№	CP, kW/°C	ΔH, kW
1	156,3	-4108,8
2	11,9	-358,6
3	8,9	-233,4
4	268	-6531,7
5	1,65	-291,1
6	336,7	11346,1
7	1,56	108,9
8	3,3	232,8

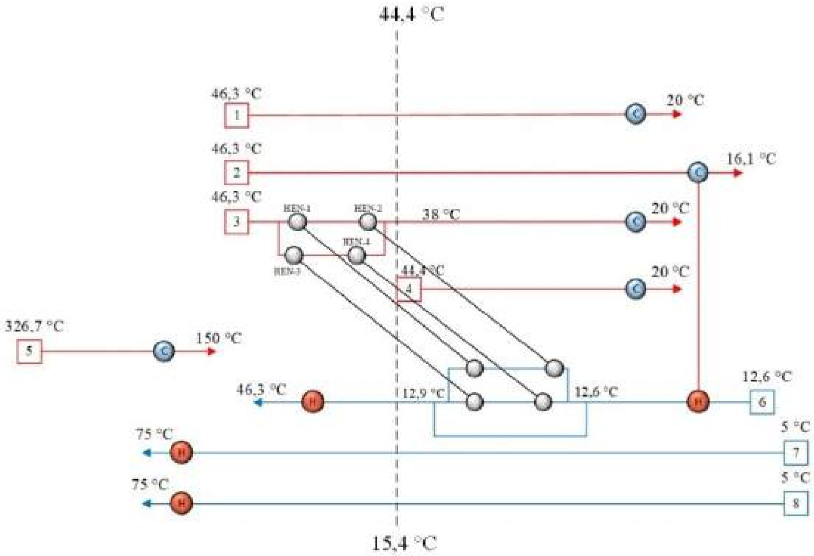

Fig. 2. *Grid diagram for the current heat exchange network*

exchange network, calculations were performed using the expression:

$$Q_{Hres} = \sum_{i=1}^{I} \sum_{k}^{K_i} C_{Pik} [T_{Tik} - T_{Si(k-1)}]$$

where C_{Pik} – heat capacity flow rate for *k*-th interval and *i*-th hot ctream; *I* is the number of hot process streams; K_i is the number of temperature intervals on the *i*-th hot process stream with different values of flow heat capacities, taking into account phase transitions; T_{Tik} is the final temperature of the *k*-th temperature range on the *i*-th hot flow; $T_{Si(k-1)}$ is the initial temperature of the *k*-th interval on the *i*-that hot stream.

The current heat recovery capacity at the plant was 17.1 kW.

When determining the potential for increasing the energy efficiency of the unit, it was calculated that it was possible to increase the recovery capacity to 10 MW, which in turn would reduce the load on hot utilities and the entire unit as a whole, thereby reducing operating costs.

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INCREASING THE EFFICIENCY OF THE ALKYLBENZOSULFONIC ACIDS SYNTHESIS IN REACTORS OF LIQUID-PHASE PROCESSES

I. O. Dolganova

Национальный исследовательский Томский политехнический университет
634050, Россия, Томск, пр. Ленина, 30
dolganovaio@tpu.ru

A special place among industrial processes of chemical technology is occupied by processes occurring in the liquid phase. Reactors for liquid-phase processes have a number of advantages: ease separation of products; possibility of using internal and external heat exchangers; possibility of using mechanical means for successful homogenization of mixtures.

A typical example of a technology that combines catalytic and non-catalytic liquid-phase reaction processes is the production of alkylbenzenesulfonic acids (ABSA) as raw materials for synthetic detergents with good cleaning abilitias and high biodegradability. The global ABSA market is growing annually by 3.5 % and is expected to reach 4300 US million $ by 2025. The ABSA manufacturing includes several stages including catalytic process of HF-alkylation of benzene with olefins and the non-catalytic process of sulfonation of alkylbenzenes (AB) in a thin-film reactor.

To date, the patterns of reaction media deactivation of benzene alkylation and AB sulfonation have not been describes. For this reason, no reliable methods have been proposed to increase the efficiency of liquid-phase processes for production of ABSA in industrial reactors. Therefore, the development of the scientific foundations and technological principles of an effective technology for the ABSA synthesis under conditions of reaction media deactivation in liquid-phase process reactors is an urgent task.

To comprehensively optimize the ABSA production of, mathematical models of reactor and associated equipment were used, built considering the physicochemical, hydrodynamic processes occurring in the devices, and also sensitive to changes in the composition of raw materials and the activity of catalysts and reaction media.

Fig. 1, 2 show active windows of modules for calculating blocks of paraffin dehydrogenation, as well as benzene alkylation, HF regeneration and alkylbenzenes sulfonation.

The use of computer modeling systems made it possible to obtain the following technical results:

1) The ability to determine the maintenance of optimal HF activity by regulating the flow of HF into the regenerator;

2) The ability to determine the date of the required washing of the regeneration column of the HF alkylation catalyst with an accuracy of up to 7 days;

3) Increasing alkylbenzenes production by 3 thousand tons/day by maintaining optimal HF flow into the regenerator;

4) Increasing the share of ABSA in the product flow from 97 to 98 % wt. by maintaining optimal sulfur consumption for combustion at a given content of undesirable components in the feedstock;

5) Increasing the duration of the interwashing cycle of the alkylbenzenes sulfonation reactor by 3–5 days by maintaining optimal acidity of the reaction medium.

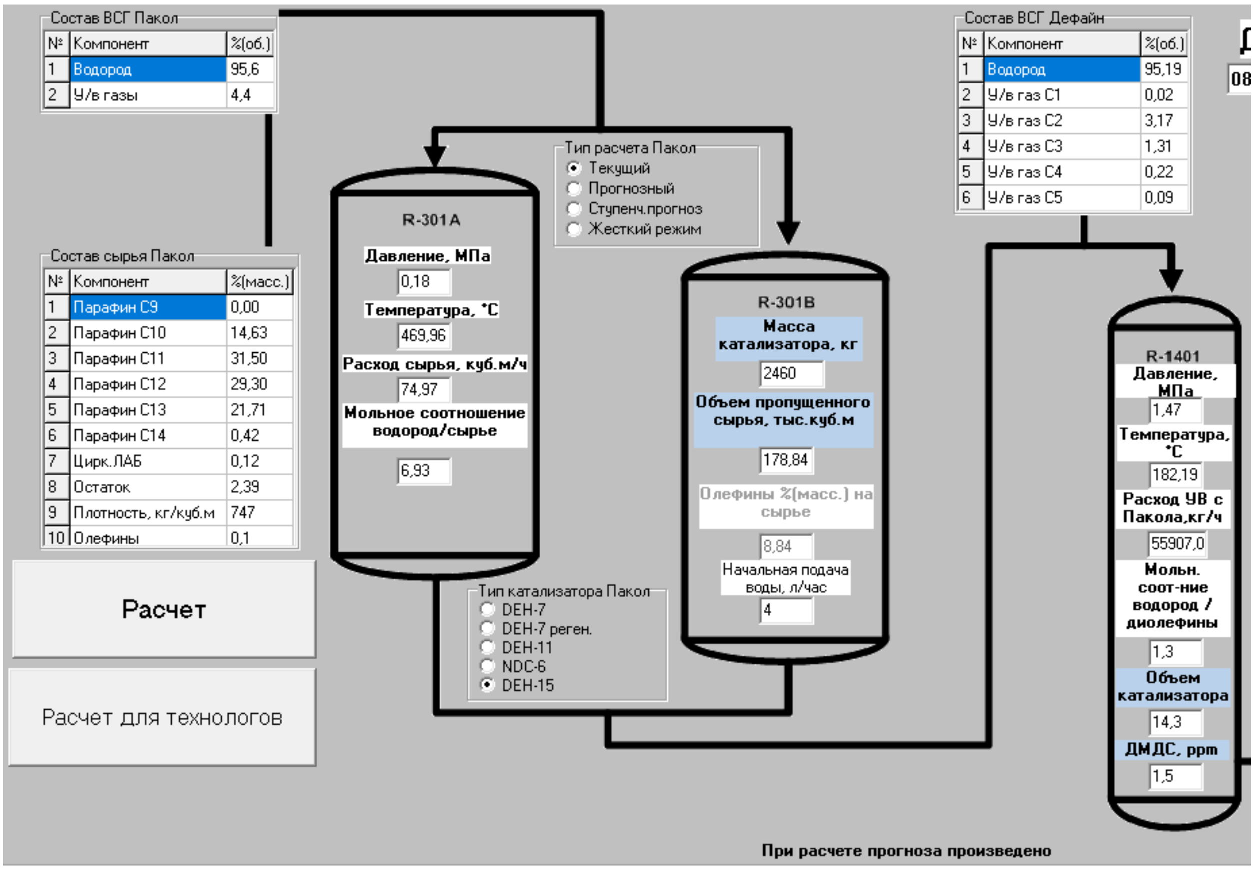

Fig. 1. *Active window of the paraffin dehydrogenation block calculation module*

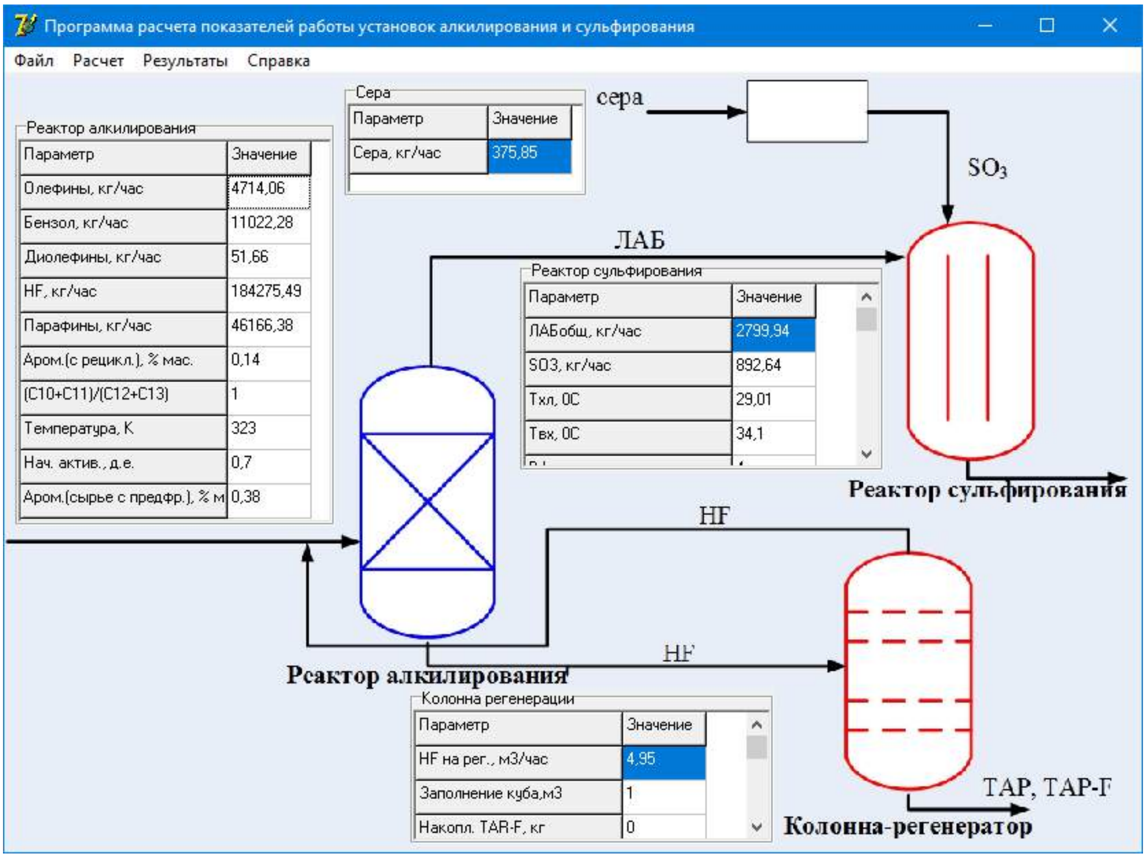

Fig. 2. *Active window of the alkylation and sulfonation blocks calculation module*

The physicochemical regularities of liquid-phase processes established in present work are not limited to the technology of ABSA synthesis. They can be extended to other liquid-phase processes occurring in industrial reactors, for example, liquid-phase alkylation processes in technologies for the synthesis of ethylbenzene, styrene, high-octane components of gasoline, as well as sulfonation processes in technologies for the production of high-tech sulfonate additives for motor oils, surfactants for the oil industry and etc.

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INCREASING THE EFFECTIVENESS OF A DEPRESSANT BY ADDING A WEIGHTING COMPONENT: ANALYSIS BASED ON CHROMATOMASS SPECTROMETRY DATA

A. O. Efanova
Science supervisor – associate professor M. V. Kirgina
Language supervisor – associate professor M. V. Kirgina

Tomsk Polytechnic University
aoe4@tpu.ru

To obtain the necessary low-temperature properties of diesel fuel (DF), the most promising method is the introduction of depressant additives. The addition of weighting components (WC) to the DF makes it possible to increase the additive effectiveness and thus achieve compliance with the necessary requirements [1].

The purpose of this work is to study the results of chromatography-mass spectrometry to substantiate an increase in the depressant additive effectiveness with the addition of a WC to a commercial DF.

Two samples of commercial DF (B_1 and B_2) from automobile gas stations in Tomsk were used as the object of research. Vacuum gas oil obtained from fuel oil (VG_1) and a fraction with a high con-