the general appearance of the dust and gas cleaner of this plant



Figure 2. External Expansion the kind of dust scrubber

As can be seen from the figure, devices with rectangular cases, inside which sleeves are suspended. The gas in them is mixed from the inside of the sleeve to the outside. After dust accumulation on the filter surface, the bags are regenerated.

In order to determine the optimal time interval between regenerations, the calculation of the maximum permissible values of the hydraulic resistance of the filtering surface has been performed.

In general, the hydraulic resistance in Pa of the filtering surface is calculated by the equation:

$$\Delta P_{\pi''} = \mu \cdot \tau \cdot c_{BX} \cdot U^2 \cdot K_1 \quad (1)$$

where τ —is the duration of the filtration cycle, s; c_{BX} —dust concentration at the filter inlet, kg/m³; K_1 —parameter of the resistance of the dust layer, m/kg [2].

The value of K_1 depends on the properties of the dust and pore connectivity dust layer on the bulkhead (dA cement with a median particle diameter $d_m = 12 \dots 20$ mm $K_1 = (6.5 - 16) \cdot 10^9$ m/kg).

Using the formula (1), at a known or predetermined hydraulic resistance of the dust layer was the duration of the filtering cycle:

$$T = \Delta P_{\pi''} / (\mu \cdot c_{BX} \cdot U^2 \cdot K_1) \quad (2)$$

The total resistance baghouse without exceeding $f_m 2700$ Pa, and the resistance of the dust layer on the partition $500 \dots 700$ Pa.

Calculations have shown that the time interval between regenerations set on the filters is 1.3 times higher than the calculated frequency, and this gives an additional opportunity to reduce energy resources on the blower.

The filters operate both under pressure and under vacuum and are installed both at the head and at the fan suction.

The impulse blowing system adopted in the system is one of the most efficient regeneration methods (compared to mechanical shaking and back flushing). Pulsed operation more distinguished by the fact that in its design is not rapping mechanisms, chokes and blower materials [3].

In the working chamber of the filter, the filter material is placed as compactly as possible, bearing the name - cell - honeycomb arrangement. The cells for dusty and clean gas are staggered. The sewn filter elements with the length $l = 2000$ mm and $l = 7000$ mm, with the diameter $d = 130$ mm and $d = 160$ mm, respectively, are stretched on a metal frame of the same parameters. P ascent e working tension - the pressure inside the filter is 6500 Pa. The cells of clean and dusty gas communicate only through the filter material. The honeycomb structure in terms of the compactness of the placement of the filter material is many times higher than all existing methods [4].

The honeycomb cell consists of 24 bag filters, combined into one mounting element weighing no more than 100 kg, which has a modular quick-assembled structure on bolted joints that does not require special mounting devices, the qualifications of installers and lifting mechanisms. When manufacturing the filter, the metal consumption of the filters is significantly reduced in comparison with analogs, and this has further reduced the load on the foundations.



Filters, having sleeves of a circular cross-section, being located at a certain distance from each other in the inter - sleeve space, create predominantly a weak gas flow, which reduces the possibility of dust returning to the material surface during regeneration, and as a result, the regeneration effect

occurs. The filter has two stages of filtration, stage 1 - settling chamber, stage 2 - filtering bags.

For uniform distribution of the flow, the settling chamber is equipped by us with a ramp device, which makes it possible for the same and / even flow to enter all modules, the number of which is –36.

The filter is equipped with sensors and a monitoring system to regulate the differential pressure, pulse time and time between pulses, and

valve operation. When the ambient temperature is below zero and condensation appears, the electric heating of the valve pilots is switched on. The entire system functions normally at an ambient temperature of - 40 °C to + 55 °C.

In tab. 1 p shows a range of characteristic temperatures for various raw materials produced at the enterprises of Uzbekistan and which can be used as a material for the production of bag filters [5].

Tab. 1.

No	Material	Fragility (frost resistance)	T * working (no more)	Softening T	T melting
1	2	3	4	5	6
1	Polyamide	-50	100	170	215
2	Polyester	-60	120	225	260
3	Polypropylene	-20	80	140	170
4	Polyethylene	-70	80	120	150

In conclusion, the following conclusions are presented:

1. Bag filters are the most versatile, reliable and efficient in cement production, operate continuously and do not require constant maintenance.
2. They can be manufactured with the specified characteristics in several designs, with various dimensions.
3. The possibility of selection (or development) of the design of the baghouse filter, taking into account the dimensions and limited existing space for the filter installation, was found.
4. Studies have demonstrated the possibility of alternative replacement filter bag material from domestic raw materials providing res ursosnizhenie and import substitution [6].

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