HYDRODYNAMICS AND AERODYNAMICS OF ROTOR FILTER CLEANER FOR CLEANING DUSTY GASES

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Abstract: *in the article, dates about dusty and poisonous gases emitted by chemical industrial plants and plants industry of construction material are given. Besides, details showed about rotor filter dusty gas cleaner which is used for cleaning poisons emission with liquid dust cleaning method in order to improve the condition of atmosphere. Moreover, in the article analyzed details of hydrodynamics and aerodynamics of rotor filter gas cleaner and total equitation for determining pressure which was lost in apparatus. As a result execution of scientific work, made recommendations to determine the liquid's and gas's energy consumption. On the base of theoretical scientific researching made derivation of quotation to determine liquid's and gas's speed in cleaning atmosphere from poisons emissions.*
Keywords: *rotor filter, hydrodynamics, hydrodynamical resistance, wasted pressure, cleaning camera, resistance coefficient, fibrous covering.*

ГИДРОДИНАМИКА И АЭРОДИНАМИКА РОТОР ФИЛЬТРНОГО АППАРАТА, ОЧИЩАЮЩЕГО ЗАПЫЛЕННЫЕ ГАЗЫ

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Аннотация: *в статье приведены данные о пылевых газах и вредных выбросах, образующихся на предприятиях химической промышленности и промышленности строительных материалов, а также о роторных фильтрных аппаратах, улавливающих пылевые газы мокрым способом, которые улучшают экологическое состояние атмосферы путём очистки вредных выбросов. Проведены гидродинамические и аэродинамические анализы работы ротор фильтра и приведены уравнения расчета общего давления, теряемого в аппарате. В результате проведённых научно-исследовательских работ, разработаны рекомендации по определению расхода жидкости и газа. На основе теоретических исследований выведено уравнение по определению скорости жидкости и газа при очистке атмосферы от вредных выбросов.*
Ключевые слова: *ротор фильтр, гидродинамики, аэродинамики, гидравлическое сопротивление, потерянное давление, камера очистки, коэффициент сопротивления, волокнистое покрытие.*

Numerous researches on dusty gases cleaning and neutralization on wet method have been conducted, and as a result of studying their achievements and defects in literature analysis, we recommend the construction of a new rotor filter dust cleaner [1, 2, 3, 4].

This new equipment is a new construction of circular motion detector rotor filter cleaners to eliminate the deficiencies in literature analysis and to clean the dusty gases in order to increase the contact between the powdered gases and the fluid in the apparatus [5].

Dusty gases are directly in contact with the moistened fibrous coating. A certain amount of dusty gas is captured on the fibrous coating on the other side of the rotor. Fibrous coating fiber size can range from 0.25 to 1 mm. The thickness of the coating is selected by the properties of the dusty gases. The smaller diameter of the fiber, the higher the contact surface. In addition, the ability of the device to hold dust is also high. One of the advantages of this equipment is the rotary drum that generates the contact surface and the rapid exchange of the surface occurs at the expense of the rate of the dust particles entering the device. It will save the energy consumed to convert the drum. In addition, powdered gases are highly efficient due to the rotor distribution of fibrous coatings and rapid cleaning of detached dust particles in the bath.

Proceeding from the above, the proposed dusty gases, wet rotor filter cleaning equipment, special fluid flowing down through the holes hydrodynamic and hardware supplies of dusty gases in order to streamline the

process of learning theoretical research was carried out. According to flow of the openings in the dusty gases for the cleaning liquid discharge orifice hydraulic resistance and hardware supplies of dusty gas consumption is covered by the rotor fiber filter coefficient of resistance linked to the theoretical study.

In order to learn hydrodynamics of liquid which is flowing to the dusty gas cleaning camera and to determine pressure to the *I-I* section and gase's aerodynamics, It is need to be analyzed pressure to *II-II* section of rotor filter cleaner.

$$\Delta P_c = P_0 + P_1, \quad Pa \qquad (1)$$

Where: P_0-суюқлик оқадиган труба ичидаги геометрик босим бўлиб, у қуйидагича топилади.pressure of liquid which is determined with the below given formula

$$P_0 = \rho g H, \quad Pa \qquad (2)$$

Where: ρ-is the fluid density, kg / m^3; g - free flow rate, m/s^2; H-fluid height, m;

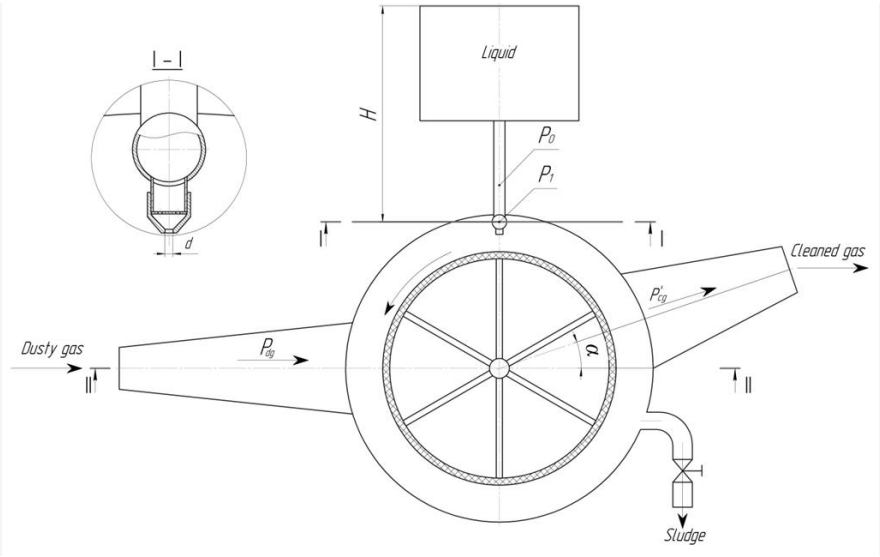

Fig. 1. Scheme of dust cleaner equipment with rotor filter

P_1 - loss of fluid pressure through the hole, which is determined as follows.

$$P_1 = \xi \frac{\omega_c^2}{2} \rho_c, \quad Pa \qquad (3)$$

Here, the resistance coefficient of fluid flow through the hole, - the rate of flowing through the hole, m/s. If we put equations 2 and 3 in equation 1, it will appear below.

$$\rho g H + \xi \frac{\omega_c^2 \rho_c}{2}, Pa \qquad (4)$$

4) The velocity of the liquid is determined below

$$\omega = \sqrt{\frac{2(\rho_c g H)}{\rho_c \xi}} = \sqrt{\frac{2gH}{\xi}}, \quad м/s \qquad (5)$$

This equation allows water to flow through a single hinge hole.

$$Q_c = 3600 \pi R^2 \omega, \quad m^3/h \qquad (6)$$

The overall fluid consumption of the equipment is crucial to maximizing the amount of fluid spent on high-efficiency dust removal and the achievement of energy efficiency.

For maximum moistening of the fibrous coating on the rotor, the number of fluid seals is selected and the total fluid consumption is determined by the equation.

$$Q_c = 3600 n \pi R^2 \omega, \quad м^3/h \qquad (7)$$

The pressure is influenced the *II-II* of the calculation scheme for the theoretical survey of the aerodynamics of dusty gases taken into the apparatus.

The total loss of dusty gases in the equipment will be as follows:

$$\Delta P_{ч} = P_{ч} + P_{ч}^{'}, \ Pa \qquad (8)$$

Here is the resistance coefficient for passing the dusty gases from the first surface of the fibrous coating on the rotor. It is determined as follows.

$$P_{ч} = \xi \frac{\omega_1^2 \rho_{ap}}{2}, \ Pa \qquad (9)$$

Here is the loss of the exchange of dusty gases passing through the second surface of the rotor, which is determined as follows.

$$P_{ч}^{'} = \xi \frac{\omega_2^2 \rho_{ap}}{2}, \ Pa \qquad (10)$$

Here is the density of semi-bulk gas, which is determined as follows.

$$\rho_{ap} = \rho_{г} + (\rho_{ч} \gamma), \ кг/м^3 \qquad (11)$$

Here is the density: kg/m^3, the density of the solid substance in the state of the exchange kg/m^3, γ -the weight of the solid in air.
If the equations 9 and 10 are set to 8, then the following expression is displayed. Equation is given below determines gas velocity.

$$\Delta P_{ч} = \xi \frac{\omega_1^2 \rho_{ap}}{2} + \xi \frac{\omega_2^2 \rho_{ap}}{2} = \frac{\xi \rho_{ap}}{2} (\omega_1^2 + \omega_2^2), Pa \qquad (12)$$

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