OBTAINING FIBER COMPOSITES

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Abstract. *In this study, MC-7 waste paper was used and its properties were studied after mechanical and chemical processing. Based on the studied raw materials and basalt fibers, the composition preparation process was developed.*

Key words: *waste paper, cellulose, composition, basalt fiber, quality indicators.*

Introduction. The widespread use of waste paper as a raw material depends on the demand for paper and paper products in the country. For example, in Russia at the beginning of the 20th century, the demand for paper and paper products per person was 3 kg, in Germany - 24 kg, in the USA - 34 kg, and at the end of the 20th century, it increased 8-10 times in Russia. By 2010, this indicator reached 41-45 kg.

It is known that the physico-mechanical properties of secondary fibers are lower than the physico-mechanical properties of primary cellulose fibers. Because during the processing of the primary fibers, their physical dimensions are reduced, as a result of the hardening of the fibers (orogovenia) during the drying process, the shrinkage is reduced by 20-40%. Therefore, in the process of processing waste paper, in addition to cleaning from dirty waste, it is necessary to try to restore the physical parameters and mechanical properties of cellulose fibers.

It is necessary to restore the physical parameters of waste paper fibers by mechanical and chemical processing, to create good conditions for regenerating the properties of water and fibril structure.

The use of mineral (basalt) fibers in the composition of paper and paper products gives them a set of unique properties that cannot be achieved in materials based on waste paper fibers. These are high thermal, chemical and biological stability insulating properties, as well as stability to the movement of various types of radiation, including very hard gamma and ultraviolet. The main interesting unique filtration properties are the combination of low aerodynamic resistance with high retention effect of submicron particles.

Traditional types of paper and paper products based on mineral fibers determine their use in various fields of technology, which are suitable or unsatisfactory due to the low stability of waste paper fibers to the aggressive effects of external factors. Examples of successful use of composites such as paper based on mineral fibers can be found in various fields of science and technology. These are aerospace engineering, engines of various names, biotechnology, construction and others. Taking into account the above considerations, we conducted this experiment on MC-7 (mixed cardboard) and basalt (3 different types) fibers.

The technology of mass production from waste paper and basalt fibers for the production of composite paper products includes the following processes:

1. Separation of waste paper into separate fragments;
2. Fragmentation;
3. Cleaning of waste paper mass in cyclones;
4. Sorting and fine cleaning;
5. Separating the secondary fiber suspension into fractions depending on their size;
6. Condensing the mass to 10...15%.

Then, taking equal amounts of each of these and mixing them, the composite material was prepared in the laboratory using the wet method. The prepared mass was diluted by 1-1.5%, and a paper sample was cast on the paper casting machine. When the cylinder of the apparatus is slowly raised together with the mesh part, the water mass at the end passes through the mesh to form a wet paper layer. The resulting paper

layer together with the mesh is removed and dehydrated in a drying cabinet at 105-110 ºC to 75-80% moisture. Then it is pressed in a press until the desired thickness is formed and kept in the press for 30 minutes. At the next stage, the quality indicators of the samples, i.e. breaking length, bending resistance, ash content and water absorption were studied. The following tables show the analysis of the results.

Table 1

Quality indicators of composite paper samples obtained on the basis of basalt fiber (ultrafine) and MC-7 different papers

№	Waste paper, %	Basalt fiber, %	Quality indicators			
			Breaking length, mm	Bending strength, H	Ash content,%	Water absorption, %
1	100	-	3550	22	6.95	3.47
2	75	25	2050	13	7.11	3.38
3	50	50	875	3	8.17	2.39
4	-	100	-	-	9.84	2.25

Table 2

Quality indicators of composite paper samples obtained on the basis of basalt fiber (fine) and MC-7 different papers

№	Waste paper, %	Basalt fiber, %	Quality indicators			
			Breaking length, mm	Bending strength, H	Ash content,%	Water absorption, %
1	100	-	3550	22	6.95	3.47
5	75	25	2700	14	7.93	3.85
6	50	50	1550	7	9.67	3.69
7	-	100		-	10.25	3.48

Table 3

Quality indicators of composite paper samples obtained on the basis of basalt fiber (coarse) and MC-7 different papers

№	Waste paper, %	Basalt fiber, %	Quality indicators			
			Breaking length, mm	Bending strength, H	Ash content, %	Water absorption, %
1	100	-	3550	22	6.95	3.47
8	75	25	1450	11	8.27	4.95
9	50	50	775	2	10.15	4.13
10	-	100	-	-	12.15	3.98

Conclusion. As can be seen from the table, three different types of basalt fiber samples and composite paper samples obtained on the basis of MC-7 different papers were studied and compared for breaking length, bending resistance, ash content and water absorbency indicators. From the results of the analysis, it can be concluded that it is appropriate to use very fine and fine types of basalt fiber, because the amount of ash and the degree of elasticity are smaller than those of coarse fiber.

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