ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 8, Issue 12 , December 2021

Cleaning a Waste Paper Mass by Using a Flotation Method

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ABSTRACT: The article presents the results of studies on the separation of printing ink from the surface of waste paper, as well as on the conduct of bleaching processes and a bleaching of paper pulp. The possibility of using the flotation method to prevent reverse sorption of a typographical ink in the paper pulp, which is why it is impossible to obtain the desired whiteness of the paper pulp.

I. INTRODUCTION

In accordance with the Law of the Republic of Uzbekistan "On measures to regulate the delivery system for collection, preparation and processing of secondary paper waste", the development and improvement of the system of paper waste preparation based on optimization of control, accounting and management in the industry, and the introduction of effective mechanisms for the industrial use of secondary raw materials by private businesses[1].

It is important to introduce technologies for the production of not only thick paper, but also printed paper from the country's waste [1]. It is also a requirement of the time that rational use of paper, along with paper waste, perennial plants, non-timber plants and secondary resources separated from basic production to eliminate raw material shortage in paper production becomes a vital issue. According to the latest data, the leading foreign manufacturers of cellulose and paper have received positive results in the production of paper and paper products from paper waste by using a floatation method.

II. MAIN PART

The rapid development of industries, as well as the growing demand for the efficient use of natural resources, contributes to the development of new technologies and the improvement of existing technological processes. Currently, there is a significant shortage of fibrous semi-finished products for the pulp and paper industry of the republic. The use of imported semi-finished products leads to an increase in the cost of the finished product and, as a consequence, to a decrease in the competitiveness of this product, as well as the profitability of production [2].

Worldwide, newsprint is made from 68% of secondary raw materials. At the same time, 68% of all paper produced worldwide is a packaging paper, and its composition consists of 50% recycled paper, i.e. waste paper. However, waste paper is almost never used in the production of printing and writing paper. Even in the US, only 6% of waste paper is used for this purpose. This means that almost 90% of the primary fiber in the production of printing and writing paper, i.e. cellulose from wood, is used. And that in turn signifies that the forest will be cut down again. MS-1, MS-2 or MS-3 sort waste paper can be used in the production of printed paper. Although there is no problem in using MS-1 and MS-2 waste paper, the presence of printing ink in MS-3 waste paper limits its use for the above purposes. In particular, the problem of maximum separation of dye on the fiber surface during the processing of waste paper, its removal from the cellulose suspension, decolorization of dyed fiber and raising the whiteness of secondary fiber is currently being studied in all developed countries [3].

When the composition of paper waste generated in different enterprises was studied by NMR analysis, a researcher, it was found that a certain amount of polycyclic aromatic compounds, heavy metal, dioxin and furan compounds were present. An analysis of the literature revealed that it was a multi-component system used in the

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preparation of typographic ink. Printing ink is supposed not to penetrate deep into the paper and to dry quickly. For this purpose, typographic inks are prepared mainly on the basis of typographic drying oils. The composition of the paint may vary depending on the purpose for which it is used. For example, when printing a newspaper, liquid paint is used, taking into account the rapid drying of the paint, and when printing books, some darker colors are used. In the preparation of all types of printing paints, wood resin and soap are added to the oil. In the literature, the composition of typographic dye is given as follows: typographic oil - 50 kg, wood resin - 10 kg, black dry - 12 kg, soap - 1 kg, color pigments 250 g. It is an olive oil that acts as a curtain. To remove the printing ink from the waste paper mass, it is first necessary to break down the component that forms the film. This means that the olive oil in the paint is an oily-waxy substance, and by converting it to a soluble state, the waste paper mass can be removed from the printing ink. When reusing all types of packaging materials, it is important to remove the dye while maintaining the physical and mechanical properties of the fibrous material. Studies have suggested 3.5% maleic anhydride and 15.8% specific polymer as the optimal content for dye extraction. Another alternative method of extracting printing ink from waste paper is currently proposed by G. Tofani. To do this, to remove the dye from the paper sediment formed during the flotation cleaning process, it is fired at 575 ^{0}C and bleached with sodium ditionite, the cost-effectiveness of reuse in paper production as a filler from the resulting ash is currently being studied [4].

Waste paper is not only a raw material with different composition complex but also a material which is differentiated by printing method, conditions, drying and bonding of the dye. Therefore, in the manufacture of high-quality masses, using as much of homogeneous raw materials as possible, or keeping the ratio of different waste materials is strictly maintained. The retention time of the dyeing material also affects the degree of dye removal from the surface of the fiber, that is, the polymerization process of the film expires after the printing of paint on the paper, which requires the use of chemical-mechanical effects to remove the dye from the surface of the fiber. The object of the research is an MC-3 sheet of paper, including books and magazines, archives (magazines, books, brochures, notebooks, notebooks, posters, etc.) [5].

As you know, it is necessary to print the surface printing, discolour and whiten the mass to return the MS-3 waste paper to the main process. In the first phase of the experiments, the dyeing and discoloration of the MS-3 sorting machine was carried out in hydrogen peroxide solution. In the second step, the process was performed in sodium hypochlorite solution.

In each of the above methods, the possibility of using a flotation method in the next section of the study, due to the lack of fibrous semiconductor products of the required value as a result of reprocessing of the typographic dye from the waste paper mass.

The essence of the flotation method is as follows: Dissolve the suspended solvent to a certain concentration by adding 1-2% of the surfactant and heat it to 50-60 ^{0}C. The air is heated into a heated suspension using a special device. The movement of air bubbles is accompanied by the dye particles in the suspension, their visibility is visually controlled, and the optimal airflow is selected manually. Under selected conditions, the process takes 5-10 minutes. The dye particles that rise to the surface of the solution are then floated using a special lattice swivel.

Typically, after applying the typographic dye from the waste paper, the dye particles are removed from the aqueous section by washing or a method of flotation. Due to the fact that large amounts of clean water (160-180 m^3 / t of treated water) is used during the washing process, large wastewater generation, loss of fibers and fillers (30-35%) are limited in the application of this method in enterprise environment. In our research we have studied the process of extracting dye from suspension by a method of flotation [6].

The essence of flotation method is the inclusion of air bubbles that attach the dye to the suspension. The flotation process is influenced by incoming mass concentrations for the flotation, including the amount of dyed paint, the amount of air used for the flotation, the size of air bubbles, and the speed of movement [7]. In our research, we investigated the effect of mass concentration on flux in the flotation process. The results of the experiment are presented in Figure 1.

ISSN: 2350-0328
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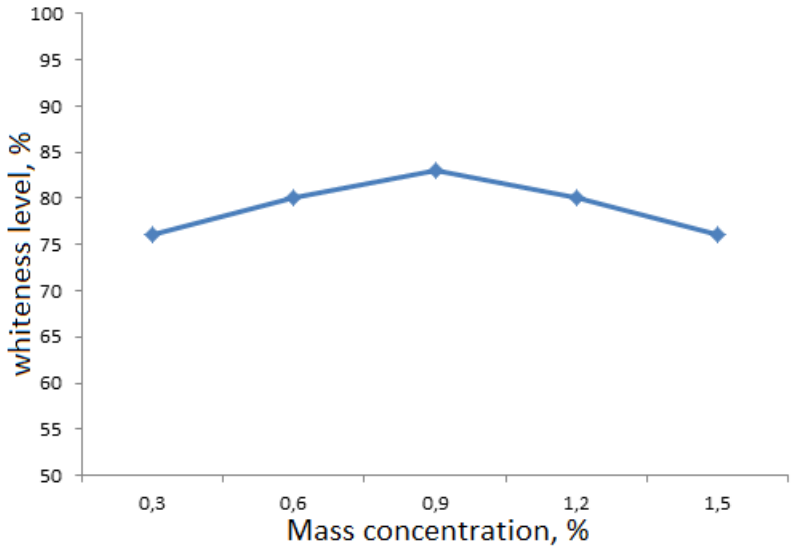

Figure 1. Depending on the degree of whiteness of the mass to its concentration. Process temperature 60 ^{0}C, duration - 10 min, SAA *(surface active substances)* concentration - 1%.

With a concentration of more than 0.9%, the movement of air bubbles in the suspension slows down, so the mass of whiteness also declines. At a concentration of less than 0.9%, air bubbles could not absorb the dye particles. This is because the dye particles are very dispersed in the suspension when the mass concentration is low. In subsequent studies, the flotation process was performed on a 9% mass concentration. The effects of flotation process duration and temperature on macular mass mass on whiteness were investigated, the results obtained below (Figure 2).

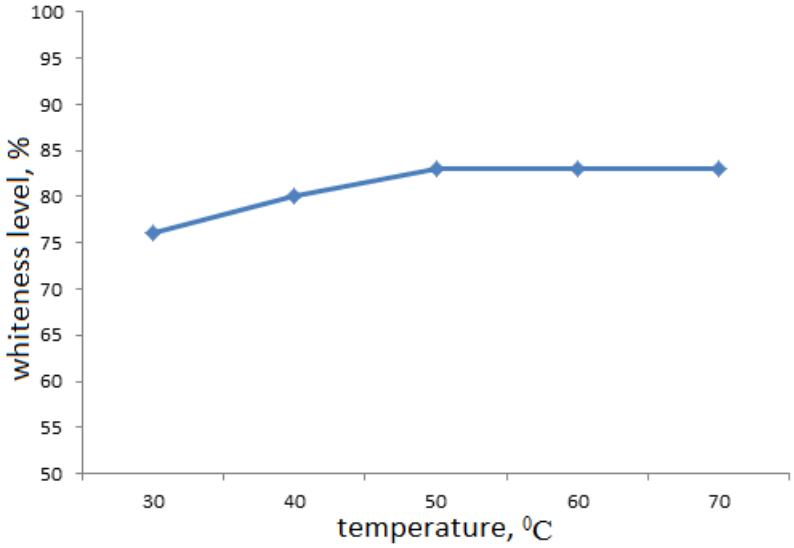

Figure 2. Dependence of mass whiteness on the flotation process temperature. Process length is 10 min, mass concentration is 0.9%, SAA concentration is 1%.

The temperature was considered to be 50 ^{0}C, since the temperature had no effect on the whiteness of the mass when exceeding T 50 ^{0}C. As the temperature of the mass increases, the viscosity of the water decreases, this results in the acceleration of air bubbles in the suspension, as well as the penetration of dye particles into smaller particles, which

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increases the efficiency of the flotation process [8]. When the process was studied, it was observed that the dye particles in the suspension, that is, dissolved from the macular mass, rapidly attaches to the air bubbles. The equilibrium was achieved for 6–10 minutes depending on the surface active matter (SAA) concentration In the process (Figure 3).

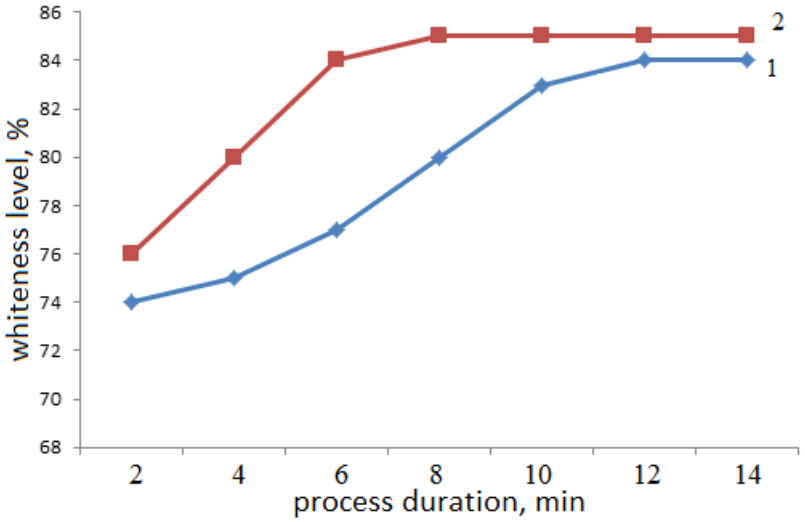

Figure 3. Dependence of mass whiteness on the duration of the flotation process. 1 - SAA concentration of 1%; 2 - SAA concentration of 2%.

Note: Process temperature is T 50 ^{0}C, mass concentration is 0.9%.

Increasing the SAA concentration by more than 2% makes the process difficult. As a result it leads to the suspension foaming in the system with the presence of air bubbles and SAA, the air bubbles come together and become more difficult to attach to the dye particles. As a result of the research, the following conditions are recommended for a flotation process:

• SAA concentration - 2%;
• process temperature – 50 ^{0}C;
• process duration - 6-8 min;
• suspension concentration - 0.9%.

III. CONCLUSION

• The factors influencing the printing process from the MS-3 paper waste paper have been studied.
• Printing and coloring of the surface of the MS-3 was applied to return the paper to the main process. In the first phase of the experiments, the dyeing and discoloration of the MS-3 sorting machine was carried out in hydrogen peroxide solution. In the second step, the process was performed in sodium hypochlorite solution. In both cases it was found that the whiteness of the mass did not reach the required level.

*Both of the above methods have revealed that the printing of waste paper on surface of the waste paper does not achieve the required whiteness value due to the resorption of the dye, so the possibility of using the flotation method at the next stage of the study has been investigated. Conditions for conducting the flotation process were proposed.
• A technological scheme for improving paper quality and paper waste has been developed.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 8, Issue 12 , December 2021

REFERENCES

1. The law of the Republic of Uzbekistan dated March 16, 2009 of No. 70 "On measures for streamlining of system of delivery of secondary paper waste for collection, preparation and processing".
2. Miratayev Abdumalik Abdumajidovich, Abdumajidov Anvar Abdumalikovich, “Removal of waxy substances from fibrous waste for the preparation of paper furnish from local raw materials”, “IJIERT”, 2021 https://repo.ijiert.org/index.php/ijiert/issue/view/110
3. Abdumajidov Anvar Abdumalikovich, Miratayev Abdumalik Abdumajidovich, Nabiyeva Iroda Abdusamatovna, Xusanov Farrux Sultanovich, “Improving the quality of secondary fiber raw materials studying process”, “ACADEMICIA”, Vol 11, issue 10, 2021. https://saarj.com/academicia-view-journal-current-issue/
4. S.N. Ivanov, Technology of cellulose-paper production, 3 volumes T.1.Raw materials and production of semi-finished goods, part 3- SPb .: "Polytechnic", 2014. - 1616 p.
5. HP Sollinger “Higher flexibility in the use of recovered paper is needed” Improving the discoloration of the waste paper. ipw. 2011. No. 1 1-12, pp. 34-35. 12.10-19F.271. Angl.
6. M. A. Ageev, A flotation process for improving the quality of macular masses. Chemistry. 2011, No. 3, pp. 201-205. Russia.
7. J. M. Alimaxumov, A.A. Abdumajidov, A. A. Miratayev. A development of waste processing technology, which is a part of paper raw materials. Collection of articles of scientific-practical conference of TITLI “Innovative ideas and development of gifted youth under the conditions of modernization of techniques and technologies”. Tashkent, 2017
December 12-13.
8. A. A. Abdumajidov, I. A. Nabiyeva; Improving a process of cleaning and bleaching of waste paper included in the paper composition. Collection of articles of scientific-practical conference of TITLI “Innovative ideas and development of gifted youth under the conditions of modernization of techniques and technologies”. Tashkent, December 12-13, 2017