

The research center of SIE Neftehim is continuously working on developing new and improving existing technologies and catalysts

COMMITMENT TO HIGH INDUSTRIAL PERFORMANCE

The Krasnodar company SIE Neftehim, LLC is No. 1 in Russia in the field of catalytic processing of light naphtha for production of motor gasoline of ecological class K5/Euro-5 and high-purity chemical synthesis raw materials. It is the largest developer and manufacturer of isomerization and reforming catalysts in this country. In addition, Scientific Industrial Enterprise Neftehim is the creator of the well known and up-to-date isomerization technology of pentane-hexane fractions Isomalk-2 over SI-2 oxide catalyst, well-proven in Russia, China, India, European countries, CIS and the Middle East. And this is not the only invention of the company. The company constantly improves the already implemented technologies and undertakes new research, as well as enters the domestic and international markets with them. Alexander Nikitovich Shakun, President and CEO of SIE Neftehim, LLC tells much about this and many other things to our magazine.

The Isomalk-2 technology is used to produce motor gasoline in Russia, CIS, EU, India, China, Middle East (LianHe, Shandong Province, China, 2020)

– Mr. Shakun, the developed by your company isomerization technology is considered to be the best in Russia; it is also not inferior to the best world developments. What is its specific advantage? Could you, please, tell us more about this technology?

– First of all, I want to clarify the following. Back in the 90's new standards for gasoline have begun to be introduced in the developed foreign countries.

The main requirement of the standards, in particular Euro-5, is the strict restriction of aromatic hydrocarbons and the most toxic of them – benzene. The main technical solution to this problem is the inclusion of

In a very short period of time, our company managed to create the Isomalk-2 technology, which proved to be more effective than the best foreign technologies above mentioned. Of course, it was not easy to convince the plants in the advantage of the Russian development. But the first unit at the largest enterprise of Ufaneftkhim (Bashneft-Ufaneftkhim) in 2003 proved not only high efficiency of the technology, but also reliability and resistance to catalytic poisons. The technology was patented in Russia and several foreign countries. In three years after the first industrial performance, the technology received wide application

commissioning and operation of units. The experience of our company in providing these services has been accumulated for decades, because before the development of the isomerization technology SIE Neftehim, LLC was involved in the process of reforming of naphtha.

All plants that use Neftehim catalysts were built or upgraded with the participation of our specialists. We always supervise each unit and each project. Whenever the engineers operating a catalyst and a unit have any questions, we are always ready to answer them and provide qualified assistance.

Each batch of catalysts produced by SIE Neftehim, LLC is subject to triple quality control



light naphtha in the process of straight-run gasoline processing technology, which allows increasing the octane number of motor gasoline without aromatics.

Similar standards had already been applied in Europe, the USA and Japan before the Russian gasoline class-5 standard was introduced.

Therefore, technologies of light naphtha isomerization by UOP (USA), Axens (France) and Süd-Chemie (Germany) have been widely used at all the oil refineries of these countries. Several isomerization units were also built in Russia under the license of these companies. The demand for isomerization units remained very high; it became obvious that Russian technology was required to avoid complete dependence on imports.

not only in Russia, but also abroad. The first foreign implementation was carried out in Romania in 2006.

– How many refineries in this country and in the world work with your catalysts? Do you provide them with catalysts only or a full service cycle for their industrial units?

– In most cases, supplying catalysts only does not solve all the challenges of an oil refinery. Catalyst is the heart of the process. But a refinery needs a technology – an engineering solution upon which the unit is designed and constructed. SIE Neftehim, LLC, as the author of the technology and the catalyst, develops basic engineering, carries out the author's supervision of the detailed design and provides technical assistance during

It is possible to state the following about the scale of industrial application of our technology and catalysts: more than 60% of motor gasoline at oil refineries in Russia today is produced using isomerate manufactured at Isomalk-2 units. The other part is the share of the foreign world licensors. The share of Russian technology will continue to grow further; there are plans to build several new units according to our technology.

A technological line has been erected at our plant in Nizhny Novgorod to produce our own isomerization and reforming catalysts. The application of catalysts and technologies developed by SIE Neftehim in foreign countries is presently expanding. Units with our license control are operating in Europe, China, India, Middle East countries, and we plan new implementations in other countries.

– **SIE Neftehim, LLC takes part in Russian national projects on commercial introduction of new technologies – reforming naphtha with continuous regeneration of catalyst and C₇-fraction isomerization process Isomalk-4. What has been achieved in this direction?**

– The issue of creating and implementing the Russian technology of reforming naphtha with continuous catalyst regeneration is currently being handled jointly by three companies – Lengiproneftechim LLC, SIE Neftehim, LLC and KNGK-Group at the Il'sky Oil Refinery. This problem is extensive and demanding. Until now such continuous catalyst regeneration (CCR) units have been built all over the world according to UOP (USA) and Axens (France) technologies only. Currently, detailed design of the first industrial unit is being carried out according to the new Russian technology. But SIE Neftehim, which is primarily responsible for the catalyst, has already switched to its industrial manufacturing: it supplied the first commercial batch of continuous reforming catalyst RC series to the foreign CCR unit and received a high appraisal of its performance. As for today, it is planned to supply RC catalysts to the plants in Russia, which operate on foreign catalysts.

Speaking about C₇-fraction isomerization process Isomalk-4 – it represents a ready-made solution. Its industrial application will be implemented in the process of further toughening of the requirements to motor gasoline for reduction of the content of aromatic hydrocarbons. The project of the first industrial plant Isomalk-4 in Russia or abroad is currently under consideration. The

purpose of the process is to produce from straight run gasoline fraction boiling within 70–105 °C, not an aromatic fuel component (produced at reforming units), but isomere with zero aromatic content. I am sure that this process will be widely applied in the future. Scientists all over the world conduct researches to develop the necessary catalyst. And SIE Neftehim has managed not only to develop, but also to test its production on an industrial scale. The SI-4 catalyst is the only industrial catalyst for isomerization of C₇ fraction at the moment.

– **You actively develop and master the production of reforming catalysts. What are the prospects of the mentioned direction and gasoline production technology on their basis?**

– Despite the limitation of aromatic hydrocarbons in motor gasoline, it is still impossible to produce modern brands of motor fuels on an industrial scale without using the process of reforming. Besides, aromatic hydrocarbons are necessary in various chains of petrochemical synthesis. Therefore, the development of effective catalysts for reforming and technologies based on them remains an urgent task for the industry.

I have already mentioned the development of Russian technology of reforming with continuous regeneration. As for catalysts, the situation is as follows. The share of foreign catalysts at Russian CCR units is 100%, and at plants with a fixed catalyst bed the share of foreign catalysts is ≈ 50%. I believe that our successful implementation of reforming catalyst at the foreign CCR facilities will

boost the switch of a number of Russian units to our RC-12 and RC-120 catalysts.

As for numerous reforming units with a fixed catalyst bed (fixed-bed reformers), there are no obstacles to their transfer to Russian catalysts. SIE Neftehim comes with modern catalysts and production line and guarantees their efficiency. The only thing required is the determined approach of Russian oil refineries, similar to the one that was applied when introducing the Isomalk-2 technology and SI-2 catalyst.

– **Over the last few years, Russia has been actively implementing innovative projects, including on import substitution. Are you involved in these programs? Do you think there is an opportunity for Russian companies to replace imported products on the market in full?**

– I would like to start with the final phrase of your question. One should not set a task of displacing imported products completely. Their presence ensures competition and high level of Russian developments. However, in Russia we have another extreme – worship of foreign technologies at the expense of equal Russian ones. We understand it well and try to act efficiently. First of all, we attach great importance to improving our scientific and technical base, recruiting and training personnel, forming the entire chain from research to industrial production of catalysts, design and implementation of technologies. But the most important argument in competition is validation of high performance in the industry. If we see the traditional bias of Russian companies, we go to other countries. For the first time two

The Isomalk-2 Isomerization Unit (TANECO JSC, Republic of Tatarstan, Russia, 2018)



new developments were highly appreciated not in Russia but abroad. The technology of isomerization of n-butane Isomalk-3, first introduced in China in 2016, is successfully implemented in China and goes to other countries thanks to the proven high performance.

I have already mentioned the second development – a reforming catalyst for units with continuous regeneration. We expect to expand the use of this catalyst not only abroad, but also in Russia.

– **Tell us about the scientific aspect of your company. SIE Neftehim, LLC conducts continuous research and testing. What research work is being done today? Is it aimed at the development of new products or do you improve the quality of the existing ones? Do you have enough scientific personnel?**

– The company tries to keep the balance: it constantly improves the already implemented developments, conducts new research, and goes out to the market with them. We take into account the current trends in the industry development.

I would like to highlight the petrochemical direction in the respect of new developments. We develop catalysts and technologies for petrochemical synthesis. As an example, I would like to mention “reverse” isomerization (or normalization) for production of straight-chain paraffin hydrocarbons C₄ and C₅, which are raw materials of organic synthesis. We are close to implementing these processes. Again,

probably, the first industrial implementation will take place abroad.

It has always been difficult with the personnel. There are practically no ready specialists able to join our team. That's why we prepare specialists ourselves from university graduates and invitees, ultimately choosing the best ones.

– **Your company is a supplier of catalysts and technologies with more than 60 years of expertise. You have achieved great success. Your company is among the leaders of exporting companies. How did you manage to attract foreign customers with your products? As far as we know you have many competitors on the market.**

– Despite the fact that we are grateful to our predecessors, who were at the foundation of the organization more than 60 years ago, we actually had to reestablish the company in the most difficult 90's. During these years, the largest research organizations ceased to exist, unable to withstand competition with experienced foreign companies. While SIE Neftehim created new products, entered both the Russian and then foreign markets, introduced the own technologies and took on a huge responsibility, knowing well that without it the company would share the fate of numerous Russian research institutes.

Approaching the foreign market helped us to make a breakthrough and open new horizons. Thanks to competition and cooperation with foreign specialists, we have improved the quality of our developments

and the professionalism of our employees, developed new demanded products and improved service. We plan to develop our international relations further. The foreign market is very pragmatic: one just needs to be more efficient, to be not afraid to take responsibility and not to stop at what has been achieved.

– **Tell us about the estimation of your activities by the state. You have a lot of awards: what developments have been recognized with particular appreciation?**

– Indeed, over the recent years, we have often been distinguished in various competitions as the company that has achieved serious success in import substitution and as the company focused on exporting its scientific and technical products. The diplomas of the Laureates of the Prize of RF Government in the Field of Science and Technology, which were awarded to me and Marina Leonidovna Fedorova, my permanent co-author of all the developments, in 2011 by the Prime Minister Dmitry Anatolievich Medvedev, remain for us the most honorable award. It sounded as follows: “For creation and widespread introduction of the Russian competitive isomerization technology and the Isomalk industrial complexes for large-scale motor gasoline production meeting the European standards.”

Yet the main award for us is gratitude of Russian and foreign customers for the confirmation of the guaranteed performance of all our developments.

The Isomalk-3 technology is applied at the largest butane processing plant (Sinopec Jinling, Jiangsu Province, China, 2019)

