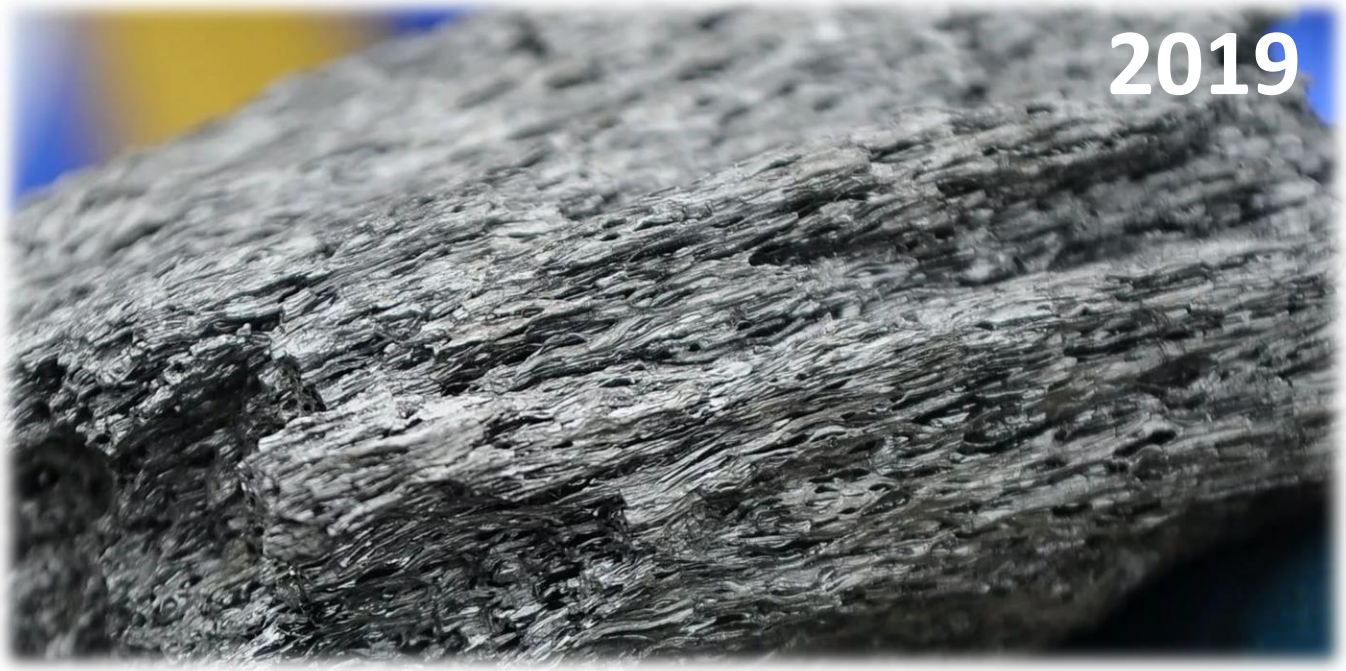
453256, Republik of Bashkortostan, Salavat city, yakutova str., building № 9, Nurimanova str. № 6, Phone number: +7-917-422-17-58
E-mail: 78kdt@mail.ru

НХК
НефтеХимКонсалт

Ishimbay's needle coke plant (Republic Bashkortostan)

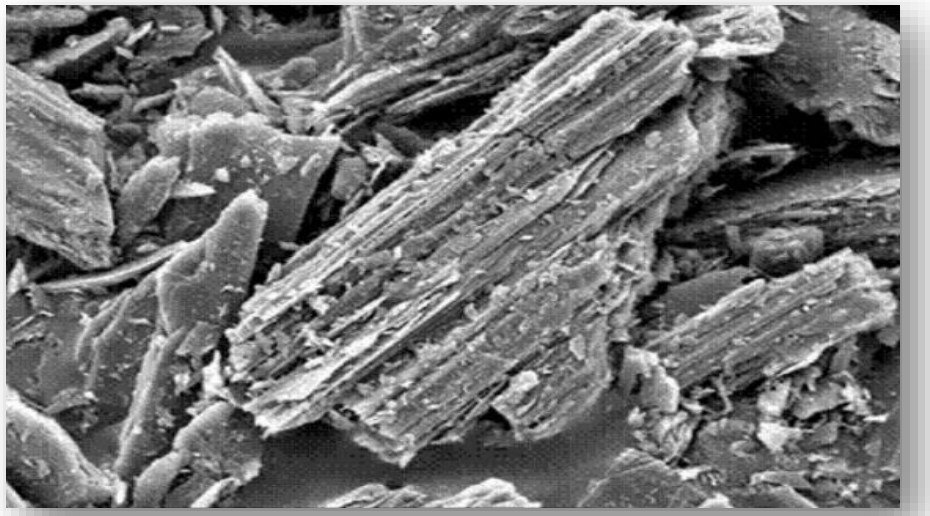
(up to 16 thousand tons of coke per year)



The project is presented by a group of design, scientific and technical, petrochemical, service, installation and IT companies, as well as educational institutions of the Republic of Bashkortostan :

LLC «Neftechimkonsalt», LLC «Hammel», LLC «Mezhregiontreid», LLC «PT-Group», LLC «Orgneftechimproject»,
PC «Salavatneftemash»;
LLC «Konkrit», FSBEI «USOTU» Salavat city,
LLC «Severstroy».

Needle coke is an expensive highly structured carbon product used for the manufacture of graphite electrodes of the highest grade. It is characterized by high density, electrical conductivity, pronounced texture and low temperature coefficient of expansion.



There is currently no production of needle coke in Russia. The only production is planned in Omsk with an output of 35 thousand tons per year by 2022. Market value of needle coke is an average of 600 Euros per 1 ton!

According to the forecast, by 2025 the demand on the Russian market of needle coke will be 150 thousand tons with an annual growth rate of + 15-20%

Comparative properties of needle coke

	Coke electrode	Coke needle
Actual density, g/см3	2,02-2,12	2,14-2,15
Mass fraction of sulfur, %	1,5-2,0	0,38-0,46
Ash content, %	0,6	0,01-0,06
Mass fraction of total moisture, %	0,5	0,02-0,1
Thermal expansion coefficient, 10-7/°C		1,0-1,6

Compared with standard electrode, needle coke has a higher temperature resistance and significantly reduces the consumption of electrodes per ton of steel. There is currently no equivalent replacement for needle coke.

Proposed technology

- **The main advantage of our technology is the production of needle coke from petroleum raw materials.**
- **As raw materials are used highly aromatized products of oil refining (for Example - a product of LLC « Gazprom Neftekhim Salavat»).**
- **The resulting coke will replace imported products.**
- **This technology has no analogues in Russia at the moment.**
- **Analog of this technology is engaged in Omsk refinery, but the planned capacity is insufficient to cover the needs of the Russian Federation.**

Russian consumers of needle coke

ENERGOPROM group

ЭПМ

EPM group of companies is the main consumer of needle coke in Russia. Consumption growth from 2019 to 2025 is planned from 50 to 150 thousand tons per year.

*The total global demand for needle coke is more than 1 million tons per year. World production is 800 thousand tons per year, concentrated in the United States, Japan and England. The leader of Conoco Phillips (USA). The highest growth in consumption is projected in Asia (+100% by 2025). The demand for this product is inelastic, and the market is oligopolistic.

Global needle coke manufacturers

There are only a few producers of needle petroleum coke in the world :

- ConocoPhillips Limited, USA;
- Seadrift Coke L. P., USA;
- Petrocoke Inc., USA;
- Nippon Oil (KOA), Japan.

Russian needle coke manufacturers

The main feature of obtaining this product is raw materials. In Russian Federation at the moment one project on construction of Coking unit for the purpose of production of needle coke in Omsk is realized. It is stated that in 2022 the start of production will take place, it is planned to obtain 35-40 thousand tons of product per year. The maximum possible productivity in Omsk (due to the capacity of production facilities for the production of raw materials) is 70-75 thousand tons per year. It should be noted that according to the forecasts of ENERGOPROM group by 2025, due to the development of the aluminum and steel industry, consumption will be 150 thousand tons per year. This data show that in the near future, despite plans to build production in Omsk, imports will not only remain, but also increase.

Technical features of the project

The implementation of import substitution is proposed: production of oil needle coke. The use of heavy pyrolysis resin and heavy FCC gas oil produced by Gazprom Neftekhim Salavat LLC was considered as raw materials.

Technological stages of production :

- **Raw material preparation** — Heat treatment of raw materials, increasing aromaticity, obtaining secondary raw materials by rectification.
- **Delayed coking** — Heat treatment is carried out in 3 coke chambers at a temperature of 500 °C and pressure 3.5-4.5 MPa. Multiplicity of circulation of raw materials (1,5-1,7). A process for the periodic.
- **Calcination** — Heat treatment is carried out at a temperature above 1400 °C.
- **Forming and processing** — Receipt of commodity product

The project team has experience in obtaining needle coke according to the full scheme. Work has been carried out since 2009. Prototypes were obtained, there is a Park of experimental units.

Material balance

The presence of a raw material basket for coking in the company "Gazprom Neftekhim Salavat" allows to plan the Capacity of coke unit - 16 thousand tons per year.

	%	thousand tons / year	tons / hour
Taken			
Heavy pyrolysis resin	12,5	10,0	1,3
FCC heavy gas oi	87,5	70,0	8,8
Total	100,0	80,0	10,0
Received			
Gases dry	14,1	11,3	1,4
Gases fatty	10,9	8,8	1,1
Gasoline thermal	19,2	15,4	1,9
Coking gas oil	34,5	27,6	3,5
Coke needle	20,2	16,1	2,0
Loss	1,1	0,9	0,1

Requirements

The project requires: railway dead end, an area of 6-7 Hectares, connection of power supply up to 4-6 MW, natural gas sources 2 million m3 / year, technical staff (120-160 people).

Economic indicators of the project

Project cost estimate in 2018 prices: 3.15 billion rubles.
Productivity of needle coke: 16 thousand tons per year.
Construction period: 2.5 years.
Demand for investments in 2018 prices: 3.15 billion rubles.
Number of jobs (staff cap.): 170.
Sanitary zone: 0.6-1.0 km.
Output of the finished main product : 20.2%.
River water consumption : 13 м^3/h.
Waste water consumption : 15 м^3/h.
Electricity consumption : 5 MW.
Natural gas consumption : 100 м^3/h.

Article	million rubles per year
Operating costs	110,8
Overhead and other expenses	63,6
Repair of equipment	51,2
The costs of raw materials	1120,2
*Sale of products	1956,8

* - at the cost of needle coke 600 € / t.

Project status for the current period

The project is supported by the Government of the Republic of Bashkortostan, a site for the implementation of the project in the special economic zone of the Ishimbay district of the Republic has been determined. There is a decision to include it in the list of priority projects of the Republic of Bashkortostan, which provides for the return of up to 30 % of the invested funds in the form of benefits, subsidies and refunds. The project was defended by the investment Committee under the Head of the Republic. Design estimates will be completed in the course of the investment project.

Performance analysis

The carried out technical and economic calculation shows expediency of construction of production of needle coke to 16 thousand tons a year.

The annual economic effect of production is: 611 million rubles.

Project payback period: Of 5.15 years

Prospect of development

The planned production of needle coke can be increased to 20-30 thousand tons per year through the construction of the second and third production lines and the use of additional sources of raw materials (Gazprom Neftekhim Salavat LLC has a number of secondary products with a reduced sulfur content), with increasing demand in Asia (in 2025, the deficit is up to 200 thousand tons per year).

Thanks for your attention!

НХК
НефтеХимКонсалт

453256, Republik of Bashkortostan, Salavat city, yakutova str., building № 9, Nurimanova str. № 6,
Phone number: +7-917-422-17-58 E-mail: 78kdt@mail.ru