

DETERMINING THE EXTRACTION METHOD OF BENZENE-TOLUENE FROM REFORMATE COMPOSITION

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Abstract: In this article, the extraction of aromatic hydrocarbons from gasoline fractions, especially the catalyst of the reforming process, by extraction or extractive rectification, its advantages over other methods, the extraction of aromatic hydrocarbons from gasoline fractions using diethylene glycol, and the relative composition of catalytic reforming gasoline extraction products were studied.

Keywords: diethyleneglycol, tetraethyleneglycol, dimethylsulfoxide, N-formylmorpholine, sulfolane, aromatic hydrocarbon, extraction.

Аннотация: В данной статье извлечение ароматических углеводородов из бензиновых фракций, особенно катализатора процесса риформинга, методом экстракции или экстрактивной ректификации, его преимущества перед другими методами, извлечение ароматических углеводородов из бензиновых фракций с использованием диэтиленгликоля, относительный состав исследованы продукты извлечения бензина каталитического риформинга.

Ключевые слова: диэтиленгликоль, тетраэтиленгликоль, диметилсульфоксид, N-формилморфолин, сульфолан, ароматический углеводород, экстракция.

INTRODUCTIONS

Extraction or extractive rectification of aromatic hydrocarbons from automobile gasoline fractions, especially the reforming process catalyst, has shown its advantages over other methods.

In the industry today, the following selective solvents are widely used for extracting aromatic hydrocarbons from oil fractions: sulfolane, diethylene glycol (DEG), triethylene glycol (TEG), tetraethylene glycol, dimethylsulfoxide, N-formylmorpholine and their mixtures with each other.

METHOD

Diethylene glycol ($\text{HO} - \text{CH}_2 - \text{CH}_2 - \text{O} - \text{CH}_2 - \text{CH}_2 - \text{OH}$) is the second representative of glycols and is completely soluble in water. DEG boiling point – 244,8 °C, melting point – 10 °C, density at 20 °C – 1,117.

Diethylene glycol can be used in the extraction of C₆, C₇ and C₈ aromatic hydrocarbons from the composition of the gasoline fraction, as well as from the catalytic reforming catalyst.

In the process of extraction of aromatic hydrocarbons, a mixture of diethylene glycol and water is used. This compound is characterized by high solubility, good selectivity and stability at the operating temperatures of the process. Due to the high boiling point of the solvent, the aromatic hydrocarbons released by the solvent are removed by driving off the saturated solvent. As a result, operating costs for steam and water are reduced.

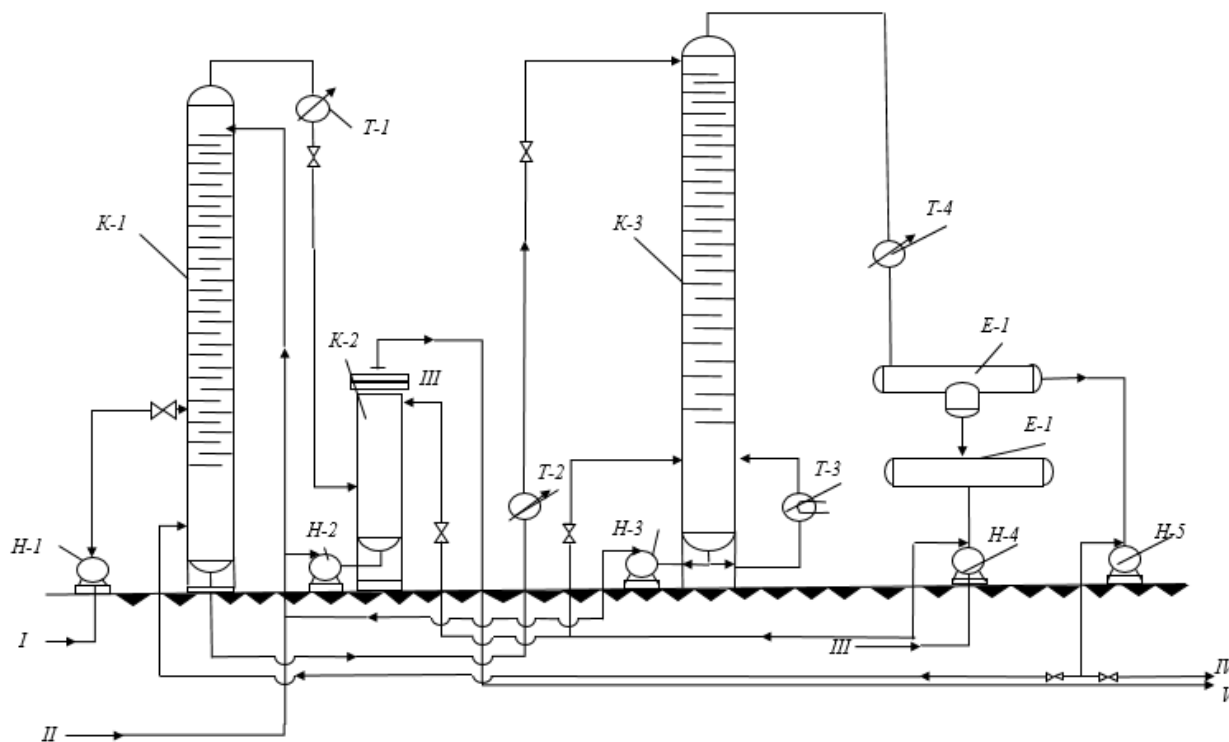
It is advisable to choose the ratio of solvent and water based on the selectivity and solubility in extracting aromatic hydrocarbons from different raw materials.

RESULTS

Figure 1 below shows the principle scheme for extracting aromatic hydrocarbons from gasoline using diethylene glycol. The process of this variant is used today to extract benzene-toluene fractions from gasoline containing a lot of aromatic hydrocarbons and to produce environmentally friendly gasoline.

Process temperature 160-175°C, pressure 8 atm. up to The solvent contains 10-20% water. The ratio of solvent to gasoline varies between 4:1 and 10:1. It depends on the concentration of aromatic hydrocarbons in gasoline. It is advisable to use raw materials containing 40% or more of aromatic hydrocarbons for the extraction process.

The incoming raw material is sent to the K-1 extraction column using the N-1 pump, and the solvent is introduced from the top of the column using the N-2 and N-3 pumps. From the lower part of the extraction column, the circulating extract in the device is sucked due to the increase in the concentration of aromatic hydrocarbons in the product with the help of the N-5 pump.



1 – picture. Scheme of the device for extraction of aromatic hydrocarbons from gasoline using diethylene glycol: K-1 – extraction column; K-2 - washing column with water; K-3 – a column for separating hydrocarbons from a solvent; E-1 – a quencher; E-2 - capacity for water; T-1, T-2, T-4 – coolers; T-3 – heater; N-1, N-2, N-3, N-4, N-5 – pumps. Lines: I– gasoline; II- diethyleneglycol; III – water; IV – aromatic hydrocarbons; V – dearomatized gasoline.

A raffinate solution containing paraffin-naphthene hydrocarbons and a small amount of diethylene glycol is removed from the upper part of the K-1 column. After cooling the raffinate in the T-1 cooler, it is sent to the K-2 column to separate

diethylene glycol from the solution using N-2 pumped water from the E-2 tank. Aqueous solution of DEG is sucked by pump N-2 and mixed with anhydrous DEG and fed back to extraction column K-1. The raffinate washed with water is removed from K-2.

The extract solution consisting of DEG, water and aromatic hydrocarbons is removed from the lower part of the K-1 column and after cooling in the T-2 cooler, it is introduced from the upper part of the K-3 evaporator column. From the top of the evaporator column, a mixture of DEG and water and aromatic hydrocarbons is removed from the top of the column as steam and condensed in the T-4 cooler and fed to the E-1 quencher. In this quencher, the mixture is separated into two. The aromatic hydrocarbons in the upper part of the mixture are absorbed by the N-5 pump, and a part is sent to the K-1 extraction column, and the rest to the adsorption device for the removal of unsaturated hydrocarbons, and then separate separation of the mixture of benzene, toluene and ethylbenzene with xylenes is sent to the rectification column for.

Table 1

Relative composition of catalytic reforming gasoline extraction products

Products	Quantity, %	Content, %				
		benzene	toluene	Xylenes and ethylbenzene	Aromatic hydrocarbons higher than C ₈	A mixture that does not contain aromatic hydrocarbons
Raw material	100	7,6	21,2	20,0	0,9	50,3
Refining	50,3	0,2	0,8	2,2	0,4	96,4
Extract	49,7	15,2	41,8	38,0	1,4	3,6

The lower layer (DEG and water) is sent to the E-2 tank, from which it is distributed to the K-2 column and a part to the K-3 column for washing the

raffinate solution using the N-4 pump. The DEG N-3 leaving the K-3 evaporator column is returned to the extraction process using a pump.

The approximate composition of the product obtained from the catalytic reforming gasoline extraction process is presented in Table 1 [2; 9-10 pp.].

As a result of purification and rectification of aromatic hydrocarbons, 99.9% pure benzene, 99.8% toluene and 99% pure ethylbenzene are obtained, along with xylenes.

THE CONCLUSION

The technological description of the catalytic reforming process in which aromatic hydrocarbons are formed in automobile gasoline at local oil refineries and the chemical mechanism of aromatic hydrocarbon formation are presented.

Modern and traditional methods for reducing the amount of aromatic hydrocarbons in motor gasoline and its fractions are presented, and a full analysis of the advantages and disadvantages of these methods is presented.

The modern technologies of extracting aromatic hydrocarbons from reformat and automobile gasoline fractions were studied, and the equipment and extractants used in them were compared and analyzed.

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