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INFLUENCE OF THE NATURE OF THE GRIND ON TOUGHNESS OF THE PAPER

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Abstract
Influence of the nature of the grind is considered In article on mechanical characteristic of the paper on base cotton with different percent accompaniment of the wheat cellulose. The Known that process of the milling of the paper mass is conducted solely big importance in creation the most varied characteristic paper sheet. Depending on the duration of the grinding, the nature of the degree of grinding and the properties of the paper change. For example, with a low (cage) degree of grinding the pulp, it is predominantly chopped fibers above the surface fibrillation, resulting in a loose and porous sheet structure. To obtain a dense, closed and strong sheet structure, a high degree of grinding of the mass (greasy mass) is necessary, ensuring the predominance of fibrillated fibers with a well-developed surface. Studies have established that the duration of milling of pulp from coniferous species of wood with sulfate bleached ennobled at 150 minutes achieves a degree of grinding of 60 ShR ° C, then 10 minutes are enough for straw sulfate bleached. It Is Installed that for reception of the paper with accompaniment of the wheat cellulose with mechanical toughness, being up to quality standard, sufficient degree of the grind 40 ^{0} ShR and does not follow to use the thick concentration of the mass. The Studies of the influence composite composition on toughness of the paper has revealled that under 10% before 20% accompaniment of the wheat cellulose is provided stability of importances, the most further accompaniment promotes the reception of the porous paper.

Key words: *the printed process, paper, paint perception, stringy half-finished item, milling, paper-forming properties, degree of the grind.*

The main process of printing production is printing process, at which process interaction of paper and paint, color perception, its distribution in paper proceeds that determines the speed of setting of paint and quality of a type [1]. The quality of a printing print is defined both by parameters of technological process of the printing , as properties of the used materials, that is paints and paper to which research of technological properties many works are devoted. Researches of the physical and chemical phenomena in printing process were begun since 1934 under the leadership of P.A. Rehbinder where the molecular nature of paper and paint was investigated, predetermining character of a course of process and interaction of these materials in the conditions of selective wetting.

Scientific research of many scientists on technological properties of paper was very fruitful. Among them it is necessary to point to works of D. Tolenar (Holland), R. Koup and A. Smith (England) - on a research of the absorbing quaility of paper; S. Chapman (USA), S. Bensten (Denmark) - on a research of smoothness of paper; A.P. Zakoshchikova, N.P. Zotova-Spanovskoy, V.A. Mudrika, D.M. Flyatte, etc. – according to the research of mechanical properties of paper.

At the Tashkent institute of textile and light industry for many decades researches on applying of local fibrous semi-finished products for production of different types of pulp-and-paper production are conducted and the considerable practical experience in their processing is piled. Specific features of a morphological structure, the chemical composition and use of

fibrous semi-finished products from the most perspective types of local non-wooden raw materials for production of different types of paper and a cardboard are studied [2-11].

Studying of kinetics of change of properties and condition of paper are caused by such factors as composition of paper on fiber, durability and flexibility of these fibers, hydrogen and donor acceptor power of chaining between cellulose fibers and friction power between them which fibrous suspension is obtained in the process of grinding [12].

Long since exclusively great value in creation of the most various properties of standard sheet was allocated for grind process (machining of vegetable fibers in the presence of water). Passing fibers of paper stock between the crossed knives and the rubbing surfaces of the grinding machines under the influence of mechanical and hydrodynamic forces are shortened and split on fibril. In the process of fibrillation the demensial surface of fibers and number of the free hydroxyl groups furthering the best contact and compound of separate fibers in standard sheet that increases property of fibers .

It is known that at grinding two processes continuously growing: 1) fiber splitting - the fibrillation and hydration furthering growth of power of communication between fibers and to increase in durability of paper; 2) reducing (shortening) of its average length, the causing weakening of durability. If during the first period of grinding fiber splitting process prevails, then the second stage of grind demonstrates process of shortening of fibers [13].

As S.N. Ivanov specifies at the beginning of grind, the action of the factors exerting positive impact on indicators of mechanical durability of paper prevails (communication forces between fibers, due to increase in an external surface of the bulked-up flexible fibers increase at fibrillation and an splitting of the thinnest fibril). However at some stage of process of grinding influence on a negative factor (shortening of fibers) strongly increases. N.P. Perekalsky and V.F. Filatenkov explain it with features of an arrangement hemicellulose in vegetable fibers. About a half hemicellulose settles down in external areas of a cellular wall of fibers, that is in those areas which already in an initial stage of process of grind tend to flaking under the influence of the grinding font and promote formation further of strong communications between fibers, the investigation of what is the noticeable growth of durability of paper.

Grinding process as Ya.G. Hinchin showed, is difficult colloidal and chemical process and therefore it cannot be explained only with simple mechanical dispersion of fiber, i.e. splitting on fibril and shortening.

The main factors of influencing quality of a grinding of cellulose are: the grinding duration, specific pressure between knives of mills, concentration of weight, type of the grinding font, district speed of a rotor or a drum, weight temperature at grind.

Depending on the grind mode, that is from duration of grind, concentration and temperature of weight, specific pressure between knives of mills the character of degree of a grinding and property of paper changes. For instance, at low (Satka) degree of a grinding of paper stock the friable and porous structure of a leaf as at grind the cabin of fibers over superficial fibrillation is provided. The prevalence of the fibrillated fibers with well evolved surface, which are rather difficult to dehydrate on a grid of the papermaking machine is characteristic of high degree of a grinding of weight (fat weight) and form dense, substantially solid, durable and strong structure of the sheet .

Depending on the influence of degree of a grinding and also composite structure and origin of fibers on overcast of papers are given in work [14]. Here the temperature of the mass of papers is characterized by an indicator of Lin-C [15] which smaller size corresponds to bigger uniformity of paper.

At dense concentration of weight division and fibrillation of fibers is facilitated at water temperature increase as the viscosity decreases and water freely gets between rigid fibers [16].

At a low temperature of paper stock process of grind by results of researches X. Mack and

R. Baumgarten promotes improvement of indicators of mechanical durability and reduction of power consumption by grind.

The interrelation between mechanical properties of ready paper and papery properties of fibrous materials for devices without knives, like "type - a stream-barrier" is established in the works [17-19]. From the found functional dependences it is visible that physical and mechanical properties of ready castings directly depend on papery properties of the developed fibrous semi-finished product, the last are in turn characterized by such indicators as tendency of fibrous semi-finished products to fibrillation or to shortening. Specific pressure between knives and mills changes the character of degree of grinding and features of paper.

Duration of grinding of different types of cellulose is various if at cellulose from coniferous kinds of wood the sulfate henbane fortified at 150 min. reaches degree of a grinding 60 ºShR, then for straw a sulfate henbane 10 min. there are enough is established by researches [1]. Fibers of straw cellulose, being not even still ground, form the weight having already rather high degree of a grinding to 30º ShR. If process of grinding of a message with the high specific pressure that usually in relation to sulphatic cellulose after 60º ShR fibers considerably collapse and decreases the mechanical durability of the formed paper. It is established that for obtaining the paper of the maximum durability it is not necessary to grind intensively fibrous material, it is necessary to influence fibers so that the hemicellulose which are contained in its external layers were released, partially or completely the external plan of a secondary wall collapsed and remained not destroyed the layer [20].

The purpose of this work is to investigate influence of degree of a grinding on strength properties of paper. An object of a research a the papers on the basis of cellulose, cotton with various addends of cellulose, from wheat straw is obtained.

Strength features of paper are characterized by utmost , critical values of tension at which integrity of material, its structure it is irreversible is broken down . Strength properties express the indicators which are characterized by the paper resistance to pulling, break, breaking down, pressing through ,impulsive loading. In the paper industry it is accepted to characterize the paper resistance to a pull by indicators of explosive freight or explosive length of paper. For example, for soft typographical papers, explosive length is not less than 2500 m, and for rigid offset, to 3500 m and more.

In this work durability of paper was characterized on the explosive length received as a result of measurement of this indicator at zero distance between clips of the explosive machine. The sheet of paper at test is broken off on the weakest point. This weak point in most cases are not fibers, but communications between them. By results of researches of mechanical durability of the paper castings (tab. 1) received from the cotton cellulose (CC) with various percentage (1 - 0%; 2 - 10%; 3 - 15%; 4 - 20%; 5 - 25%; 6 - 30; 7 - 100%) introduction at degree of a grinding 600 and 420ShR, constructed the chart (fig. 1).

Table. 1.

Values of strength properties of the studied papers

Number of paper	Explosive length, m		Number of double excesses	
	At 60ºShR	At 42ºShR	At 60ºShR	At 42ºShR
1	3142	3142	86	86
2	3901	5140	256	60

3	3666	5140	126	14
4	3713	3442	162	42
5	4371	3564	211	27
6	3666	3199	350	38
7	5264	4700	78	21

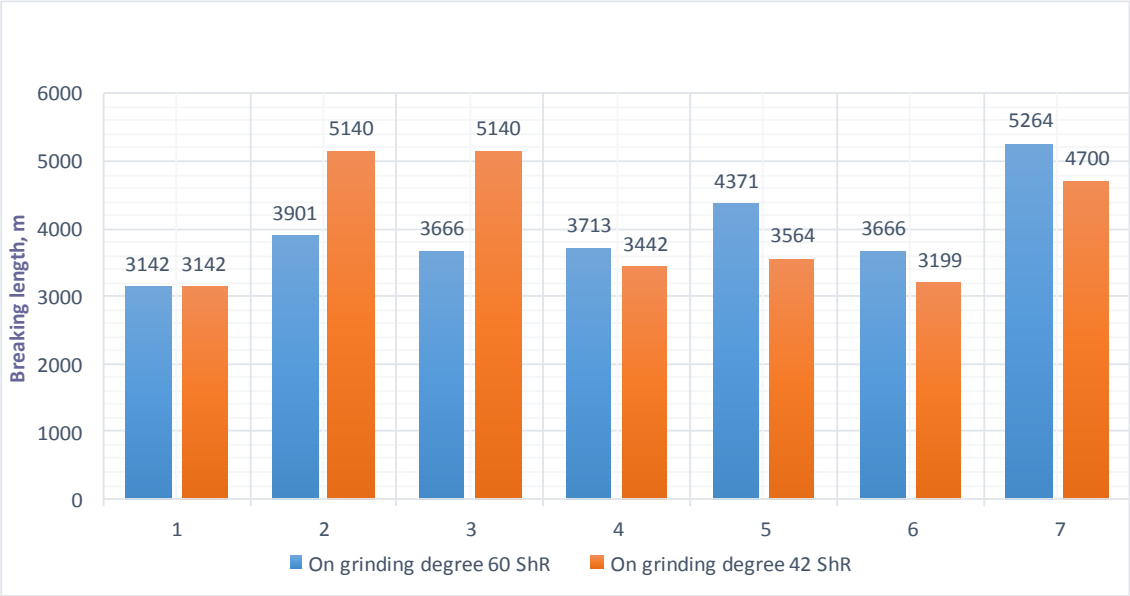

Fig. 1. Change of explosive length depending on grinding degree papers with various percentage addition of PTs

It is evident from the chart, that the change of degree of a grinding led to change of mechanical durability of the studied papers. If at paper as a part of which 10% addition of PTs, at degree of a grinding 60 ºShR mechanical durability is 3901 m then at degree of a grinding 42 ºShR durability is 31% more. An explanation for it is that grinding without essential shortening provided their good fibrillation. The fibrillated fibers of wheat straw with the developed surface interfered with dehydration on a grid that promoted formation of tight , close structure. Also at 1,4% concentration of paper stock the center as touched only the external plan of a secondary wall of fiber did not collapse.

Conclusions:

By results of researches it is possible to establish that for obtaining the paper with addition of wheat cellulose with the mechanical durability conforming to requirements of the standard degree of a grinding 40 0ShR is enough. It is not necessary to use tight concentration of weight. Revealed researches of influence of composite structure on durability of paper that at 10% to 20% addition of wheat cellulose stability of values is provided. Further addition furthers the obtaining cellular paper as amount of short fibers furthering fast dehydration on a grinding.

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