

WET DUST CLEANING DEVICES AND THEIR ROLE IN ENVIRONMENTAL PROTECTION

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Annotation. This article examines current environmental issues around the world. The negative impact of industrial enterprises on the environment and their consequences have also been studied. An increase in the number of industrial enterprises and an increase in the volume of their production further complicates the negative impact on nature. The article studied dust collecting equipment used in industrial enterprises, namely wet dust collecting devices, and their analysis. Studies have been conducted on the advantages and disadvantages of these devices.

Key words. Environmental problems, environment, nature, industrial enterprises, atmospheric air, dust collector, dusty air purification, wet method.

Introduction. Nature and man interact with each other on the basis of clear laws. Violation of this relationship can cause environmental crises. Today, as a result of the rapid development of industrial enterprises, biosphere pollution is observed in the society, and one of the most important tasks arising from this is to carry out remedial works against man-made pollution.

The circulation (movement) of atmospheric air affects the local climatic conditions and through the climate the water regime, the soil and the vegetation layer. Atmospheric air is one of the most necessary components of the natural environment for human life. Sufficient normality of human life largely depends on the composition and level of purity of inhaled air. Air pollution to a certain degree causes the human body to suffer from various diseases[1].

An average person breathes 25 kilograms of air per day. As a result, dust, soot and gases in the air accumulate in the body. This gradually leads to the weakening of the human body, and as a result, the body loses its ability to adequately resist various infections. We will consider some of these in separate examples.

The relationship of man with the environment and the surrounding nature is one of the main ecological problems. In the process of living, a person always has an impact on the environment. Especially today this effect has become very noticeable. As a result of the rapid growth of the population on earth, the number of production enterprises to provide and satisfy the needs of the population is constantly increasing,

the use of natural resources is increasing, and the number and types of vehicles are increasing. As a result, the scale of anthropogenic changes in nature is expanding due to the ruthless influence of man on the environment[2].

Statement of issue. In our country, consistent efforts are being made to protect the environment, ensure public health, rational use of natural resources, and improvement of sanitary and ecological conditions. As a result of equipping and re-equipping production areas with modern technologies, the amount of harmful substances released into the atmosphere has decreased by 2.1 times, and the discharge of waste water has decreased by 2 times. Some factories have a negative impact on the environment by emitting excessive emissions into the air. Such cases are the cause of citizens' right objection[3].

The rapid development of industrial and agricultural enterprises is one of the factors of pollution of water bodies with sewage. Along with discharging a large amount of wastewater into water bodies, maintaining their purity is one of the important tasks in the national economy [4]. Therefore, with the correct selection of the wastewater treatment method, it is possible to ensure that the wastewater discharged into water bodies fully complies with the requirements of sanitary standards[5].

The emergence of geocological problems is faster than human economic activity, its impact on nature has increased significantly, in particular, new man-made creations have been introduced in landscapes, in short, it is related to the activity of anthropogenic landscapes. Therefore, specific Geocological problems have formed in different areas of the Earth's surface, which can be called local Geocological problems in terms of their scope and essence. Although local geocological problems are not recognized globally or in large areas, neglecting their elimination can lead to a wide range of composition and complexity of the local environmental situation[6].

Uzbekistan, along with many developed countries, entered the new millennium with global problems of socio-economic demographic and environmental nature. Intensive use of natural resources, disposal of unusable production products that are not included in the natural cycle of substances, use of ecologically dangerous biotechnologies, etc., have led to a violation of the balance between energy sources and the state of the surrounding environment. In most cases, there is a mismatch between living activities of living organisms and the capabilities of their adaptation mechanisms in disturbed environments. A lot of work is being done in the country in order to ensure environmental safety, improve the ecological situation, maintain a favorable ecological situation, ensure the effectiveness of state management in the field of ecology and environmental protection, and to further accelerate the measures implemented in the field of crime prevention[7].

Dust content is one of the main causes of air pollution. Industrial dust from cotton gins is polydisperse, where the particle size can be as small as a tenth of a

micrometer or several millimeters. A large amount of dust is released into the air and atmosphere of production buildings during the initial processing, transportation, drying, cleaning, ginning, linting, processing of fiber waste from the production of cotton. Dust mainly consists of 3 fractions: dirty particles - crushed pieces of cotton; fibrous and mineral particles (mineral particles pass through the soil to cotton); are dirty and fibrous particles of dust released from cotton during processing[8].

To clean the dusty air, they are washed with water or other liquids and cleaned of solid particles. This method is used in cases where air cooling and humidification are allowed, and solid particles are not expensive. It is known that when air cools, water vapor condenses, particles become wet and their density increases. As a result, solid particles are easily separated from the air. In this case, the particles act as condensation centers. If the particles are not wetted by liquid, then air cleaning in this type of devices is ineffective. In such cases, to increase the level of air purification, alcohol - surfactants are added to the liquid, which means that the wetting ability of the liquid is increased[9].

Materials and methods. When dusty air is used in wet dust removal, the dusty stream is in contact with liquid in the form of droplets or films. Hydrophilic dust adheres to the surface of the liquid and is removed from the device with it. With wet dust cleaning, it is possible to capture very small particles (up to 0.1 μm) and very high (up to 99%) cleaning levels can be achieved. In addition to dust collection, wet dust cleaning devices can be used simultaneously to solve the following tasks: gas cooling or humidification; capture of drops and mists together with dust; absorb gas additives.

Devices with hollow nozzles (scrubbers) consist of a hollow shell, in the lower part of which dusty gas is supplied, and in the upper part, water is sprayed with the help of nozzles. The gas moves opposite to the water droplets moving from top to bottom (Fig. 1). The size of the droplets should be quite large so that they do not escape with the purified gas. The nozzles work with a pressure of 0.3-0.4 mPa. If the gas velocity is more than 5 m/s, a drop trap is installed after the scrubber. When the size of the particle is larger than 10 μm , the cleaning level of the device is 99%, as the size of the particles decreases, the cleaning level of the dust collector suddenly decreases. Liquid spray scrubbers are used to capture large dusts, cool and condense gases. The height of the device is usually 2.5 times larger than its diameter. The specific consumption of water ranges from 0.5 to 8 l/m³.

In nozzle devices, attachments (nozzles) are used to increase the contact surface (Fig. 2). Fixed nozzles can be round, spherical and other shapes. The liquid moves in the form of a film on the surfaces of the nozzles. The specific consumption of liquid is 1.3 - 2.6 l/m³. Hydraulic resistance of nozzle scrubbers is 300-800 Pa. The average cleaning rate of the nozzle scrubber is 75-85%. However, when capturing particles

larger than $2 \mu\text{m}$, the cleaning rate of the device can exceed 90%. Nozzle scrubbers are more efficient than sprayers, but their hydraulic resistance is greater.

At present, a number of effective constructions of abstract fluidized bed wet cleaning devices have been developed. In particular, the experts of Tashkent State Technical University proposed several new types of rotary nozzle scrubber. When the nozzles reach the rotating state, the fraction of void volume in the layer is $e=1$. This scrubber is successfully used in the gas dedusting system of the hard-to-dissolve and refractory metals combine of Uzbekistan in the city of Chirchik.

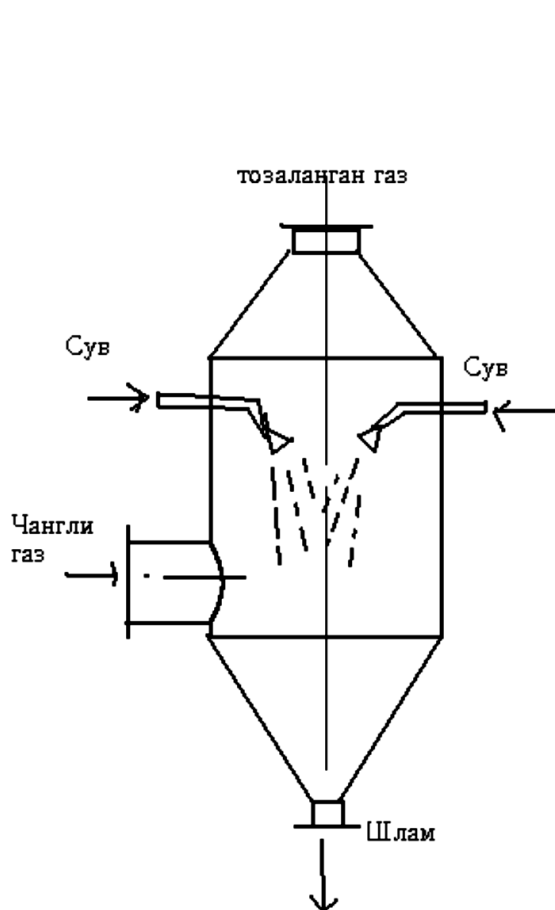


Fig.1. Hollow nozzle

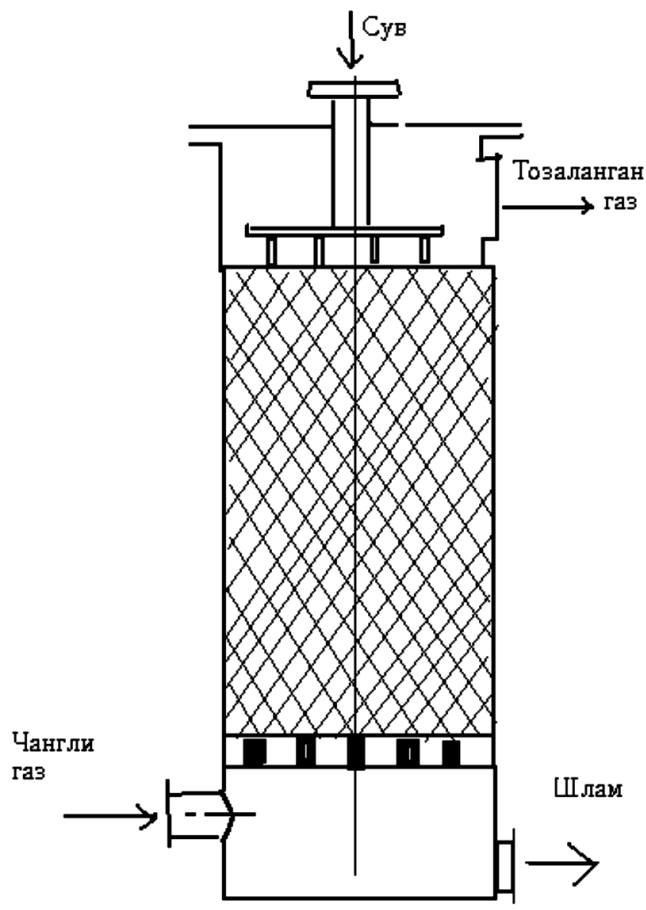


Fig.2. Nozzle scrubber

The disadvantage of wet air purification is the generation of polluted wastewater. Such effluents require treatment. Wet dust collection devices have the following disadvantages: a) adhesion of dust particles to the surfaces of the device and pipelines; b) consumption of liquid (usually water) is quite large; c) protection of equipment and pipelines from corrosion is required for cleaning dusty air, especially aggressive dusty air; g) it is impossible to use at low temperature (less than 0°C), because the water freezes; d) installation of an additional drop holder is required for high-speed devices[10]. The capture of suspended particles by a drop of liquid is carried out due to almost all methods of sedimentation. Such drops are built at the expense of solid spheres. From the tests, it was found that the effect of the shape of

the droplets and their possible vibration in the cavity on the deposition efficiency cannot be taken into account. A comparison of different deposition methods showed that their effect on dust capture efficiency was not uniform.

Summary. Above are several types of devices used for wet dust cleaning and their dust cleaning methods and principle of operation. According to the results of the conducted research, it was found that dusty air cleaning by wet method has high efficiency. The high cleaning efficiency of these devices is highly effective in protecting the environment (atmosphere) from various dusty, gaseous wastes. Although dusty air purifiers have high efficiency, they are not without a number of disadvantages. The use of wet vacuum cleaners in winter brings some difficulties. The reason is that the water freezes due to a sudden drop in temperature in the winter season, and it is impossible to use the device in this case. Various methods can be used to prevent the water from freezing (heating the water, adding an additional antifreeze, etc.), but these additional means increase the costs and, as a result, decrease the economic performance. Also, one of the biggest disadvantages of a wet dust capture device is that wastewater is generated during the process of capturing dust with water. Wastewater treatment requires additional means. This increases costs. In addition, one of the biggest environmental problems today is water shortage. It takes a lot of water to clean dusty air with water. Taking into account the above, the possibility of cleaning dusty air with water decreases again. In short, existing wet dust cleaning devices do not fully meet the requirements of the current era. Today's demand is to develop a dust capture device that is energy efficient and highly efficient.

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