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Efficiency of Fabric in The Systems of Dust and Gas Cleaning of Cement Production

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Abstract

Due to the increase in the number of cement plants, the process of collecting dust from cement production is especially important for Fergana, since this is one of the areas of technogenic pollution of the surrounding air basin. data on the efficiency of gas cleaning by fabric filters in different periods of their operation are given. To ensure the reliability of the filters and their high efficiency, it is shown that it is necessary to have large filtering surfaces and to avoid too deep regeneration.

Conclusions on the increase in cleaning efficiency are presented. The high capital costs are then offset by longer hoses and spare parts without replacement and lower maintenance costs. Methods and procedure for regenerating filters without damaging tissue are presented, and a feasibility study to reduce the time for their replacement.

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Introduction

All enterprises of the Fergana region use the currently generally accepted dry dust and gas cleaning systems for cleaning their emissions, the technical characteristics of which were presented earlier [1]. These cleaning systems are based on filtering dusty gases with fabric filters, which are one of the oldest technical solutions to achieve effective dust collection at a relatively modest capital and operating cost. The increased requirements for the degree of gas purification in cement production revealed a tendency towards an increase in the share of used filtration devices in comparison with devices for wet gas cleaning.

Table 1 shows the data [2] on the efficiency of gas cleaning with fabric filters in different periods of their operation (the efficiency was determined by particles with a size of 0.3 microns).

Influence of the deposited dust layer on the efficiency of the fabric

Table 1

Textile	Cleaning efficiency,%		
	clean the cloth	after dusting	after backflush cleaning
Thin synthetic	2	65	13
Thick brushed synthetic	24	75	66
Thick brushed woolen	39	82	69
Basalt roving	35	87	72

It can be seen from the table that the cleaning efficiency with a thin cloth after its regeneration decreases sharply in comparison with a dusty one, while the difference in cleaning efficiency when using thicker bulky cloths is much smaller. If a continuous layer of dust forms on the fabric between regenerations, a very high dust collection efficiency can be expected, even in the form of submicron particles.

Thus, the clean cloth of fabric filters itself is not a highly effective filtering medium in the literal sense, and in some cases it only serves as a supporting surface, i.e. serves as the basis for the formation and retention of the filtering dust layer.

Since the layer formation process takes a long time at low concentration, the best results are obtained when cleaning gases with high dust content. The ability of most particles less than 5 microns in size to coagulate with the formation of strong loose aggregates in the gas flow, in the tissue and on its surface makes it possible to use even rare tissues as an effective filtering medium.

When cleaning the fabric, a significant part of the dust sediment is removed, but a significant amount of it remains inside the fabric between the threads and fibers, therefore, a high cleaning efficiency remains. When regenerating dusty fabrics, do not allow them to be re-cleaned.

It is advisable to use small gas loads in these filters - usually 0.3-1.2 m^3/ (m^2• min). At high speed, excessive compaction of the dust layer can occur, accompanied by a sharp increase in resistance. Since the particles penetrate deep into the layer and tissue, a disturbance of the dust layer is observed, accompanied by a secondary entrainment of dust, especially from the holes between the threads.

With an increase in the filtration rate, the outlet concentration rises rather sharply immediately after regeneration (Fig. 1). In addition, at high filtration rates, regeneration is required too often, which increases the wear on the fabric and mechanisms. To ensure reliable operation of filters and their high efficiency, it is necessary to have large filtering surfaces and to avoid too deep regeneration.

Industrial fabric filters must reliably provide the specified gas purification efficiency. Moreover, based on economic considerations, the filter resistance should not exceed 0.75-1.5 kPa (75-150 mm of water column), and only in special cases its value can reach 2-2.5 kPa (200-250 mm of water.Art.). With a higher hydraulic resistance, the breakthrough increases sharply and the breakdown of the sleeves or their destruction is possible.

The efficiency of gas cleaning in fabric filters is quite high, but it can decrease if the fabric is defective, poor pressure of the sleeves on the nozzles or in the nests, leaks in tube sheets, rupture, wear or stretching of the sleeves [3, 4].

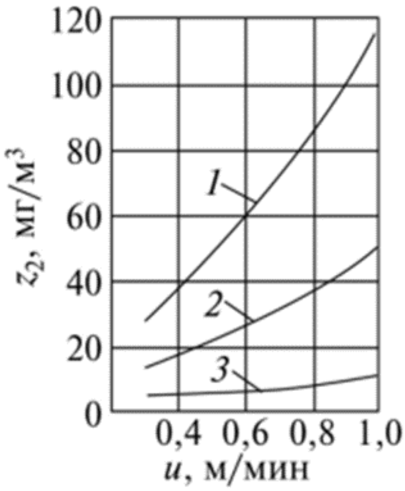

Fig. 1. **Dependence of the output concentration of dust in gases (z_2) on the rate of their filtration through the fabric:**

1 - immediately after regeneration; *2* - during several cycles "regeneration - filtration"; *3* - at the end of the filtration cycle before regeneration

The main factor that determines the area of the filter cloth in the installation is the pressure drop across the cloth, and not the value of the gas cleaning efficiency, and only in some cases the permissible gas load on the cloth can be determined by the value of the output dust concentration.

Method

For an approximate calculation of the filtration area of a fabric filter, it is necessary to determine the total flow rate of dusty gases entering the fabric (taking into account suction) and the flow rate of purge gases or air coming from the regenerated section. In addition, you need to know the gas load (filtration rate), which is selected based on operating experience, depending on the fabric used.

The total filtration area *S* (m ^{2}) of the installation is determined by the formula:

$$S = S_P + S_C = \frac{V_1 + V_2}{u} + S_C \qquad (1)$$

where S_p - filtration area in simultaneously operating sections, m ^{2}; S_c - tissue area in the regenerated section, m ^{2}; V_1 - consumption of dusty gases, taking into account suction (in the gas duct and the bunker), m ^{3} / min; V_2 - flow rate of purging gases or air, m ^{3} / min; *and* - filtration rate (gas load on tissue), m ^{3} / (m ^{2} • min).

Below are the gas load values for various fabrics:

Synthetic or glass fabric, gas load, m ^{3} / (m ^{2} • min) 0.6-1.2 0.5-1.0 0.3-0.9

For easily removable dusts and their low concentrations (less than 1 g / m ^{3}), the gas load when using woolen fabrics can be increased to 3.0 m ^{3} / (m ^{2} • min). When using synthetic fabrics, the load is taken 10-15% lower than for glass fabrics, given their lower holding capacity.

According to the data of numerous industrial tests, the output dust concentration under these conditions is 20-50 mg / m ^{3} with an initial dust concentration of 5-50 g / m ^{3}; at a lower initial concentration, the final concentration is also lower.

It has been practically established that in most cases the value of the gas load and the wear of the bags primarily depend on the value of the input concentration and dispersion of the dust, and usually high dust content and high dispersion make it necessary to increase the filter size if the calculated value of the filter resistance should remain within 1-1, 5 kN / m ^{2} (100-150 mm water column). Therefore, when calculating the required surface of the fabric, sometimes they proceed not from the accepted gas load, but from the amount of dust supplied per unit of the surface of the fabric per unit of time [10]. It is believed that for normal operation of filters in the cement industry, this amount of dust per 1 m^2 of fabric should not exceed 12-18 g / (m^2• min). Based on this, the calculated gas load will be determined from the equation

$$u = 18/z_1 \qquad (2)$$

where z_1 *is the* input dust concentration, g / m^3.

For example, at z_1 = 20 g / m^3, the gas load will be 18/20 = 0.9 m^3/ (m^2• min).

Having determined the total area of the fabric, find the required number of filters or sections *n* in a multi-section installation:

$$n = S/S_1 \qquad (3)$$

where S_1 is the area of the filter bags in one filter (in one section), m^2.

Since *n* must be an integer, the resulting value is rounded towards an increase in the number of filters or sections.

The total resistance of the installation with bag filters is the sum of the admissible resistance of the fabric, the calculated resistances of the gas ducts and the filter housing (at the inlet and outlet of gases).

The purge air consumption for regeneration by backflush is 1.5-1.8 m^3/ (m^2• min), and the ratio of the purge air consumption to the air consumption during filtration is 1.5-2 [5].

For synthetic and glass fabrics, this ratio is assumed to be lower in order to avoid too intensive cleaning.

The fan is selected according to the number of gases after the filters; to the volume of filtered gases add the volume of air or backflush gases, as well as the volume of sucked air. This volume is on average 20-30% of the initial volume of the gases to be cleaned. Knowing the total volume of gases and the total resistance of the installation, fans with the required characteristics are selected.

When choosing a fabric for certain working conditions, the design of the filter and the method of regeneration, the dustiness of gases, the properties of the deposited dust, the composition and temperature of the gases, and the features of the technological process are taken into account. Based on these data, the type of fiber or yarn, the weave of the fabric and the method of its finishing are selected [6].

To increase cleaning efficiency and reduce resistance, the gas load on the fabric is reduced.

Conclusion

If the adopted method of regeneration is ineffective, then for the successful removal of dust from the fabric, it is necessary either to accumulate thick layers of dust with a corresponding decrease in the filtration rate, which leads to an increase in the filter mechanical stress. To ensure the continuity of the operation of such installations, additional sections are provided, in the presence of which current repairs can be carried out without stopping the entire unit [7].

When using filters, in which regeneration does not cause severe wear of the fabric, but is associated with a significant increase in the filtration area, capital costs increase, but the duration of their operation without costly shutdowns for routine maintenance increases significantly. The high capital costs are then offset by longer hoses and spare parts without replacement and lower maintenance costs.

Literature

Abdullayev Ibrohim Numanovich, Umirzakov Zuxriddin Axtamjanovich. Research on the operation of bag filters for dust and gas cleaning in cement production (on the example of factories in the Ferghana region of the republic of Uzbekistan)/ The American Journal of Interdisciplinary Innovations and Research (ISSN–2642-7478) Published: November 30, 2020 | Pages: 115-123 Doi: https://doi.org/10.37547/tajiir/Volume02Issue11-21

Abdullaev Ibrohim Numanovich, Rakhmanov Bakhodir Kushakovich, Umirzakov Zuhriddin Akhtamzhonovich. Development and research of an effective dust collector for cleaning gas streams from fine dust from cement production. "International Journal of Economic Growth and Enviromental Issues" Volume:8, Issue:3, October 2020, 59-62 p.

И.Н. Абдуллаев, Э.М. Юнусалиев, Б.К. Рахманов, З.А. Умирзаков Оптимизация конструкций рукавных фильтров (на примере цементных заводов ферганской области). Современные ресурсосберегающие материалы и технологии: перспективы и применение : материалы Международного симпозиума. – Новосибирск : НГАСУ (Сибстрин), 2020. – 283, [1] с. ISBN 978-5-7795-0923-7. стр 212-216.

Абдуллаев И.Н., Умирзақов З.А. Оптимизация конструкции пылеуловителей цементного производства. Тошкент темир йўл мухандислари институти "Қурилишда иновацион технологиялар" Республика илмий-амалий конференцияси метариаллари, 169-170 бетлар.

Бергер М.И. Справочник по пыле- и золоулавливанию [Текст] / М.И. Бергер [и др.]; под общ. ред. А.А. Русанова. — 2-е изд., перераб. и доп. — М.: Энергоатомиздат, 1983. — 312 с.

Ужов В.Н. Очистка промышленных газов от пыли [Текст] / В.Н. Ужов [и др.]. — М.: Химия, 1981. — 392 с.

Ужов В.Н. Очистка промышленных газов фильтрами [Текст] / В.Н. Ужов, Б.И. Мягков. — М.: Химия, 1970. — 320 с.

M.M.Madraximov, Z.E.Abdulxayev, E.M.Yunusaliev, A.A.Akramov. “Suyuqlik Va Gaz Mexanikasi Fanidan Masalalar To’plami” Oliy oʻquv yurtlari talabalari uchun oʻquv qoʻllanma. -Farg’ona: 2020-yil, 232 bet.

Мадрахимов, М. М., and З. Э. Абдулҳаев. "Насос агрегатини ишга туширишда босимли сув узатгичлардаги ўтиш жараёнларини ҳисоблаш усуллари." *Фарғона Политехника Институти Илмий–Техника Журнали* 23, no. 3 (2019): 56-60.

Muratovich, D. S. (2016). Study of functioning of reservoirs in the form of cylindrical shells. *European science review*, (9-10).

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