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# STUDY AND ANALYSIS OF CONSTRUCTIVE PROJECTS OF DUST REMOVAL EQUIPMENT

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**Annotation**

From the development trends of the chemical and food industries, it is known that it is important to choose the rational mode of the process for the production of high-quality and large-scale products of a wide range, as well as to develop an effective constancy of machines and apparatus. Separation of various dust from the air content by wet method, technological and sanitary cleaning of industrial waste dust are mass exchange processes that are widely used in chemical and food production. In order to carry out these processes more efficiently, it is very important to develop a new hardware structure with a high efficiency of working in a wet method, as well as to determine its parameters. The article studied dust collecting equipment used in industrial enterprises, namely wet dust collecting devices, and their analysis. Provides information about wet dust collection devices, their use, operation and device. Studies have been conducted on the advantage sanddis advantages of these devices.

**Keywords**

Environmental problems, environment, nature, industrial enterprises, atmospheric air, dust collector, dusty air purification, wet method, dust vents, filtration, centrifugal, rotor filter, Venturi scrubbers, dust sink chamber, cyclone, foam dust holders, drum duster, battery cyclone, electrofilters.

Dust cleaning machines are especially important in modern production processes, those that work in a wet way.This article will tell you in detail about the structures of the dust removal apparatus in the wet method, the basics of their project and the principle of operation. In the chemical industry, production of building materials, pharmaceutical, food and other industries, a number of gaseous Miscellaneous systems are formed in the processes of grinding, appetizing, mixing, transmission, drying, cooking and processing of granular materials, powders, fumes, fogs. In the above processes, dust with particle size around 3 ÷70 μm is formed, while activating fuel and condensing industrial vapors, smoke and fogs are

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formed with a size equal to 0.3÷5 μ of the solid and liquid-shaped particles contained.

For the correct implementation of technological processes, it is necessary to clean industrial gases and air from dust. Mixers, dispergators, most substance exchange devices, a number of industrial devices cannot work well without effective gas and dust removal schemes. They are used for the purpose of preventing the accumulation of dust, gas and other contaminants in the air. In this article, we will discuss the types of dust removal devices in the wet method and their advantages. Currently, in industrial and manufacturing processes, it is important to protect the environment and increase the efficiency of heating systems. Therefore, various technologies are widely used for cleaning dust air and gases. In this article we came to the same conclusion by conducting an analysis on the differences between venturi scrubbers, rotor filter chag cleaning devices and drum dust removal devices and their effectiveness.

**Venturi scrubbers.** Venturi scrubbers are systems that release dust, liquids, and other nuclear particles out of gases. Their basic principle is based on the Venturi effect that B dies and as the gas flow rate increases, its pressure decreases and the fluid flows through this medium.

Advantages:

- High efficiency. They filter their sound well and help reduce particles harmful to breathing.

- Simplicity. Regular maintenance and repair is not required.

Disadvantages:

- Efficiency can decrease when working at high operating temperature and pressure.

- The need to work with water and other liquids, which can create complications.

**Rotor filter dust removal devices.** Rotor filter dust removal devices are mainly mobile and easy-to-use cleaning systems. They use rotor filters and a vacuum system. Rotor filters collect dust and particles, followed by a cleaning process. Advantages:

- High cleaning rate. It captures several particles through high filters.

- Easy transportation and installation. They are more mobile and fast-fitting equipment.

Disadvantages:

- Requires frequent maintenance, since dust accumulation in rotor filters can be strong.

- It usually consumes more energy compared to other cleaning methods.

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**Drum dust removal machine.** Drum dust removal machines are mainly used in the use and processing of industrial dust. This method synchronizes drum filters and mechanical cleaning processes.

Advantages:

- Able to effectively dust large volumes of dust and particles.
- Cost-effective, because the materials are often cleaned quickly.

Disadvantages:

- The installation and adjustment process can be complicated.
-In some cases, additional energy may need to be spent for their operation.

**Comparative analysis of wet-method apparatus**

**Table-1**

| **Hardware parameters** | **Venturi skrubber** | **Rotor filter device** | **Drum dust cleaning** |
|---|---|---|---|
| effectiveness | high | high | medial |
| technical service | few | often | medial |
| energy consumption | medial | high | quick cleaning |
| ease of installation | medial | high | few |
| flexibility | few | high | medial |

Cyclone dust removal is specifically designed to collect dust and easy Impurities during grain processing. This product uses a long cone design and has a mechanical separator that uses centrifugal force to remove dust particles from grain processing production, thereby improving efficient material separation. Dust air and particles move along the inner wall of the cyclone, dropping down in the cyclone until they land on the dust holder as the particles lose their velocity. The cyclone is often used as front filters and can meet most of the dust removal requirements

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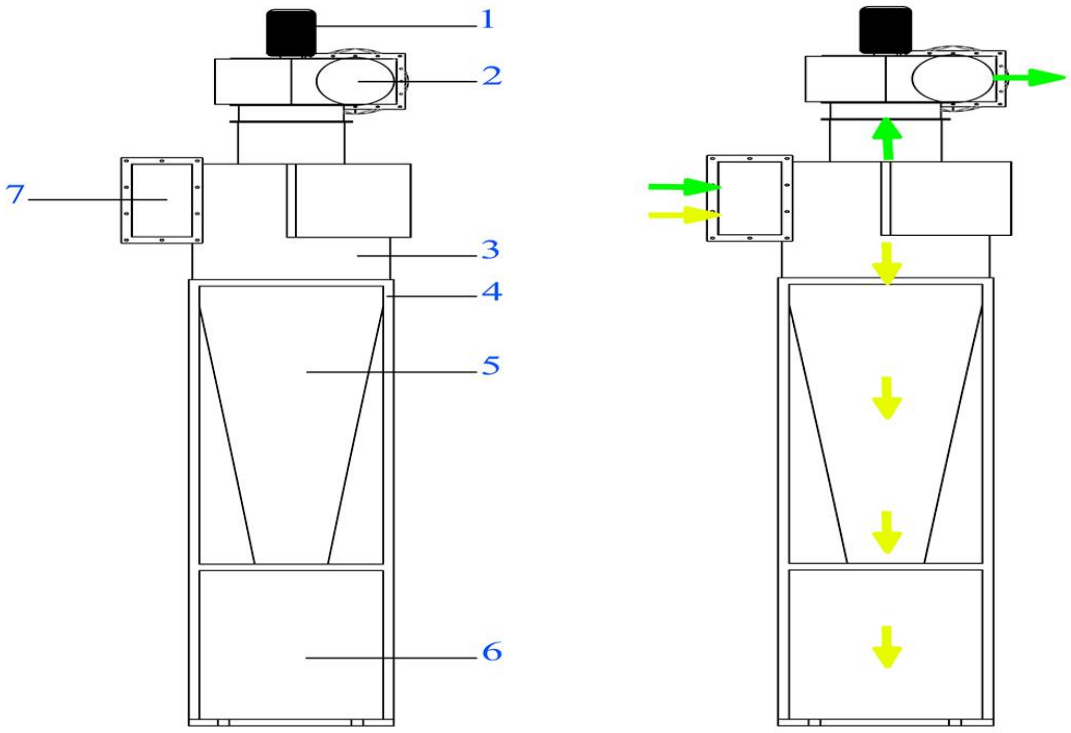


Fresh air

Dust

| DUST REMOVAL IN CYCLONES | | | | | |
|---|---|---|---|---|---|
| Model | Airflow range ($m^3/h$) | Size (L*W*Y/m | Weight (t) | Power (kWt) | Voltaj (V) |
| XFX X55 | 4012-7919 | 1,2*1,2*4,5 | 0,266 | 3.3 | 380 |
| XFX X75 | 5712 ~ 9530 | 1,2*1,2*4,5 | 0,285 | 7.5 | 380 |
| XFX X110 | 7412~11141 | 1,2*1,2*4,5 | 0,304 | 11 | 380 |

1. Engine, 2. Air output, 3. Snail shell, 4. Frame, 5. Conus, 6. Combined barrel, 7. Air intake.

Industrial cyclone dust collectors are typically mechanical dust collectors used as pre-cleaners for other gas and particle cleaning equipment. They are auxiliary devices that are often used as the first stage of dust collectors combined with large fabric filter dust collection systems. While cyclone separators are part of multistage dust collection systems, they can also be used as product separators in air transport systems, size reduction processes, or product processing systems.

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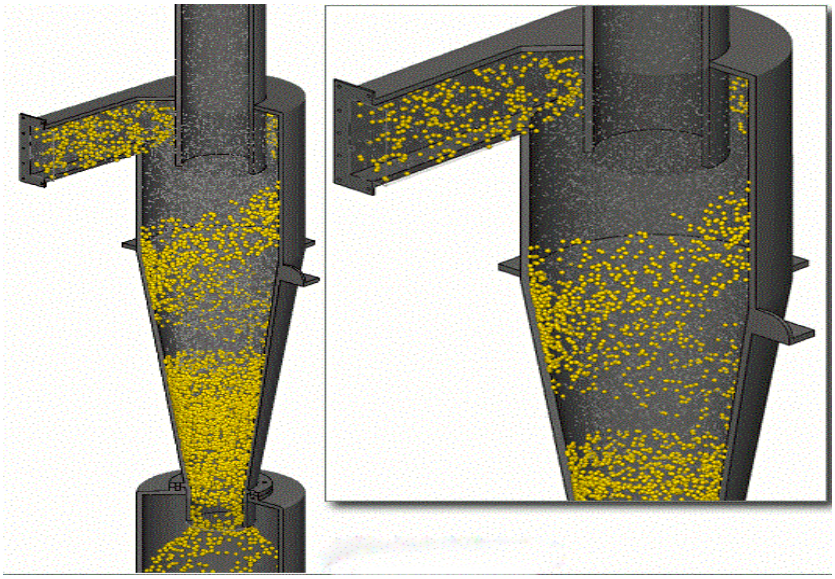

- **Cyclone efficiency increases in the following cases:**
- Distribution of coarse particle size *
- Specific gravity of High products
- Lower gas density
- Smaller output diameter. Pressure drops are also the cause.

The cyclone system aims to increase the flow of air inside a plant or plant, as it serves to recirculate dust. After use, cyclone dust collectors help other filtration systems, usually larger bag and cartridge dust collectors, reduce dust load and thus save maintenance and repair costs. Cyclone dust filtration systems are useful for objects such as furniture and ceramic factories, wood processing workshops, mining industries, agricultural facilities, and manufacturing operations that involve mechanical processing, grinding, or cutting processes-all of which produce large and coarse particles. An additional advantage is that cyclone separators can also remove Sparks and embers from the system before the fabric filter bag system.

Operationally, industrial cyclone dust collectors are inertial separators, further distinguishing the system from bag dust collectors. Cyclone dust collectors use centrifugal, friction, and/or inertial forces to separate dust from the airflow. When air is drawn into the system, a fast cyclonic motion is generated in the assembly chamber. This movement targets larger and coarser particles in the air stream, lowering them into the funnel at the bottom of the system.

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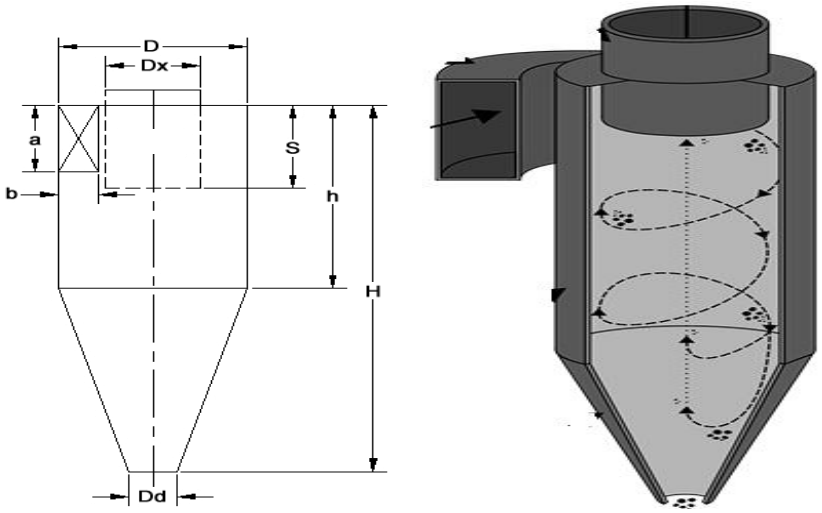


**Technical indicators of dusty air purifiers** **Table-2**

| Device type | Of dust in the air maximum amount, kg/m³ | Individual particles size, mkm | Cleanup degree, % | Hydraulic resistance, N/m² |
|---|---|---|---|---|
| Dust sink camera | unbounded | >100 | 30...40 | - |
| Cyclone | 0,4 | >10 | 70...95 | 400...700 |
| Battery cyclone | 0,1 | >10 | 85...90 | 500...800 |
| Sleeve (fabric) filter | 0,02 | >1 | 98...99 | 500...2500 |
| Do not avoid the center scrobbers | 0,05 | >2 | 90...95 | 400...800 |
| Foam dust holders | 0,3 | >0,5 | 95...99 | 300...900 |
| Venturi scrubbers | 0,05 | >1 | 95...99 | 3000...7000 |
| Electrofilter | 0,01...0,05 | >0,005 | 99...99,9 | 100...200 |
| Rotor filter device | 0,08 | >1 | 94...97 | 4000...7000 |
| Drum dust cleaning | 0,08 | >1 | 94...98 | 1000...2500 |

The process of designing dust removal apparatus in a wet way consists of the following steps:

- Requirements analysis. To determine the needs of the client and develop a device suitable for them.

- Just like shape and weight. Determination of the weight and dimensions of the apparatus.

- Functional modules. Design of various functional modules in the system, for example, pump, filters and control system.

- Prototype preparation. Prototype production based on ready-made schemes.

The principle of operation of cleaning machines in the wet method is mainly based on the use of water or other liquids. These apparatus are made up of a number of elements that act together during the process of operation:

- Pump. It is used to pull water into the apparatus.

- Filter system. It is necessary to separate dust and impurities.

- Insulation part. Used to restrict air access.

The effectiveness of dust removal devices in the wet method:

- Productivity. The effectiveness of the work that the hardware workers do.

- The use of energy. Energy output and economy. However, there are also existing problems:

- Eco problems. Issues of water consumption and decontamination of contaminated water.

- Operating costs. Funds spent on repair and work.

Today, the development and innovation of cleaning machines:

- Automation. Optimization of work processes using automatic control systems and sensors.

- Energy saving. Using new energy sources.

- Ecology. Solutions aimed at protecting the environment.

In place of the conclusion, it should be said that in the wet method, dust removal devices remain an integral part of modern industry. Their constructions and projects serve to improve efficiency and practice efficiency. Another important factor is innovation aimed at ensuring environmental safety and improving energy efficiency. With the development of technologies, it is expected to develop a new generation of hardware and create the opportunity to make them more convenient and effective. Venturi scrubber, rotor filter dust removal devices and drum dust removal devices each have their own advantages. While Venturi scrubber has high efficiency, it can be socially and economically complex. Rotor filter systems are characterized by easy adaptation and high efficiency, while the drum system is a simple structure and offers advantages depending on its principle of open operation. A comparative analysis of each system plays an important role in the process of their selection and helps to choose the right solution depending on the area of use.

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