

INSTALLATION OF NEW TYPES OF BASALT FIBER FILTERS IN INDUSTRY

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Abstract: *In this article, a new type of filter material was obtained from a composite of cellulose and basalt fiber. Mechanical, physico-chemical properties of the obtained filter material were studied. The fields of use of the new type of filter have been analyzed.*

Keywords: *Filter, paper, cellulose, polymer, annual plant, polyacrylic acid, polymethyl vinylpyridine.*

Cellulose [(C₆H₁₀O₅)_n] is an organic compound and the most abundant biopolymer on Earth. It is a complex carbohydrate or polysaccharide consisting of hundreds to thousands of glucose molecules, linked together to form a chain. While animals don't produce cellulose, it is made by plants, algae, and some bacteria and other microorganisms. Cellulose is the main structural molecule in the cell walls of plants and algae.

The principal commercial use for cellulose is paper manufacturing, where the kraft process is used to separate cellulose from lignin. Cellulose fibers are used in the textile industry. Cotton, linen, and other natural fibers may be used directly or processed to make rayon. Microcrystalline cellulose and powdered cellulose are used as drug fillers and as food thickeners, emulsifiers, and stabilizers. Scientists use cellulose in liquid filtration and thin layer chromatography. Cellulose is used as building material and electrical insulator. It is used in everyday household materials, like coffee filters, sponges, glues, eye drops, laxatives, and films. While cellulose from plants has always been an important fuel, cellulose from animal waste can also be processed to make butanol biofuel. Some types of bacteria secrete cellulose to produce biofilms. The biofilms provide an attachment surface for the microorganisms and allow them to organize into colonies.

Currently, paper filters based on cellulose, glass, ceramics, gauze, felt, and filtering materials made of artificial polymers are widely used. The composite filter made of basalt and flax fiber has a special place with its advantages. They are more pressure resistant and corrosion resistant; they can work in high temperature range, acid and alkaline environment.

There are several ways to clean oils today. are available and the most commonly used in the industry are:

Autonomous filter based on cellulose. This filter is used to reduce solid particles in water and oil fractionation products. An ion exchange agent can also be used to reduce the acidity of products. Pressure filter based on glass fiber - this filter is mainly designed to clean products from solid particles. Electrostatic filter - this filter is used to reduce solid particles in oil fractionation products. Centrifugal separator is intended for cleaning of solid particles of high density present in oil and water. The vacuum filter is designed to clean the dust that contaminates the products through the air and reduce the amount of water. All of the above technologies are methods available in the industry. It is worth noting that the fiberglass pressure filter and cellulose-based paper filter are preferred over other types of filters due to their high efficiency and cost-effectiveness. Both of these oil filters technically work best under constant conditions, i.e. constant flow and pressure.

Indicators of semi-synthetic Addinol 10-40 oil purified using various filter materials

№	Filter material type	Particle size					
		0-5 μm	5-10 μm	10-20 μm	0-5 μm	5-10 μm	10-20 μm
		Not cleared			Cleaned up		
		Number of particles					
1.	Belting fabric filter	1727	455	211	1053	113	32
2.	Polyamide synthetic filter				985	102	19
3.	Basalt + flax fiber filter				782	18	0
4.	As required by GOST				780	15	0

The largest particles are retained on the surface of the outer layer of the filter material, while the smaller particles enter the inner layer of the filter material and are retained in the filter material, providing a high dirt holding capacity. This type of filter can also be installed during the depressurization process of the system pump. This is another one of its advantages. The use of autonomous cellulose-based filters also allows for the removal of water by absorption or consolidation, as well as the removal of sludge and oil decomposition products.

Indicators of synthetic Liqui moly 5-40 oil purified using various filter materials

№	Filter material type	Particle size					
		0-5 μm	5-10 μm	10-20 μm	0-5 μm	5-10 μm	10-20 μm
		Not cleared			Cleaned up		
		Number of particles					
1.	Belting fabric filter	1603	361	147	998	108	29
2.	Polyamide synthetic filter				808	99	18
3.	Basalt + flax fiber filter				664	17	0
4.	As required by GOST				650	15	0

Indicators of mineral oil purified using different filter materials

№	Filter material type	Particle size					
		0-5 μm	5-10 μm	10-20 μm	0-5 μm	5-10 μm	10-20 μm
		Not cleared			Cleaned up		
		Number of particles					
1.	Belting fabric filter	1822	501	227	1080	134	34
2.	Polyamide synthetic filter				958	112	21
3.	Basalt + flax fiber filter				724	22	0
4.	As required by GOST				700	20	0

According to the research results of the filtered oil, it was found that the maximum particle size of the pollutants in the oil is 10 μm, and the amount of pollutant particles with a size of more than 5 μm is less than 4-5%. During full-scale

tests, the pressure drop in the filter element did not change, which indicates a high resource of the device for tangential cleaning of used engine oils, the service life of known direct current devices increases at least twice.

Conclusion. A comparative analysis of filtration with paper filters made of cellulose, glass, ceramics, gauze, felt and artificial polymers has proven the possibility of using filter material made of basalt and flax fiber composition for cleaning technical oils. The possibility of promising use of dust filter material for cleaning engine oil was shown. Effective use of filter material made of basalt and flax fiber composite is shown in the example of oil cleaning during engine start-up. The possibility of using a filter made of a composition of basalt and flax fiber was confirmed for tangential filtering of used motor oils. The tests made it possible to develop and put into production a number of products designed for cleaning oil in stationary equipment. In the course of research, the fineness range of cleaning engine oil with filter materials made of basalt and flax fiber composite was from 0 to 75 μm .

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