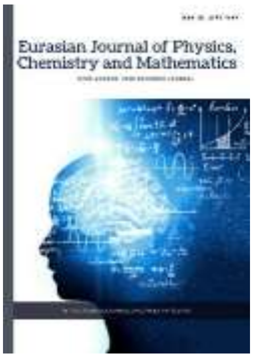


Ethylene Production from C3+ Olefins Through Combined Catalytic Cracking and Metathesis Reactors

Egamberdiyeva Zulxumor Abduraxmonovna

ABSTRACT

This article will consider the possible combination of catalytic cracking and metathesis processes and the calculation of economic efficiency to obtain ethylene from C3+ olefins by process calculation in Aspen HYSYS software.

Keywords: Petrochemical production, polyethylene, metathesis, combined processes, separation system

Introduction

Consumption of plastics and other polymers has been increasing around the world over the past five decades . According to statistics, the demand for polyethylene is growing at a high rate: +39% in 5 years and 4101 thousand tons per year by 2025, one of the reasons for stimulating the growth of ethylene production. The increased interest in new technologies of ethylene production is explained by its high demand as a raw material for the production of polyethylene, ethylene oxide, ethylene glycol, polyglycol, ethylenexlorgidrin, ethyl alcohol, synthetic smolas and other large petroleum-chemical synthesis products.

In 2020, propylene production in Russia reached 1.8 million tons (annual increase of 8%), as well as a significant increase in the production capacity of C3 + olefins associated with the introduction and modernization of oil refinery deepening processes. In particular, catalytic cracking process. Often fractions containing olefin cannot be sold as a high-yield product in oil refineries, therefore it is recommended to use them as raw material for the production of basic monomers - ethylene and propylene. Recent developments in the field of cracking of lightweight hydrocarbons [2] primarily provide great opportunities for propylene synthesis from C4+ olefins. In such processes, ethylene is produced as an additional product. Low-margin olefins can be processed by a metathesis process for the production of highly refined ethylene and propylene. In oil refineries, a combination of catalytic cracking and metathesis processes increases ethylene yields.

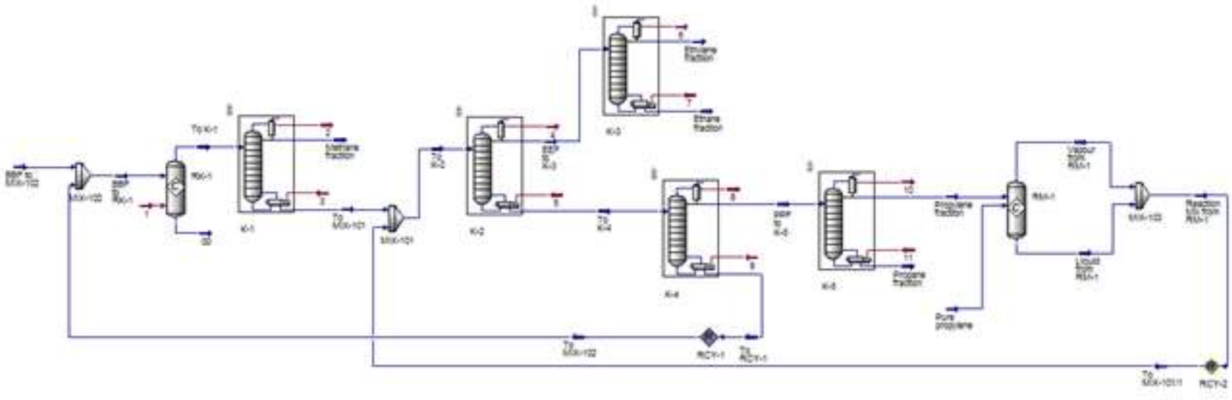
Purpose: Develop new approaches to oil refineries and modernization of petrochemical enterprises in the case of ethylene extraction from C3+ olefins by combining catalytic cracking and metathesis reactors.

Tasks:

1. Analyze the existing technological scheme of installation G-43-103 to find problems with further modernization;
2. Development of a new technological scheme of the process;
3. Develop a computer model of the ethylene production process in Aspen Hysys;

4. Calculate the operating regimes of cracking and metathesis reactors and separation system apparatus.
5. Analyze tender precincts to evaluate the relevance of the combined processes;
6. Calculation of economic efficiency.

Modeling such processes and predicting the results obtained is possible using the Aspen HYSYS program (Fig. 1).



1 picture. *Aspen HYSYS* application catalytic kreking and propylene metathesis process model

The material balance of a catalytic crequenge reactor with a capacity of 200 to achieve maximum selectivity and yield of lower olefins using the traditional composition of catalytic crequenge raw materials and process conditions of 590°C and 0.14 MPa [3]. Thousands of tons/years and its geometric parameters were originally calculated.

To obtain ethylene with a purity of at least 97.7% of catalytic creking products, an separation system consisting of demethanizer, deathenizer, depropanizer, ethylene and propylene pillars has been developed. When using the butane-butylene fraction as a raw material for catalytic creaking, the calculation of the dimensions (diameter, height) of the main equipment was carried out and performance indicators (temperature, pressure) were determined

1-Table
Material balance of the kreking reactor

Component	Him ashyo	Mahsulotlarning hosildorligi
Methane	-	0,0362
Ethylene	-	0,1724
In Eta	-	0,0651
Propilen	0,0100	0,2024
Propane	0,0020	0,0115
i-butane	0,0330	0,0012
n-butane	0,1090	0,2152
Butane-1	0,2460	0,1611
i- butane	0,0750	0,0631
trans-butane -2	0,3140	0,0164
six- butan -2	0,2060	0,1056
n-pentane	0,0050	0,0006

When designing a metathesis reactor with a capacity of 150,000 tons per year, the results of the study of the process in the molybdenum-cobalt catalyst were used [4]. The Co-Mo catalyst requires a relatively low temperature (150-160°C), but high pressure (3.2 MPa), which ensures higher selectivity (94%) and propylene conversion (43%). Its presence, good reproduction, resistance to poisons determine the use in this process.

Based on the material balances obtained by the reactors and the separation system, a combined process scheme of catalytic crequezing and propylene metathesis of the butane-butylene fraction has been developed. The material balance of the technological process is calculated (table 2).

2-Table

Material balance of the joint process of catalytic cracking and propylene metathesis

Names	Consumption, kmol/h	Chiqim, %
Accepted:		
BBF	4040	92,8
Propilen	309	7,2
Accepted:		
Methane fraksiyasi	632	14,5
Ethylene fractomy	1520	35,0
Etan fraksiyasi	963	22,1
Propane fraksiyasi	1234	28,4

At each transition, the conversion of raw material is 90.4%, ethylene yield and selectivity are 35.0 and 38.9%, respectively.

In addition to catalytic crequencing and metathesis processes, a combination of many other petroleum processes and petrochemical processes is possible, e.g. catalytic hydrogelosis, hydrocarious processing of oil and oilfields and other oxygenates, hydrodevaksing, oligomerization, etc. The design and calculation of such processes, as well as the implementation of additional equipment and searches, expands the specifics of the work of project institutions.

Conclusion:

Thereby, it is possible to analyze the technological scheme for the production of catalytic kreking, pyrolysis and metathesis - ethylene extraction processes, combining catalytic kreking and ethylene production processes to develop a technological scheme for the production of ethylene. the metathesis, which leads to an increase in the target fraction and a further increase in profits.

References:

1. Review of the world and Russian trends in petrochemicals until 2020 / Speaker: D. V. Kolobov. - Strategic development of "SIBUR Holding" XAJ.
2. E. O. Altinkovich, O. V. Potapenko, T. P. Sorokina, V. P. Doronin, T. I. Gulyaeva, V. P. Talzi ZSM-5 modifikatsiyalangan zeolitda butan-butilen fraksiyasining krekingi // NEFT KIMYOSI, 2017. No 52. bet. 156-102
3. Feldblum V. Sh. Olefin dimming and dysproporation. M., - "Chemistry", 1978 year.
4. Klimenko A.P. Ethylene production of oil and gas. - M.: GNTINiGTL, 1962. - 412