WAYS OF INCREASING TO EFFICIENCY OF THE REFINERIES

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Rapidly growing demand and high oil prices force oil companies to search potential efficiency improvements of the refineries. Global Shell Solution technical audit has shown possibility of increasing to efficiency of the refineries without essential investment. How can companies define priority challenges, allowing perfecting technical-economic factors of the production?

The criteria (safety factors of quality, heat recovery, engineering standards deviation and others) to allow defining the bottleneck problems in sphere of management and technical usage of the plant are examined in this paper. The analysis of the plant was organized by means of criterion. The improved processing characteristics of the reformer, CDU, xylene plant and blending of gasoline and diesel oil are shown.

The heat recovery reduction results [1,2] to account of the partial reconstruction of the heat exchanger networks of CDU and the reduction quality reserve in the diesel and gasoline blending were presented. The technological process rate analysis is considered here.

Case study 1 (well-founded reduction of the quality norms of the intermediate products).

In existing scheme of the process (Fig. 1) summary xelenes get from catalysate fractions 105-127^{o}C on distillation block, herewith-heavy aromatic hydrocarbons are separated in column K-6. Hereinafter ortho-xelene is separated by the method clear rectification, para-xelene is separated by the cryogenic crystallization while meta-xelene and ethyl benzene enters on isomerization for the reason increase fission yield. At the same times a result side reaction of disproportionation and trans-alkylation is newly formed heavy aromatic hydrocarbons. It is separated in column T-103.

The power-consuming is increased in this unit because of double separation of heavy aromatic hydrocarbons in column K-6 and T-103, and what is more process is conducted under raised reflux ratio since contents target component C8 in column distillate is specified (99.3 and 99.2% masses).

Results of executed modeling have shown that column K-6 can be excluded from scheme without reduction quality to marketable products; herewith heat load will fall on 20 GJ/hour.

The experiment was given for acknowledgement of these conclusions

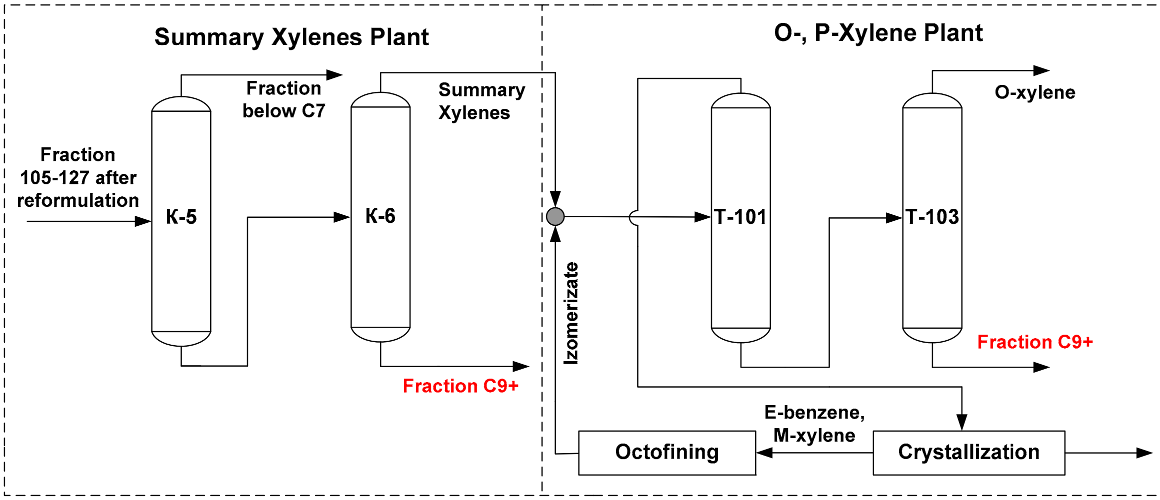

Fig 1. The goods xelenes separation.

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On the first stage warm-up profile column K-6 was changed so (Fig. 2) to enlarge the an aromatic hydrocarbons concentration C9+ in distillate before 2% masses. Since quality to marketable products did not grow worse (Fig. 3), the absence of the column K-6 directly is imitated on second stage by means of mixing its selections in reservoir.

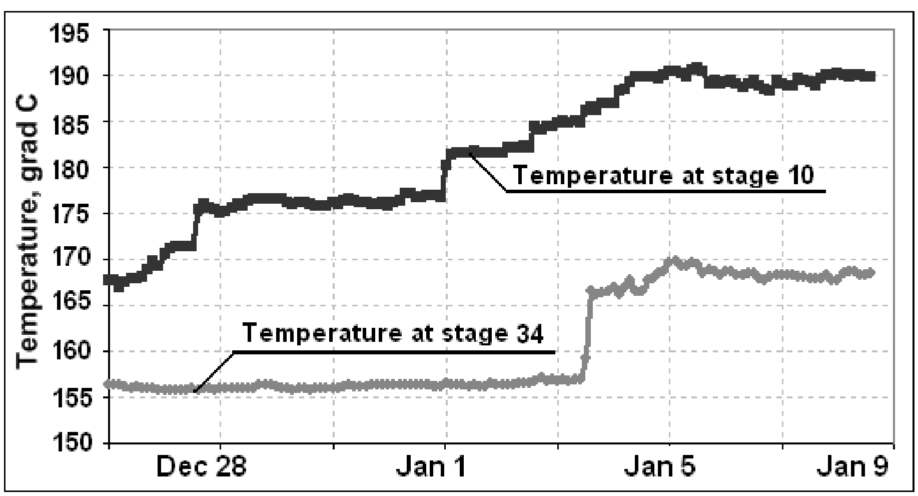

Fig.2 The column K-6 warm-up profile .

The results of the laboratory checking have shown (Fig. 3) that quality to product herewith did not grow worse. Thereby, the experiment has confirmed that column K-6 reasonable to exclude from scheme (the economic effect is approximately $1.000.000/year).

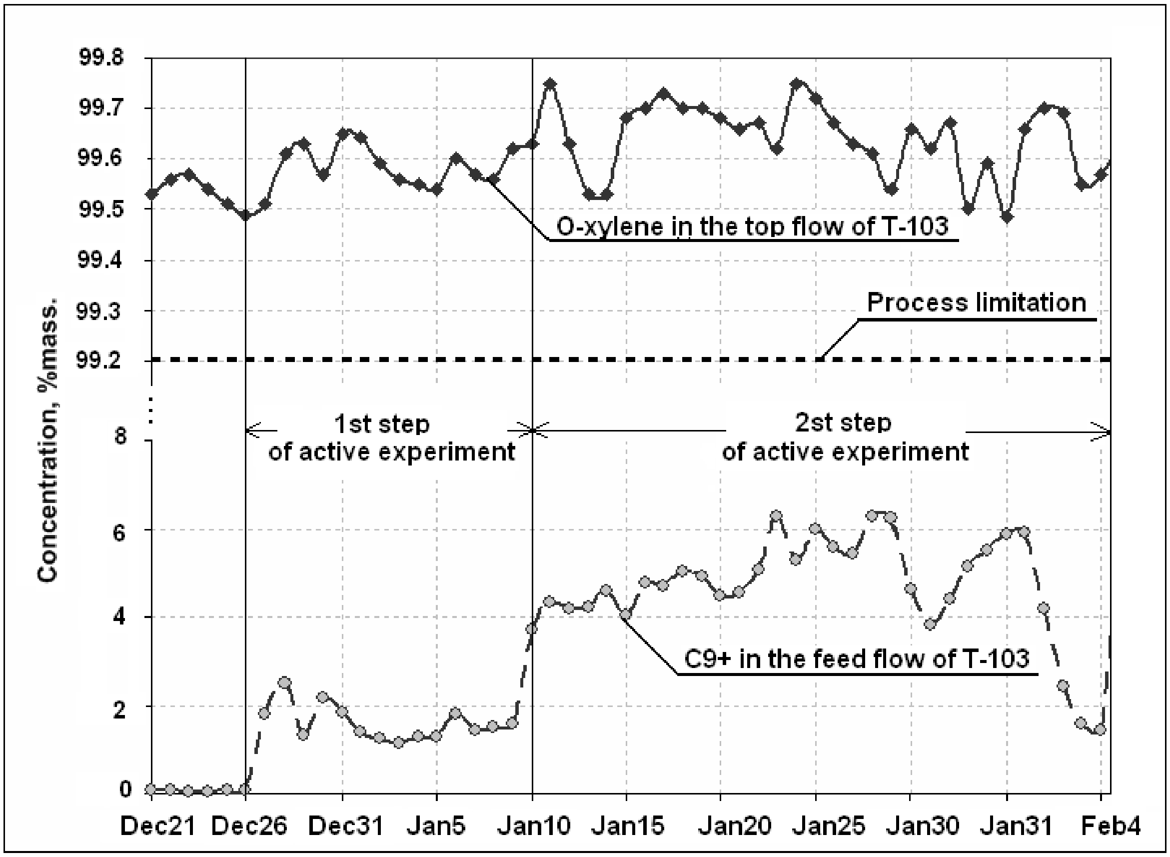

Fig. 3. The experiment results.

Case study 2 (preservation of quality to product at the excess to design loading)

In benzene production scheme (Fig. 4) heat is going from the reactor block in stabilizations in fixed amount. Presenting additional cool feedstock in the reactor block has brought about reduction available heat resource, but loading the stabilization block increased.

This has brought about reduction reflux ratio of the column K-4 and are growing of the contents hydrocarbon C6 in reflux with 5% before 23% masses.

Modeling of the process has shown the regulation quality reflux possible reach to account of the partial redistribution heat resource is between columns K-3 and K-4.

Called on industrial check (Fig. 5) has confirmed relevancy of the recommendation.

The Block to stabilizations translated in new mode, economic effect is $1.000.000/year

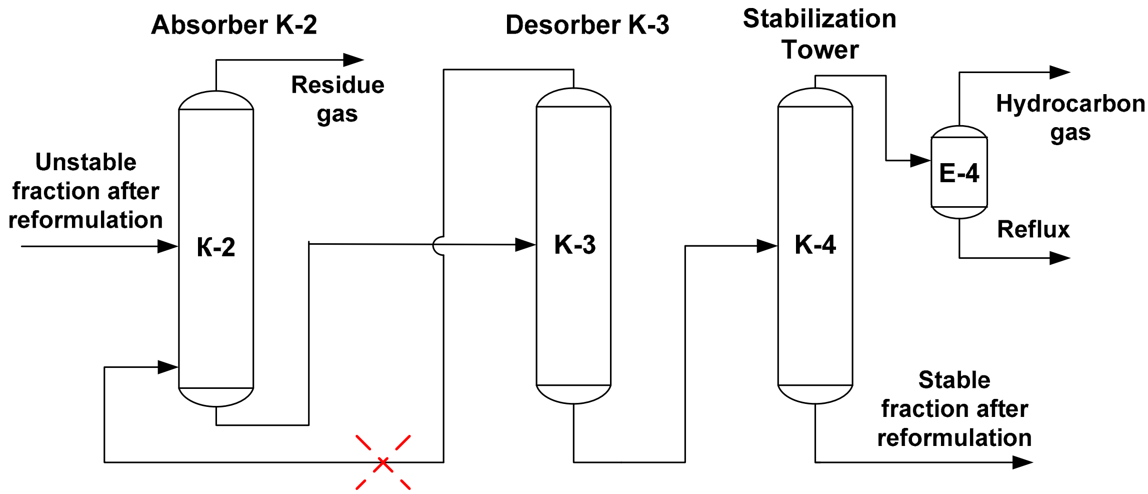

Fig 4. Principle schemes of the block to stabilizations of the benzene reformer

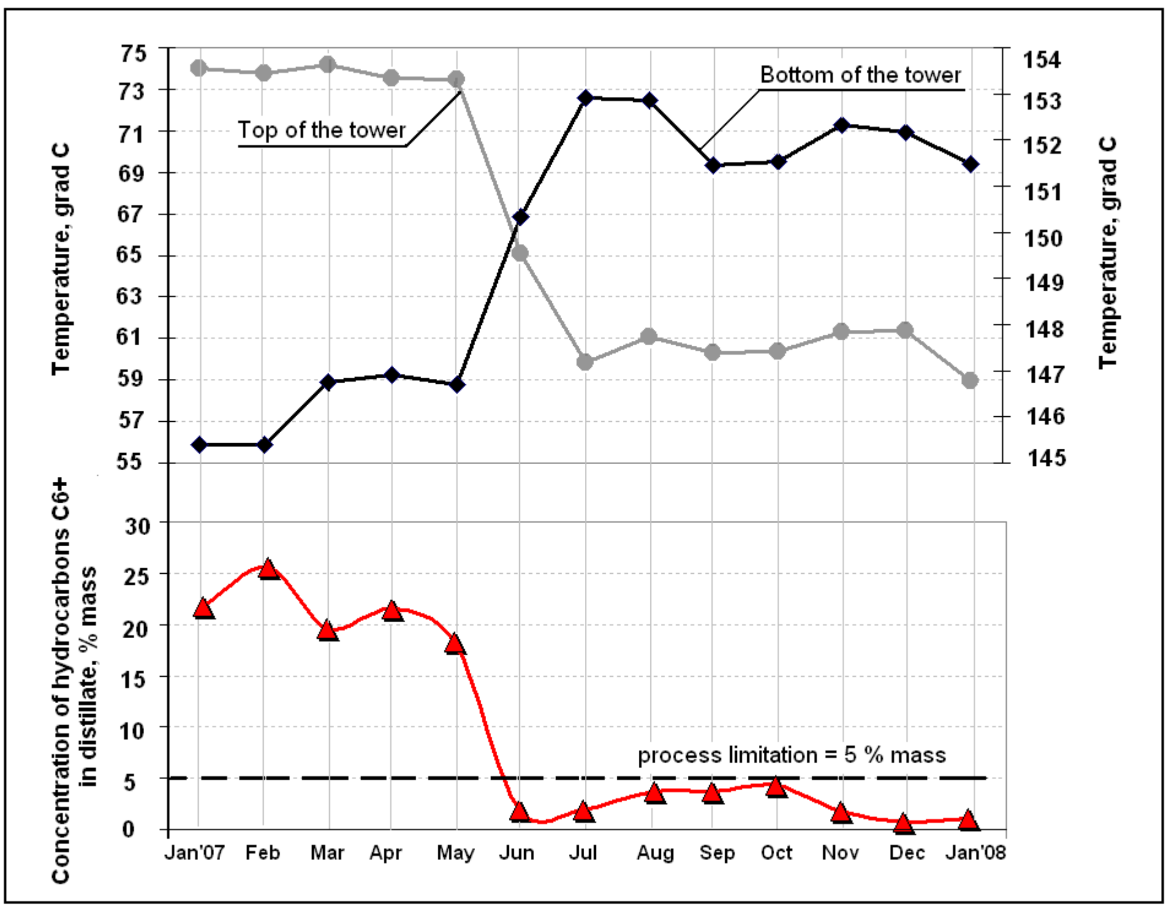

Fig. 5 Changes of the mode of the block to stabilizations of the benzene reformer

Case study 3 (change the mode for production of the product to more high category)

The block secondary rectification of the benzene reformer (Fig. 6) is intended for separation of the benzene and toluene of the high purity.

 The process is complicated from ratio "benzene: toluene" in raw material is changed over a wide range (Fig 7).

The goods benzene satisfies the Russian standard a quality with heavy stocks, but does not correspond to the European rate.

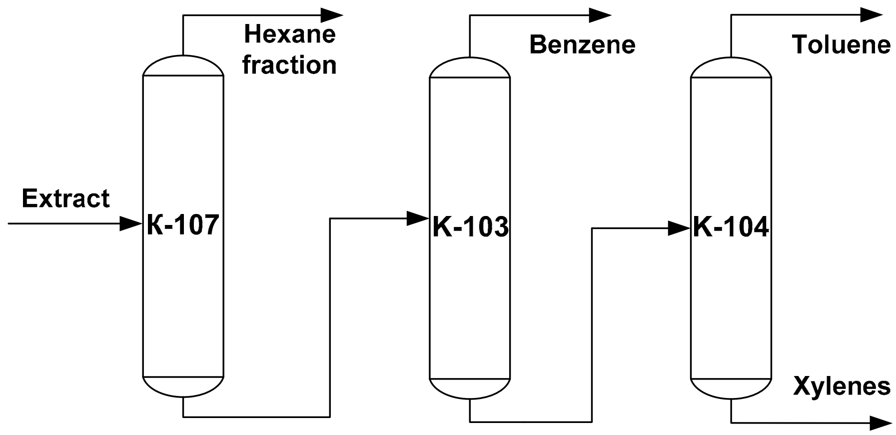

Fig. 6. The block secondary rectification of the benzene reformer

The modeling of the process has shown that possible to provide firm functioning the block in broad range of the change the composition feedstock with reception more clean benzene. The active experiment on industrial installation has confirmed these results (Fig. 7).

Thereby, the correspondence to of the goods benzene specification europen company can be provided when change the technological mode. The potential economic effect is $1.500.000/year.

Case study 4 (the *well*-founded reduction of spare quality in products)

The production of butane and i-butane are realized on gas fractionation plant in the column with clear rectification. In existing mode products has a significant spare on contents of the admixtures (Fig. 8).

The modeling has shown that under relatively soft change the mode possible to reduce the consumption of the heat on 5-10% (depending on composition of the feeding), having saved fair supplies on quality of the marketable products (Fig 8). The profit is $130.000 when change the mode are carried out.

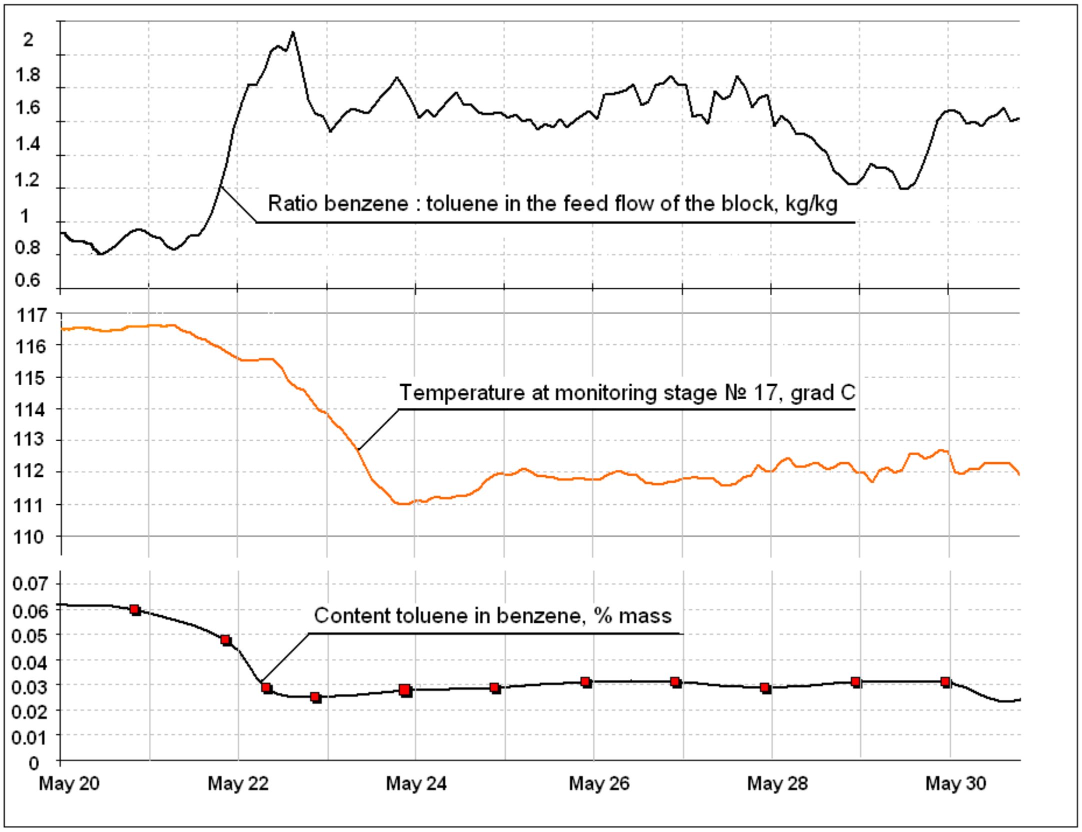

Рис. 7 Results of the experiment on block secondary rectification

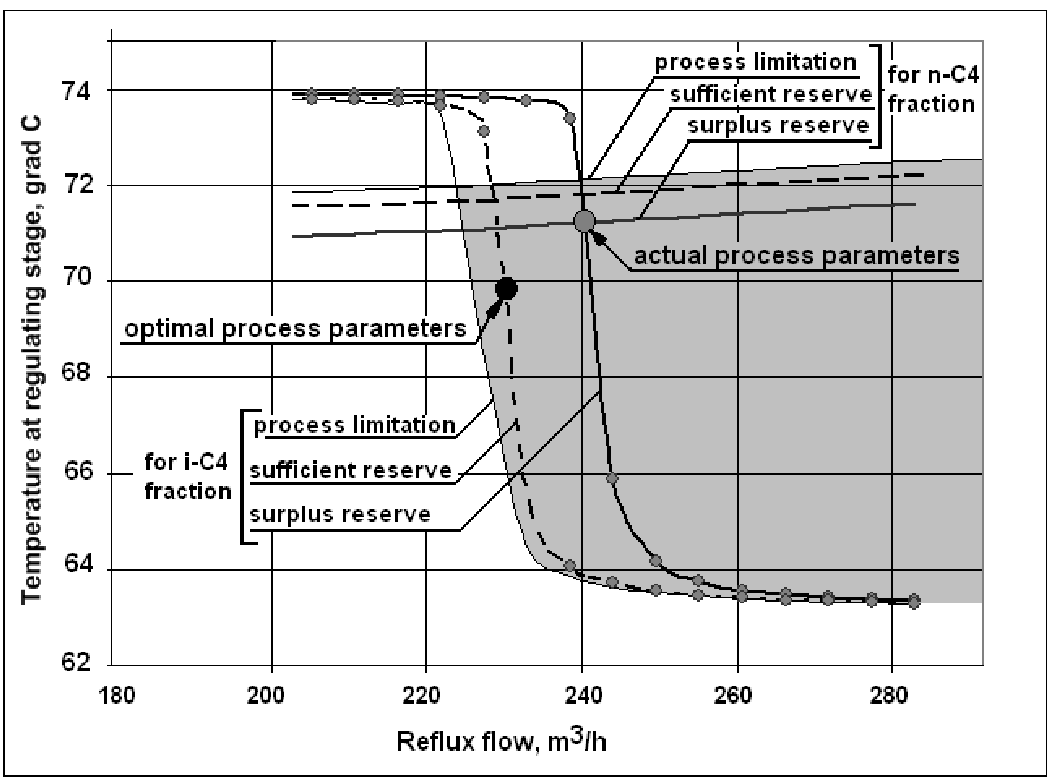

Fig 8 The temperature as function of reflux flow.

Thereby we can find the bottlenecks in production, analysing and revising the technological mode rates.

The significant economic effect is possible to get due to optimization technological mode on units with bottlenecks

REFERENCES

1.Nickolay V. Lisitsyn, Nickolay V. Kuzichkin, Vladimir I. Fedorov. Increasing the Efficiency of Mass and Heat Exchange Networks. 2006 Annual Meeting Abstract ID# 61619 *Submitted to* COMPUTING AND SYSTEMS TECHNOLOGY DIVISION.

2. Nickolay V. Lisitsyn, Nickolay V. Kuzichkin. Optimization of Benzine and Diesel Fuel Blending. 2006 Spring National Meeting *Abstract ID# 41637 Submitted to* TOPICAL A: 9TH TOPICAL CONFERENCE ON REFINERY PROCESSING