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EFFECT OF INTERACTION OF LARGE AND SMALL INDUSTRIAL ENTREPRENEURSHIP IN OIL REFINING

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Abstract

The article describes the development options for the interaction of large, medium and small industrial enterprises in oil refining and petrochemicals using the example of increasing the efficiency of the oil refining complex. Using the author's method, the boundaries of the interests of large and small industrial enterprises in oil refining and petrochemicals are determined and the economic effect of their interaction is predicted. The solution of research problems was carried out using a computer algebra system and computer-aided design Mathcad. For clarity, the article describes two entrepreneurial projects. The first investment project involves the creation of a workshop for filling automobile oils (flushing, transmission and motor) in the form of a small enterprise on the basis of a large oil refinery. The second project is to create production of sulfur concrete in the form of a small industrial enterprise on the basis of a large oil refinery. The first project does not provide for the interaction of various forms of industrial enterprise. The second project is based on the interaction of various forms of industrial enterprise and provides for the determination of the boundaries of their interests. Thanks to the introduction of special copyright methods, the interests and activities of large and small industrial enterprises are distinguished, as well as forecasts for the subsequent results of joint work. The developed interaction scheme will significantly expand the staff, provide numerous new jobs, increase competitiveness among other companies, as well as provoke the subsequent development of the profile engineering industry.

Keywords: Interaction, enterprise, oil refining, petrochemicals, entrepreneurship.

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1. Introduction

The significance and specific weight of refining in oil production volumes is gradually growing, which is confirmed by the wide involvement of many companies in this process. According to these statistics, the Russian oil refining industry is interested in increasing the efficiency and volume of oil refining. At the same time, the modernization and growth of equipment capacity should be a priority. This is especially true of secondary processes for the processing of oil and petroleum products, bringing them to full compliance with the primary processing processes.

The production of oil products is a more profitable business compared to others in the Russian Federation, so the study of this issue is relevant and in demand in the theoretical arena. Therefore, many people carefully study this important area (Sozinova, 2019).

It should be noted that there are some constraints to capacity growth in the recycling sector. The most compelling reason is the restrictions on the market for goods in the form of low demand. Accordingly, to obtain the target result, it is necessary to expand the market. This will become possible due to the diversification of production enterprises, as well as the additional equipment of medium- and small-tonnage production in the form of industrial entrepreneurship based on plants for primary oil refining (Eliseeva & Ryabov, 2013). According to this, the effectiveness of methods and criteria for the symbiosis of large and small industrial enterprises in the industry under study should increase. The boundaries of the interests of small and large production in the oil refining industry and petrochemicals should be built strictly individually in accordance with proprietary methods, it is also necessary to carefully predict the effectiveness (Polyakova, Nesterenko, & Sverdlikova, 2019).

2. Problem Statement

To study these issues, it is proposed to consider as much as possible the project, which is aimed primarily at improving the efficiency of the oil refining industry. The goal of the project is to generate additional income due to the increase in sales of automotive oils on the market at a retail price in the regions of Siberia and the Far East.

Given the forecasting of large volumes of income, as well as high production capacity, this project refers to large industrial enterprise. So, Large petrochemical enterprise (KrNHP) should refuse to cooperate with small industrial enterprises and transfer entrepreneurial risks in accordance with the criteria for maximum and constant profit.

An alternative option for filling your own raw materials is to transfer the oils to a third party. It can be a packer from the side or a small business. This approach should significantly reduce investment. However, such an alternative is not a reliable way to achieve this goal and profit in the required amount. This is due to the fact that the share of the income received should go to pay for the work of a third-party packer. Otherwise, this person will turn away from such transactions and will be engaged in packing independently without the help of large companies and the subsequent distribution of goods.

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3. Research Questions

The main objectives of the project include the creation and launch of production facilities for the packaging of automobile oils in containers from 1 to 5 liters, as well as providing the necessary conditions for the sale and production of these goods.

At the present stage, the expansion of large oil refineries in the production and packaging of automobile oils (flushing, transmission and motor) is carried out. This leads to the crowding out of small packaging companies. According to this, the market can move to the number of large enterprises of the Russian Federation due to the work of its own oil blocks, a decrease in sales volumes and small packaging (Botkin, & Topoleva, 2018).

Modern oil refineries are independently engaged in the packaging of oils in up to 70 % of cases. During 2016, according to statistics, 150,000 tons were produced and packaged in the Russian Federation. It should be noted that legal and illegal production volumes have significant differences. Today, the legal production begins to dominate the market.

The majority of base oil producers in the Russian Federation are located closer to Europe. In the east, competition for KrNHP is reduced to zero. At the same time, the need for automobile oils in the east is only 50,000 tons. Extensive transport leverage allows KrNHP to maintain competition and eliminate competing companies in the eastern part of Western and Eastern Siberia, the Far East. Some market segments of the studied company will be closed for study due to the popularity of Japanese cars.

All motorists have heard about the popular oils named Oil of KrNHP. Recently, these oils have been actively replaced by O-max oils in the eastern regions. According to statistics, this happens at the level of 25–30 thousand tons of packaged oils every year.

An alternative option for the development and growth of capacities at KrNHP is to improve the performance of the parent company in the western regions. At the same time, the same investments in finance and other resources in the eastern part of the country are more profitable. This gives significant advantages in the specified territorial market. The western market is more loaded with other companies, which means it is becoming less attractive.

4. Purpose of the Study

The volume of investments in this project fluctuates around 7,000 thousand US dollars. The indicated amount is allocated to legal relations with the land, obtaining special documentation, construction of workshops for packaging, registration of rights to carry out any work, purchase of packaging equipment, installation of additional installations, creation of a communications system. The indicated costs and distribution of payments are compiled on the basis of design estimates that are previously developed by Neftekhimdesign (Korotkih, 2016).

Investments in working capital, namely the acquisition of raw materials for the production of pre-packaged oils, cans and necessary labels, are based on the technical characteristics of the purchased production equipment. Raw materials and materials costs are taken from the actual data of existing production facilities (Kushnir, & Gubanova, 2019).

Costs that appear at the time of the production process include:

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- the cost of production processes for producing oils, which are then packaged. The cost of each element is calculated using the actual cost of producing high-alloy oils;
- costs of production processes, the creation of labels and packaging of the necessary containers, as well as packaging in cardboard, installation on Euro pallets and a special casing. Table 1 shows the calculations of the cost of containers in the amount of 5 and 1 liters;
- payment of electricity consumption based on the actual costs of providing KrNHP with electricity;
- expenses for administrative and managerial and production personnel according to the calculated data of KrNHP;
- taxes and other obligatory payments according to the legislation.

Table 01. Cost price in the volume of tanks 1 and 5 liters

	Unit	**Consumption**		**Unit price, including VAT, RUB**		**Expenses with VAT, RUB / piece**	
		1l	5l	1l	5l	1l	5l
Polyethylene (canister)	kg	0.0686	0.2352	22.0	22.0	1.509	5.174
Polypropylene (caps)	kg	0.00686	0.01764	22.0	22.0	0.151	0.388
Dye (2% by weight)	kg	0.00154	0.00516	310.0	310.0	0.477	1.600
Label	pieces	1.0	1.0	2.5	5.0	2.5	5.0
Foil	per 0.1 meter	0.000241	0.000180	1.5981	1.2888	0.0004	0.0002
Pallets	1 pallet	0.002083	0.007407	50	50	0.104	0.370
Boxes	1 box	0.10	0.33	10	10	1.000	3.333
Film	per 1 kg	0.000625	0.002222	24	24	0.015	0.053
Scotch	for 1 meter	0.080	0.273	0.1	0.1	0.008	0.027
Electricity (consumption)	per kWh	0.205	0.686	0.11	0.11	0.023	0.075
					With the VAT	5.79	16.02
					Without the VAT	4.82	13.35

According to the data for 2017, the effectiveness of the oil unit before taxation is an average of 0.8 thousand rubles per 1 ton of automobile oils. The budget of pledged investments for the construction of the packaging workshop will be 7 101 thousand USD.

The source of income is the proceeds from the sale of pre-packaged oils according to prices. These prices are competitive for domestic production, and the cost of oil of competing companies is usually 10 % higher.

Production volumes are always predicted and planned. The author's methods and statistics are used. They reflect the need for oil materials, taking into account the technical equipment and equipment features.

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The calculation of economic indicators was carried out with the study of performance without the use of credit. The standard NPV model and discounted type financial flows with a rate of 15 % per annum were used. The calculation was carried out for a period of 10 years from the start of investment (Mosakova, 2017).

The main results of compiling a model of economic performance can be considered indicators calculated using the special software Project Expert, which are listed in Table 2 below.

Table 02. Investment performance indicators (modeling with Project Expert)

Indicator	Value
Discount rate, %	15.00
PB, month.	41
DPB, month.	51
ARR, %	39.79
NPV, rub.	209375001
PI, fractions of units.	2.07
IRR, %	41.15
MIRR, %	21.99

5. Research Methods

The following is an example of the interaction of a large business company with small industries using the example of the processing and use of sulfur, which occupies a significant place and market share in oil refining products. Thanks to the introduction of special copyright methods, it was possible to distinguish between the interests and activities of large and small businesses, as well as to make forecasts for subsequent results of joint work.

The main task of optimizing processes for large and small businesses is to determine the optimal structure of goods according to the parameters of a given system of restrictions on resources and technical capabilities. The tasks also include determining the boundaries of interests in the production processes of various forms of entrepreneurship, which is solved mainly for a large industrial enterprise.

The solution of these problems and the achievement of the project goal by the example of the KrNHP enterprise are carried out using the Mathcad system. This type of simulation applies the following parameters:

- The scale of production processes,
- A type of goods,
- The cost of obtaining a product,
- The cost of resources for the production of the specified goods,
- The cost of a good,
- The specific weight of the main product in the structure of the range of a refineries,
- The specific weight of the by-product in the structure of the range of a refineries,
- Income from the production of goods.

The following criteria have been developed for optimization:

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- The scale of oil refining,
- Productive capacity,
- Oil product price,
- Raw material costs in kind and in cash,
- Losses of oil refining in kind and in cash.

The capacity of production processes of oil refineries in resources in these calculation tables was taken into account at the level of 12 million tons of crude oil. At the same time, the total volume of oil products accounted for at the level of 8 million tons.

Table 3 reflects the indicators that were obtained during the optimization of the structures of production complexes according to the maximum profit parameter.

Table 03. The structure of products KrNHP in the optimization criterion 1

Name	Specific weight, %
Main oil products	
Naphtha	9.9
Summer diesel fuel	24.1
Winter diesel fuel	0.4
Automobile gasoline with octane number according to the research method not less than 98	9.1
Automobile gasoline with octane number according to the research method not less than 95	45.6
Automobile gasoline with octane number according to the research method not less than 92	9.8
Aviation hydrocarbon fuel	0.1
Total	100
Co product	
Petroleum bitumen	0.3
Petroleum oil	24.9
Commercial fuel oil refining	73.9
Petroleum coke	0.2
Associated petroleum gas	0.3
Butyl alcohols of oil refining	0.2
Selected sulfur	0.2
Subtotal	100

The data obtained provide us with information on maximizing income in the form of a priority indicator for the production and sale of motor gasoline with an octane rating of at least 95. Mazut is a by-product. The shares of motor gasoline with an octane rating of at least 95 and mazutare 45.6 and 73.9 %, respectively. This allows us to talk about the prospects for the production of large volumes of these goods and covering the fullest possible needs of the modern oil products market (Zhahov, Krivoshlykov, & Shatokhin, 2017).

The indicators that were obtained during optimization in the structure of production according to the value added maximization parameter reflect the priority of the oil refining industry in the form of the need for the production of motor gasoline with an octane rating of at least 98, as well as a by-product of oil refining butyl alcohols. We turn to the structure of the main turnover. Car gasoline with an octane

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rating of at least 98 has optimal production share ratios of 30.9 %. The same parameter for butyl alcohols of oil refining is 42.9 %, which indicates the importance of the production of these goods and their competitiveness in the market of the oil refining industry.

The results that were obtained in the optimization processes according to the parameter for minimizing total costs reflected the priority of jet fuel and mazut. Jet fuel is a sought after product with an optimal share.

An important criterion, which is a priority for large-scale production, is the volume of net profit. That is why the best version of the product structure was determined according to the criteria for maximum profit. The most profitable product is Premium-95 gasoline. Back in 2017, it was profitable due to a profit of 1 billion rubles for the oil company.

In connection with the use of the criterion of profit maximization, it is possible to determine the limits of interests for large and small businesses in the field of sulfur processing and production of sulfur concrete. This limit can be expressed using the following formula using the author's method.

$$Vi = \frac{1\ billion\ rubles}{3895\ rubles - 830\ rubles} \approx 326264\ m^3/year$$

6. Findings

Oil refineries typically have sulfur and styrene from their own production processes. That is why the cost of sulfur concrete is determined without taking into account the cost of raw materials. In this regard, the cost of one square meter of sulfur concrete is 830 rubles. At the same time, the market value of a product of similar quality will be 3895 rubles. Given the priority and profitability of Premium-95 gasoline, the same profitability of production of sulfur concrete can be assumed. The production of such volumes requires a large amount of sulfur in 200 thousand tons. At the same time, the volume of its production in the studied company amounted to only 26 thousand tons in 2017.

Accordingly, we can summarize the following results. A large business is not interested in self-processing of sulfur. This is due to the fact that the ratio of profit in gasoline and sulfur concrete is simply not comparable. However, according to statistical studies, the production of sulfur concrete is in demand and important, since the profitability of such activities is 15 %. Accordingly, sulfur processing is suitable for medium and small industrial enterprises (Shupletsov, & Bunkovsky, 2010).

Based on the above analysis and research, the realization of the potential of oil refineries for the processing of by-products and the production of sulfur products requires the interaction of large and small businesses. This is explained by different levels of company development, other goals and setting individual tasks.

The choice of raw materials is carried out taking into account the technical equipment of the company and its capabilities, which will accordingly affect the quality of the goods.

The economic effect of the interaction of industrial entrepreneurship on the example of sulfur utilization at KrNHP will include:

- Reduction of payments for waste disposal of a large industrial enterprise (KrNHP), as well as reduction of costs for storage of sulfur as production wastes (6.6 million rubles / year).

- Net profit of a small industrial enterprise with the free receipt of raw materials from KrNHP - 38.1 million rubles / year.
- Salary – 5.6millionrubles / year.
- Taxes and other obligatory payments of a small industrial enterprise – 10.3 million rubles / year.
- Mandatory deductions from the wage fund – 1.8 million rubles / year.
- 30–35 extra jobs.
- The overall economic effect of the emergence of one small industrial sulfur processing enterprise on the basis of KrNHP production facilities is 62.3 million rubles / year.

7. Conclusion

The effect of the interaction between large and small industrial enterprises in the oil refining industry will be the substantial benefit of all enterprises. This benefit will be reflected in the financial condition of each company, the growth of profit of all participants in the process and the improvement of the material condition of their employees.

The above optimization scheme will significantly expand the staff, provide new jobs, increase competitiveness among other companies and holdings, as well as provoke the development of engineering. The achieved level of development of mechanical engineering will make it possible to best equip jobs, provide the necessary basic and additional equipment to obtain better basic and by-products of oil refining and petrochemicals.

This scheme can be applied to any company, regardless of its turnover and currently occupied place in the oil market. The provided example confirms the effectiveness of the proposed scheme and the effectiveness, both from the theoretical side and from the practical side.

References

Botkin, I. O., & Topoleva, T. N. (2018). Integration of an industrial enterprises: regional dimension. *News of Science and Education*, *3*(1), 015-021.

Eliseeva, O. V., & Ryabov, A. N. (2013). Methods of implementation and accounting of settlements with contractors. *Basic research, 11-4*, 715–718.

Korotkih, U. S. (2016). Prospects of Gas-Powered Fuel Use in Russia. *Int. Sci. J., 2*, 77–80.

Kushnir, K. A., & Gubanova, E. V. (2019). Research of development of enterprises of the defense-industrial complex in the Russian Federation. *Chief mechanic, 7*, 34–42.

Mosakova, E. A. (2017). Russia in the system of modern international labor migration. *Russia and the modern world, 2*, 113–121.

Polyakova, A., Nesterenko, J., & Sverdlikova, E. (2019). Meta-institutions as a Product of Institutional Dynamics and Institutional Reformation. *Postmodern openings, 10*(2), 137–154. https://doi.org/10.18662/po/76

Shupletsov, A. F., & Bunkovsky, D. V. (2010). Essence and Efficiency of Industrial Entrepreneurship in Oil Refining and Petrochemicals. *Baikal research journal 6*, 27–29.

Sozinova, A. A. (2019). The Concept of Industrial Enterprises' Economic Development Amid the Global Financial and Economic Crisis. *Lecture Notes in Networks and Systems*, 57.

Zhahov, N. V., Krivoshlykov, V. S., & Shatokhin, M. V. (2017). Ways of modern agriculture in: specifics and state support. *Proc. of the 30th Int. Busin. Inform. Manag. Associat. Conf., IBIMA 2017 – Vision 2020: Sustainable Economic development, Innovation Management, and Global Growth 2017*, 3646–3652.