

**OPTIMIZATION OF OPERATION OF INDIRECT  
BRAGORECTIFICATION PLANTS**

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**ABSTRACT.** *It is proved expedient to supply to the impurity concentration column of alcohol-containing fractions in the form of non-condensed steam in the deflegmators of the main columns in the amount of 5%. This solution allows to reduce the heating steam consumption from 10 to 8.8 kg/dal of anhydrous alcohol. The expected profit for the plant with a capacity of 3000 dal of alcohol per day will be about 2 million UAH per year.*

**Key words:** *bragorectification plant, impurity concentration column, alcohol-containing fractions, vapour.*

**ОПТИМІЗАЦІЯ РОБОТИ БРАГОРЕКТИФІКАЦІЙНИХ УСТАНОВОК  
НЕПРЯМОЇ ДІЇ**

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**АНОТАЦІЯ.** *Доведено доцільність подачі в розгінну колону спиртовмісних фракцій у вигляді несконденсованої в дефлегматорах основних колон пари в кількості 5 %. Таке рішення дозволяє зменшити витрати гріючої пари від 10 до 8,8 кг/дал безводного спирту. Очікуваний прибуток для заводу потужністю 3000 дал спирту на добу становитиме близько 2 млн грн на рік.*

**Ключові слова:** *брагоректифікаційна установка, розгінна колона, спиртовмісні фракції, пара.*

Known methods of obtaining rectified alcohol in bragorectification plants (BRP), equipped with a impurity concentration column (ICC), involve the introduction of alcohol-containing intermediates and by-products on its feed plate in the form of vapour condensate with a temperature of 25-30 °C. For effective separation and concentration of volatile impurities, a necessary condition is an increase in steam consumption from 2.56 to 3,59 kg/kg of anhydrous alcohol (a.a.) introduced into the column (by 28,7%) [1].

A large number of scientific works are devoted to the issues of optimization of the operation of the BRP. To solve the actual problem, the authors proposed to feed the ICC feed plate with alcohol-containing fractions in the form of vapor not condensed in the carbon dioxide separator, deflegmators of the beer, ether and rectification columns, as well as with the syrupy fraction and syrupy alcohol in the vapor state [2].

Studies of the effectiveness of the innovative method were conducted in the production conditions of SE "Chudnovsky distillery" in two stages. At the first stage for comparison the efficiency of the known method (typical rectification) was investigated, according to which in deflegmators of the main columns 98 % of the amount of steam coming out of the upper part of each column was condensed, non-condensed steam was fed to their condensers, from which the steam condensate in the amount of 2 % was directed to the ICC feed plate. In the second stage, the effectiveness of the innovative technology was investigated in two ways. According to method I, not steam condensate, but non-condensed steam in the carbon dioxide se ICC feed plate. According to method II water consumption for cooling of deflegmators was reduced in such a way that in deflegmators 95 % of steam from the amount of steam leaving each column was condensed, and non-condensed steam in them in the amount of 5% was supplied to the ICC. During the research the quality of obtained rectified ethyl alcohol was controlled. Consumption of water and heating steam was recalculated per 1 dal a.a. The results of the studies are presented in the table.

**Table - Water (W) and steam (P) consumption for indirect-acting BRP equipped with a impurity concentration column**

BRP columns	W, m <sup>3</sup> /dal a.a.			P, кг/dal a.a.		
	known way	innovative		known way	innovative	
		method I	method II		method I	method II
Beer	0,065	0,064	0,062	20	20	20
Ether	0,154	0,151	0,146	12	12	12
Rectification	0,282	0,276	0,268	22	22	22
ICC	0,128	0,125	0,121	10	9,1	8,8
BRP	0,629	0,616	0,597	64	63,1	62,8

The table shows that the use of the innovative method allows reducing the total water consumption by 0,032 m<sup>3</sup>/dal (5,1 %), and steam by 1,2 kg/dal (1,9 %) compared to the known method. At the same time qualitative indicators of rectified ethyl alcohol corresponded to the normative indicators for alcohol of "Lux" grade according to State Standard of Ukraine 4221:2003.

At the organization of steam streams of ICC supply the profit for the plant of average capacity (3000 dal of alcohol per day) will be about 1,5 million UAH per year. Increasing the amount of non-condensed steam in the deflegmators of the main columns from 2 to 5 % to feed the ICC allows to reduce steam consumption from 10 to 8,8 kg/dal, and increase the profit by 33,3% compared to method I.

#### **List of references**

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