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On the Issue of Disposal of Fiber Materials. Modernization of Technological Equipment for the Production of Disperse Fiber Concrete Filler

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Annotation: This scientific article presents a modernized experimental - industrial model of a rotary-centrifugal disperser, which can be used in fiber-reinforced concrete production technology.

Key words: waste, industrial and consumer waste, recycling, fibrous materials, fiber-reinforced concrete, grinding, rotary-centrifugal disperser.

INTRODUCTION.

The increasing volumes of waste generated daily are an integral part of a developing economy. Old technologies for recycling industrial and consumer waste cannot cope with existing volumes without harming the environment. That is why modernization of old and development of new recycling technologies is currently so important.

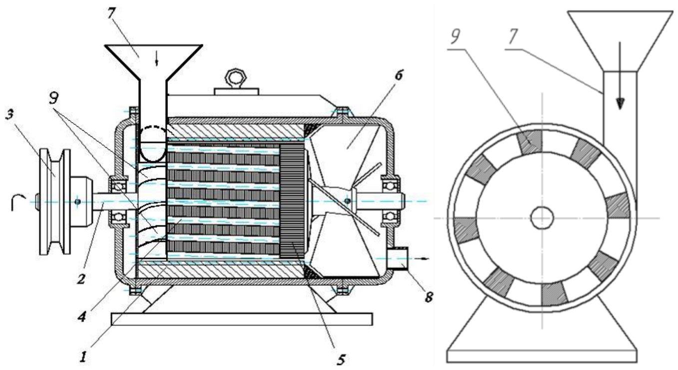
Returning waste to the "production-consumer" process is waste recycling, one of the most rational methods of disposal. This technology can be used not only at a waste processing plant, but also in various industries. Many materials, when crushed, can be reused in the production of products in various industries. In particular, fibrous materials wood, cardboard, paper, etc.

Can be used in the production of a secondary product for filling fiber-reinforced concrete. However, grinding is a labor-intensive and complex process; existing units do not cope with this task effectively enough.

Considering the relevance of this area, the creative team has modernized an experimental industrial model of a rotary-centrifugal disperser, which can be used in fiber-reinforced concrete production technology.

RESEARCH MATERIALS.

The rotary centrifugal disperser (hereinafter RCD) is designed for coarse and medium grinding of fibrous materials of medium and low strength, such as waste of various polymers, pulp and paper and wood waste, etc.



a) **b)**

Pic. 1. Rotary centrifugal disperser, a) front view, b) side view

The rotary-centrifugal disperser (Figure 1a) consists of the following parts: A gear shell 1 is rigidly fixed in the housing, the length of which corresponds to the length of the working part of the rotor, which is a shaft 2 mounted in bearing supports.

On one side of the shaft, a pulley 3 is attached using a key connection. The working surface of the rotor is formed by a cylindrical gear shell 4, which is attached to the shaft using a key connection. Moreover, the angle of inclination of the cutting elements can range from 3-7º to the rotor axis to 12-15º.

On the opposite side, at the end of the grinding zone, there is a nozzle 5, which has a special profile, designed for the final destruction of the fibrous material and regulation of the dispersed composition of the material at the exit from the grinding zone. In the space between the bearing cover and the nozzle on the rotor shaft, an impeller 6 is attached with set screws, which ensures intensified unloading of the dispersed material.

The essence of the proposed modernization lies in changing the configuration of the RCD rotor, optimizing the location of the loading pipe, and making removable nozzles of various profiles, taking into account the properties of the material being processed. We propose to place blades 9 on the surface of the rotor; they are installed along the trajectory of the incoming material and have a width equal to the diameter of the loading nozzle 7. The loading nozzle 7 is offset from the rotor axis to the teeth of the shell in such a way that when the rotor rotates, the crushed material is drawn into the grinding zone (Pic. 1b). This arrangement provides the required grip angle and eliminates the ejection of material from the loading pipe.

Discharge pipe 8 is located in the rear cover of the disperser and ensures unimpeded exit of crushed material.

The process of grinding material in the RCD is carried out as follows: the crushed material through the loading pipe 7 enters the grinding zone due to the vacuum created by the rotor blades. The loading pipe also gives the initial trajectory of movement to the crushed material, which intensifies the grinding process. Pieces of material are captured by cutting elements, forming cells into which the material falls. The movement of material with sequential destruction is carried out along the rotor due to the constant support of the material and the presence of an axial component arising from the inclination of the cutting elements to the rotor axis, as well as due to the pneumatic effect created by the rotor blades. The grinding of material caught between the teeth of the shell and the grooves of the rotor occurs due to shearing, rupture and partial abrasion. When the rotor rotates, the material is pressed against the gear shell 1 by centrifugal forces, and is repeatedly cut off and also abraded by the cutting elements of the rotor. Thus, the material, moving towards the discharge pipe, is gradually crushed. The crushed material is picked up by the rotor impeller and fed to the outlet pipe8. When operating a RCD with a classification and mixing chamber, the unmilled fraction is separated, as well as the homogenization of the standard product with dispersed additional products.

RESULTS.

Modernization of the rotor and loading pipe made it possible to increase the intensity of the grinding process and achieve a reduction in energy consumption by 10-12%.

CONCLUSION.

The main modifications made to the RCD are:

The addition of blades to the surface of the rotor to improve the grip angle and eliminate the ejection of material from the loading pipe.

The offset of the loading pipe from the rotor axis to the teeth of the shell to improve the drawing of the crushed material into the grinding zone.

The use of removable nozzles of various profiles to take into account the properties of the material being processed.

These modifications resulted in an increase in the intensity of the grinding process and a reduction in energy consumption by 10-12%.

The modernized RCD can be used to produce a secondary product for filling fiber-reinforced concrete. This can help to reduce the amount of industrial and consumer waste that is generated and disposed of in landfills.

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