INCREASING OF EFFICIENCY AND STABILITY OF ALKYLBENZENE SULPHURIC ACID GENERATION UNIT EQUIPMENT

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Linear alkylbenzosulphonates (LABS) are chemical substances with saturated hydrocarbon chain of 10–13 carbon atoms linked with one or several sulpho groups. These materials are one of the common anions used in the production of detergents. The raw material for alkylbenzene sulphuric acid (ASA) production is linear alkylbenzene (LAB), which is produced at "KINEF" plant as a result of following steps occurrence:

1) dehydrogenation of paraffins to olefins;
2) alkylation of benzene with olefines to obtain LAB. The process is performed using HF-catalyst which is regenerated in a column-type apparatus;
3) sulphonation of LAB to ASA.

Optimization of chemical-technological system as a whole is possible only by improving the efficiency of each of all production stages in view of their relationship.

The previously developed mathematical models of dehydrogenation, hydrogenation and alkylation reactor did not take the mutual influence of operating modes of apparatus and composition of raw materials in other stages of production into account. The aim of this study is to develop a mathematical description for the key stages of alkylation and sulphonation as well as the use of resulting computer modeling system to enhance the equipment efficiency and stability.

Fig. 1 shows the effect of effective operating modes maintaining of "alkylation reactor-HF regeneration column" system, that are predicted with use of computer modeling system [1–2].

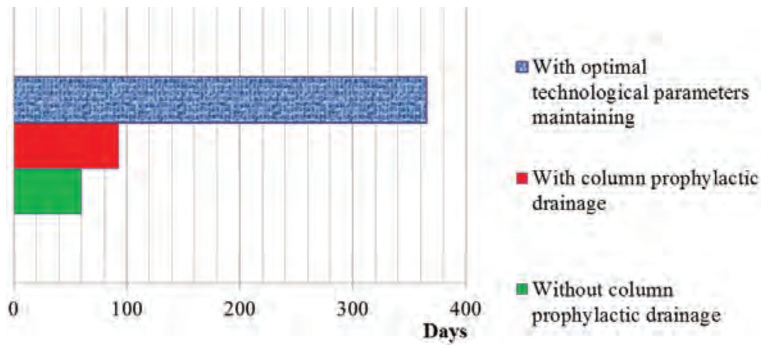

Fig. 1. *The duration of LAB production unit stable operation*

Thus, the effect of predicting the date of HF regenerating column operation violation is prevention emergency situations resulting from an uncontrolled temperature rise in HF regeneration column bottom, as well as reducing material and time costs associated with the necessity of HF regeneration column operation withdrawal.

For sulphonation reactor, optimization with mathematical model is in determination of optimal reactor operation modes, depending on the composition of incoming raw materials. Thus, while SO_3/LAB ratio maintaining within the limits specified for a particular proportion of aromatics in the feed dehydrogenation reactor, the ASA in the product flow will be above the lower limit – 96% by weight.

References

1. *Ivanchina E.D., Ivashkina E.N., Dolganova I.O., Platonov V.V. Vliyanie termodinamicheskoj ustojchivosti vysokomolekulyarnyh aromaticheskih uglevodorodov na aktivnost' HF-katalizatora processa alkilirovaniya benzola olefinami S9-S14 // Neftekhimiya, 2014.– Vol.54.– №6.– P.1–8. [In Russian]*
2. *Dolganova I.O. Diss. ... kand. tekhn. nauk.– Tomsk: TPU, 2014.– P.155. [In Russian]*