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ANALYSIS OF DUST GASES SYSTEMS OF DIFFERENT GENRES FROM LOCAL INDUSTRIES AND CONDUCT OF THEIR CLEANING EXPERIMENTS

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Abstract
Separation of various particles from the air and technological and sanitary treatment of industrial waste gases is one of the widely used processes in the production of chemical and food products. It is an urgent task to implement these processes and to rationally select the mode of the process for the production of a competitive and high-quality product, as well as to develop equipment of a new construction with high efficiency. In this regard, there is a tendency to use devices working in the wet method. The complexity of the phase interaction and hydrodynamic structure in the wet cleaning of industrial dust gases, a wide range of changes in the physico-chemical properties of dust, and the interdependence of structural and mode parameters make the process unique represents.

Keywords: filters, NIIO Gas, mass, aerodynamic, dust content, hydraulic resistance, fraction, U-shaped micro manometer.

Introduction

Currently, thousands of tons of dust and secondary gases with various toxic properties are emitted into the atmosphere from ferrous and non-ferrous metallurgy, chemical and petrochemical, construction industry, energy and fuel industry. This condition has a negative impact on the environmental condition of the areas where industrial enterprises are located, as well as the deterioration of working conditions and sanitary conditions. Therefore, it is important to clean the dust and secondary gases generated in the production processes of industrial enterprises, to reuse them in the production processes, and to eliminate environmental problems [1-10].

On a global scale, scientific and research work is being carried out in the priority areas of reducing environmental pollution, waste processing, reuse of industrial dust and gases, and intensification of technological processes of industrial enterprises [10-20].

Recently, the Republic of Uzbekistan has been making great efforts to reduce heterogeneous emissions of various types into the atmosphere, lithosphere and hydrosphere and to improve the environment (the country releases 200 million tons of emissions into the atmosphere,

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lithosphere and hydrosphere per year). In particular, to ensure ecological safety in the country, to improve the ecological situation, to maintain a stable favorable ecological situation, to ensure the effectiveness of state management in the field of ecology and environmental protection, and to further accelerate the measures being implemented to prevent violations committed in the field The decision of the President of the Republic of Uzbekistan dated 30.12.2021 PQ-76 came into force.

Methodology

During the study, measurements were made to determine air consumption and dustiness, pressure losses, dust-air flow velocity and dispersed dust composition.

An external filtering method using AFA filters was used to determine whether the air stream was dusty. Measurements before and after the apparatus were carried out in parallel at certain time intervals.

In this case, the air velocity in the air duct was pre-measured using a MIOT pneumometric tube to create isokinetic conditions during sampling [5]. The essence of the method is to ensure the equality of the flow rate in the path of the sampling pipeline and the analyzed airway.

In the studies, each filter was weighed using an analytical balance before and after measurement. Knowing the weight difference, the cleaning efficiency was determined according to the formula [3]:

$$\eta = \frac{\Delta g_1 - \Delta g_2}{\Delta g_1} \cdot 100\%, \qquad (1)$$

here:Δg1 is the difference in filter mass before and after measuring dustiness before cleaning, g;Δg2 is the difference in filter mass before and after measuring dustiness after cleaning, g.

To determine the efficiency of sample extraction, the equation proposed in [2] was used:

$$\frac{C_{тр}}{C_в} = \frac{w_в}{w_{тр}} - \frac{wв / w_{тр} - 1}{4\mathrm{StR} + 1}, \qquad (2)$$

where: $C_{Тр}$ is the concentration of dust particles in the sampling pipe, kg/m3; $C_в$ - the concentration of dust particles in the air conditioner, kg/m3; $w_в$, $w_{Тр}$ – air velocity in the air transmitter and intake pipe, respectively, m/s; StR – inertial settling parameter:

$$StR = \frac{C_к \rho_ч d_ч^2 w_в}{18\mu \cdot D_{тр}},$$

where: $C_к$ is the Cunningham-Milliken correction coefficient for particles with a size of $0.2<д_ч<2$ μ m:

$$C_к = 1 + \frac{2}{d_ч \rho}[6,32 + 2,01lx\rho(-1095d_ч\rho)],$$

$D_{Тр}$ is the diameter of the pipe, m.

Before cleaning, the method of air sedimentometry was used to determine the dispersed content of calcium technical soda dust, and the method of internal filtration through cascade impactors in NIIO Gaz construction was used to determine the dispersed content of waste [22]. The device is made in the form of seven disks included in one case. Each disc has a lubricant-filled nozzle and outlet. In this case, the nozzle belongs to the previous stage, and the outlet of the line to the next stage. Thus, the number of disks on which the impactor is assembled corresponds to the number of buttons on it.

The initial known dust concentration in the stream of the sampling duration is determined by giving $C_{кон}$ (g/m3) and the optimal mass of the sample taken G (g):

$$T = \frac{100G}{Q_{нос} \cdot C_{кон}}(мин). \qquad (3)$$

In the study, the relative mass composition was determined according to the following formula:

$$M = \frac{m_i}{\sum_{i-1}^{n} m_i}, \qquad (4)$$

here: i=1-7 – stage number; m_i - the amount of dust that settles in the corresponding step, kg.

The new particle fractionation limits are obtained from the variation of the extraction rate with respect to the calibration rate, and the corresponding particle diameter is calculated from the following equation:

$$d_ч = d_4^{50} \sqrt{10\mu_в / G \cdot \rho_ч \cdot 1{,}82 \cdot 10^{-5}}, \qquad (5)$$

where: G is the consumption of gas through the impactor, l/min.

The principle of isokineticity was followed in the study of fractional composition of particles.

Air consumption Q (m^3/s) is calculated from the following formula:

$$Q = \omega \cdot S, \qquad (6)$$

here: w –air flow speed, m/s; S is the cross-sectional area of the air duct, m2.

Air-dust flow rate is determined by dynamic pressure [23-29]:

$$w = \sqrt{\frac{2H_д}{\rho}}, \qquad (7)$$

here: $H_д$ – dynamic pressure, Pa (determined using U-shaped micromanometers);ρ- air density, kg/m3.

The concentration of dust in the air was determined as follows:

$$\mu = \frac{2{,}76 \cdot 10^6 \cdot G(273 + t_c)}{\nu\tau \cdot P_б}(мг / м^3) \qquad (8)$$

where G is the dust mass, g; t_c – air temperature according to dry thermometer, ^{0}C; ν - air consumption through the device, l/min; t - duration of air extraction, min; $P_б$ is barometric pressure, Pa.

The hydraulic resistance was measured using a U-shaped micro manometer. The measurement technique presented in was used for aerodynamic and dust measurements. Processing of measurement results and experiments was carried out by static methods.

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