Volume 3, Issue 10, October - 2025 **ISSN (E):** 2938-3811

DEVELOPMENT OF A TECHNOLOGY FOR PRODUCING COTTON CELLULOSE WITH MINIMUM CONSUMPTIONS OF CHEMICALS AND WATER RESOURCES

K. D. Mirsaidova,
Prof. R. Sayfutdinov,
Prof. E. Egamberdiev
Tashkent State Agrarian University
Department of Ecology and Environmental Protection
(93) 539-34-35, e-mail kmirsaidova2020@ gmail.com

Abstract
The object of the study was the cooking liquor, spent liquor, the flow rate of washing water, their purification after washing, and the quality indicators of the cotton pulp obtained. We studied the optical density before and after bleaching with sodium hypochlorite (NaClO), experimentally determined the optimal bleaching rate of spent liquor and wash water, studied reducing the pH of the medium, determined the residual amount of sodium hydroxide, and identified the chemical oxygen demand (COD5) and biochemical oxygen demand (BOD5) waste liquor and wash water.

Keywords: Pulp, paper, industry, low-grade, lint, cooking solution, cellulose, residual chemicals, cotton pulp production, sodium hypochlorite (NaClO), mass concentration - 10%, NaOH consumption, cooking temperature.

Introduction

Extremely great attention is paid to the problem of environmental protection in our camp; in recent years, this issue has been deeply reflected in the Constitution of the Republic of Uzbekistan and in the fundamental laws on land, its subsoil, waters, forests, atmospheric air and wildlife, as well as in special decrees on nature protection of the Oliy Majilis and the Cabinet of Ministers of the Republic of Uzbekistan [1,2].

In connection with the constant increase in water consumption in the Republic, demands are being made more and more insistently to consider consumed water as a national good. And include the cost of water consumption directly in production costs, affecting the cost of production.

Scientific research aimed at reducing the consumption of clean water and chemicals in the pulp and paper industry is certainly relevant, especially in the Central Asian region.

Web of Scientists and Scholars: Journal of Multidisciplinary Research

The purpose of this work is to develop a technology for producing cotton cellulose with lower water and chemical consumption, the implementation of which helps to reduce environmental pollution and reduce the consumption of drinking water.

The raw material used was cotton linters of the 2nd grade B, type of medium weedine

Research has been carried out to obtain cotton cellulose from lint 2 grade B of medium weediness in two ways, by: a) alkaline cooking; b) oxygen-alkaline cooking;

The quality indicators of the obtained celluloses and the sanitary characteristics of the liquor and washing waters are presented in Table 1 and Fig. 1 shows the NaOH content in the spent liquor and its content after four times washing of the obtained cotton cellulose.

Under laboratory conditions, the obtained cotton cellulose was washed with separate portions of water until neutral.

After each step of washing the pulp, the washing water became more transparent.

When washing cotton cellulose after oxygen-alkaline cooking, the water consumption to a neutral medium was 280 ml. This is due to the fact that in oxygen-alkaline cooking, the optimal consumption of NaOH was 1.5%, in alkaline cooking, it was consumed 2% or more. In addition, in the process of oxygen-alkaline cooking, many organic inclusions containing in cotton linters, in particular, lignin pentosan, hexosan, and others are oxidized and converted into solution.

Cotton pulp quality indicators and sanitary characteristics of the spent liquor depending on from cooking methods

Table 1

3 №	The ways boiling cotton boiling	Quality indicators of cotton cellulose					Waste liquor indicators		
		α-cellulose, %	Joint venture	Belizeon, %	Sol-ness,%	Fat-wax-substances, %	Opticalkayaraftness *	Soderburningresidualleg NaOH	pH
11	Alkaline cooking	97	1950	87	0,228	0,18	1,9	1,085	11,6
22	Oxygen-alkaline cooking	99,2	1700	92	0,072	0,074	0,6	1.09	11,2

When washing the obtained cotton pulp after cooking, it is shown that the amount of sodium hydroxide in the solution immediately decreases after the first washing.

The graph shows the results of determining the remaining NaOH after each wash rate. Washing of cotton cellulose after alkaline cooking to a neutral medium was observed at 5 times washing of the pulp, and during oxygen-silk cooking at 4 times washing. Tois cellulose obtained from oxygen-alkaline cooking is washed to neutrality at a lower water consumption than conventional alkaline cooking cellulose.

Comparison of the sanitary characteristics of used liquors alkaline cooking and developed cooking.

Table 2

№	Sanitary indicators of lye	Cooking conditions	
		Alkaline cooking	Oxygen-alkaline cooking
1.	Optical density, turbidity,%	81	29
2.	COD_5 mg. O_2 / l	907	98
3.	BOD_5 mg. O_2 / l	450	152
4.	Organic hydrocarbon content	326	188

The table shows the comparative sanitary characteristics of spent liquors from conventional alkaline cooking and oxy-silk cooking.

The analysis of the lye of oxygen-silk cooking showed that its optical density is 80% lower than the optical density of alkaline lint liquor, the biochemical oxygen demand, in particular BOD_5 - by 66.5%, and the chemical oxygen demand - by 60%.

The pulp obtained from oxygen-alkaline cooking is washed to neutrality with less water consumption than conventional alkaline pulp

The above results testify to the improvement of the sanitary characteristics of the spent liquor of oxy-silk cooking in comparison with alkaline cooking several times. The indicated advantages are a prerequisite for the repeated use of the spent liquor in the process of producing cotton pulp.

Based on calculations of laboratory data, it is shown that the waste liquor can be reused several times without reducing the quality of the resulting product.

With a fivefold use of waste liquor, the water consumption is reduced from 45 m3 / t to 13.5 m3 / t, and sodium hydroxide from 675 kg / t to 127 kg / t.

The above results indicate an improvement in the sanitary characteristics of the spent liquor of oxygen-silk cooking in comparison with alkaline cooking several times.

Findings

1. The advantages of obtaining cotton cellulose from lint of 2 varieties B types of medium weediness by oxygen-alkaline in comparison with the classical alkaline method have been investigated.
2. Based on the calculations of laboratory data, it is shown that the waste liquor can be reused without reducing the quality of the product obtained. This made it possible to return the wash water for the preparation of cooking solutions. With a fivefold use of waste liquor, the water consumption is reduced from 45 m3 / t to 13.5 m3 / t, and sodium hydroxide from 675 kg / t to 127 kg / t.
3. The developed technology for the production of cotton cellulose with the reuse of waste liquor contributes to the conservation of material resources, in addition, the reduction of harmful emissions on the environment is achieved

Web of Scientists and Scholars: Journal of Multidisciplinary Research

References

1. «Decree of the President of the Republic of Uzbekistan No. PF-60 dated January 28, 2022 – On the New Development Strategy of the Republic of Uzbekistan for 2022–2026.»
2. Smook, G.A. Handbook for Pulp and Paper Technologists. — Angus Wilde Publications, 2016.
3. Yamashita H. (ред.) Advances in Paper and Board Packaging. — 2023.
4. Sayfutdinov R.S. Development of a chemical technology for the use of cotton waste for the production of chipboards and cellulose. Abstract of a thesis in technical sciences. Tashkent, 1998, p. 49.
5. Ergashev T., Ergashev A., Environmental safety - the environment of human life. T.: Chino ENK, 2007.155 s.

Web of Scientists and Scholars: Journal of Multidisciplinary Research