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Features of the Supply Chain Development in the Areas of Oil Production and Refining

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***Abstract*— The oil industry is one of the most important industries, which are the main export goods of Russia. The oil and gas industry is involved in a global supply-chain that includes domestic and international transportation, ordering and inventory visibility and control, materials handling, import/export facilitation and information technology. In addition, the price of the third main component of exports of natural gas substantially depends on the level of prices for oil and oil products. The oil industry of the Russian Federation is closely connected with all sectors of the national economy, and therefore is of great importance for the Russian economy. The demand for oil is always ahead of the offer, so almost all developed countries in the world are interested in the successful development of our oil industry. The object of the research of this article is to organize the supply chain management development in the areas of oil production and refining. The subject of research is the territorial organization of oil production and refining. The purpose of the work is to analyze the territorial organization of oil production and refining in Russia. The goal of the research involves the solution of the following main tasks: To study the theoretical and methodological issues of the oil industry; Identify geographic differences in the distribution of petroleum resources; to substantiate ways to improve the territorial organization of oil production and refining in Russia. The organization of the development of the supply chain management in the areas of oil production and refining is characterized by significant features. These include issues of investment policy and the development of innovations, the efficiency of managing production clusters, the tax structure in this sector of the economy, the supply chain foreign economic activity and others.**

***Keywords*—** *economics, supply chain management, economic and mathematical modeling, gas and oil industry, regional economy, innovation management*

1. Introduction

The oil industry is a sector of the economy that is engaged in the extraction, processing, transportation, storage and sale of natural mineral oil and associated petroleum products from supplier to costumer in the supply chain process. Related industries include geophysics, drilling, production of oil and gas equipment. The basis of the oil industry is vertically integrated oil companies.

Oil production is a complex production process, which includes geological exploration, well drilling and repair, the purification of oil produced from water, sulfur, paraffin and much more. Oil and gas production is engaged in oil production - an enterprise (a structural unit of an enterprise) engaged in the extraction and transportation of “crude” oil and gas to a commercial accounting center. Its infrastructure usually includes booster pumping stations, cluster pumping stations, installation of a preliminary discharge of water, oil pipelines.

Oil pipelines are engineering and technical facilities of pipeline transport, designed to transport oil. Oil pipelines are divided into trunk and field. The construction and maintenance of the pipeline is quite expensive, but it is the cheapest way to transport gas and oil. Tankers and supertankers (super-large ocean tankers with a displacement of 320,000 metric tons (deadweight) used to transport crude oil from the port of loading instead of transshipment or directly to the refinery) are used to transport oil by waterways.

The purpose of oil refining (refining) is the production of petroleum products. These are various types of fuels (automotive, aircraft, boiler houses, etc.) and raw materials for subsequent chemical processing. Gasoline, kerosene, diesel fuel and technical oils are divided into different brands depending on the chemical composition [1-4]. The final stage of the production of oil refineries is the mixing of the components obtained to obtain finished products of the required composition. The main products of oil refining are: petrochemicals (plastics), asphalt, diesel fuel, fuel oil, gasoline, kerosene, liquefied petroleum gas, petroleum oils, lubricants, paraffin.

The analysis of geological reserves of oil in the earth's interior is constantly bearing an approximate form. The reliability of these estimates is based on a variety of reasons and, above all, on the degree of geological knowledge of the territory, the extent of the exploration work already carried out, the criteria and methods used in processing the obtained results of field studies. In addition, often from general economic, political and even social factors, sometimes forcing individual firms and even countries to publish intentionally overestimated or, on the contrary, underestimated estimates of their reserves of natural raw materials [5-9]. At the beginning of the 21st century, there were approximately 600 oil refineries in the world with a total primary processing capacity of 4 billion tons.

2. Methods

Having a dynamic and efficient supply chain in the drilling industry can be useful in accelerating the response and possible change in the needs of the chain members in response to environmental changes and competitive conditions. In this study, the main parameters for integrated supply chain management of offshore drilling projects have been investigated. Due to the nature of drilling projects, time plays a key role in determining the economic viability of these projects. When analyzing and forecasting socio-economic phenomena, a researcher quite often faces the multidimensionality of their description. This happens, for example, when solving the problems of market segmentation, building a typology of countries according to a sufficiently large number of indicators, forecasting the market conditions of certain goods, studying and forecasting economic depression and many other problems.

Cluster analysis is one of the methods of multidimensional statistics most clearly reflects the features of multidimensionality in the procedure for classifying objects. The name "cluster analysis" comes from the English word "cluster" - cluster, cluster. The main purpose of cluster analysis is the partitioning of the set of objects under investigation, characterized by a set of features, into homogeneous groups (clusters) in the corresponding understanding [10-15]. This means that the task of classifying data and identifying the corresponding structure in it is being solved. It is intended to isolate compact, distant from each other groups of objects, or to find a “natural” partition of the aggregate into areas of a cluster.

Cluster analysis is one of the areas of statistical study of socio-economic processes that are associated with the study of mass phenomena. The results of cluster analysis will actually describe the consumer’s portrait from rational and emotional (assessment of the degree of agreement with the statements) points of view [16-22]. On the basis of them, you can define a target group of qualities, place accents in an advertising message, get rid of illusions about the exclusivity of your product for any particular property, etc.

3. Results and Discussion

Therefore, identifying the elements of the supply chain, creating a proper and logical relationship between its members, optimal management of the execution time of each chain factor and the process of focusing the relevant activities will be considered as the first step in integrated supply chain management of drilling industries. Having a proper supply chain in the oil and gas drilling industry requires integrating chain decisions from customers and employers to suppliers. The enterprises of this industry are distributed over the territory of the globe much more evenly than resources and oil production, as each more or less large state tends to have its own refineries operating for domestic consumption, and in most cases for export. In this light, a significant advantage of economically developed countries in the total capacity of all refineries in the world was quite understandable: 930 million tons were concentrated in North America, 700 million tons in Western Europe, 250 million tons in Japan, and 650 million in Eastern Europe and the CIS countries t, and only the rest is in developing countries.

This supply chain has developed over many decades, as it was believed that it was more economical to import crude oil and process it at the place of consumption. However, in the 1980-1990s. The opposite direction has begun to manifest itself more and more clearly - to carry out the primary processing of crude oil in the areas of its production, and to export petroleum products [23-29]. On the basis of this focus lies both the industrialization of developing countries, primarily oil-producing ones, and the policies of Western states, which are aimed at moving “dirty” industries to developing states.

As a result, in recent times, oil refining capacity in developing countries has increased significantly faster and has already reached significant proportions: 300 million tons in Latin America, nearly 300 million tons in the Middle East, and 150 million tons in Africa. Nowadays, the share of developing states in the world capacity of refineries is already more than 2/5, and this figure does not stop increasing (Fig. 1).

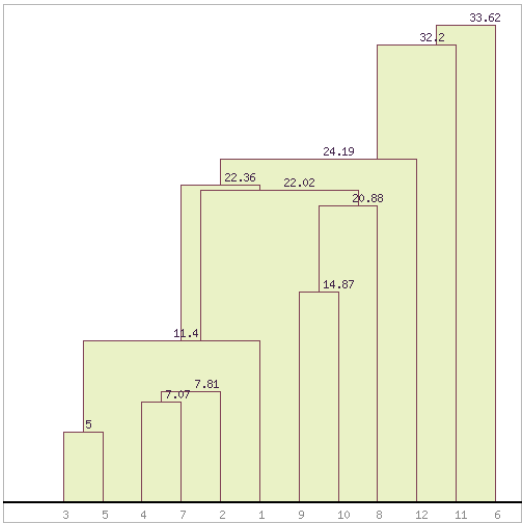

Figure 1 - An example of a cluster hierarchy of global refining capacity

In the main turn, this refers to the oil-producing states of the Persian Gulf. Such as Saudi Arabia, Iran, Iraq, Kuwait, which already have impressive refining capacity, mainly for export. This also applies to certain other oil-producing states (Venezuela, Mexico, Indonesia), as well as to Brazil, India, Argentina, and Thailand, where oil refineries operate to a greater extent or entirely in the domestic market.

In addition, some of the nodal points of the world sea routes (Singapore), the islands of the Caribbean Sea (Virginia, Netherlands Antilles, Trinidad and Tobago) are large oil refining centers, while the refineries located here are characterized by a particularly large processing capacity (20-30 million tons / year). The oil industry of the Russian Federation is a strategic outpost of the country, the basis of stability and the basis for the development of the modern economy [30-37]. The modern world cannot be imagined in the absence of refined petroleum products: fuel for space rockets, pavements and medicines, toys in the hands of a child – all products of the oil industry in Russia and in foreign countries without exception.

Currently, the oil industry is developing in many parts of Russia. Western Siberia is especially distinguished, where about 300 oil and gas fields are discovered (over 70% of Russia's total oil and gas production). The main fields are Samotlor, Ust-Balykskoe, Megionskoe, Fedorovskoe, Surgut and others. Siberian oil is of very high quality. The Volga-Ural basin is the second largest oil producer in Russia. The oil of this basin is distinguished by high sulfur content (up to 3% sulfur), which requires special purification, but it also contains a large amount of light hydrocarbons. Oil deposits are explored in Tatarstan, Bashkortostan, Udmurtia, Samara, Perm, Saratov, Volgograd regions. In terms of oil reserves, Russia ranks 7th in the world, behind Saudi Arabia, Kuwait, Iran, the United Arab Emirates and Venezuela. In terms of proven oil reserves, Russia ranks second in the world after Saudi Arabia. Russia's reserves are 20.2 billion tons. There are three large oil bases on the territory of the Russian Federation: West Siberian, Volga-Ural and Timan-Pechora.

Given the low degree of confirmation of the forecasted reserves and an even greater share of fields with high development costs (of all the oil reserves, only 55% have high productivity), the overall prospects for the Russian oil industry in terms of the growth of explored fields cannot be called cloudless [10-15]. Even in Western Siberia, where the main increase in reserves is expected, about 40% of this increase will be accounted for by low-yield fields with a flow rate of less than 10 tons per day, which is currently the margin of profitability for this region.

It should be borne in mind that in the Russian Federation after the seventies, not a single large high-yield field was discovered, and the newly increased reserves in terms of their condition are deteriorating sharply. The shelf areas of Sakhalin and the Caspian Sea are also promising. Potential oil resources were discovered in Eastern Siberia, Yakutia (Vilyui hollow), as well as on the shelf of the Sea of Okhotsk, Bering and Chukchi seas (fig. 2).

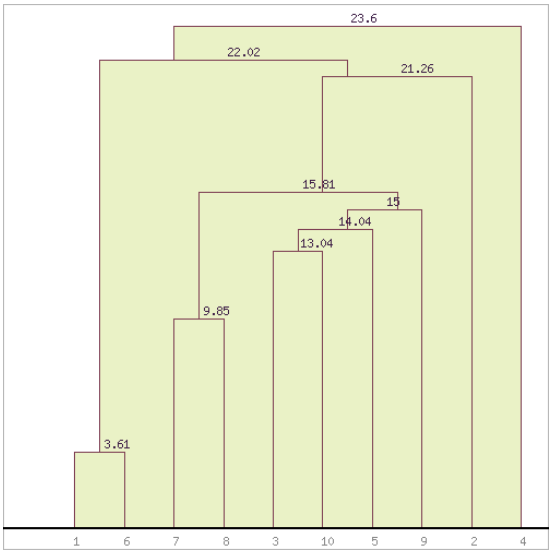

Figure 2 - An example of a cluster hierarchy of Russian deposits with high development costs

As it is already known, oil has been extracted and used by man since quite a long time, with the general growth of industry in the world and the oil industry began to develop rapidly and with each year more and more oil resources were developed. The total oil reserves in the earth's interior is approximate, it depends on the geological study of the territory by mankind. Russia ranks second in the world in terms of reserves of this mineral. The oil industry in Russia is important for the country's economy.

4. Summary

Today, one of the most important and key processes in integrated management of organizations and projects is to create a coherent, efficient and effective supply chain. Supply chain management is one of the cornerstones of business implementation infrastructure in the world. In the coming decades, the oil industry will remain the main pillar of the Russian economy and the most important source of revenue for the state budget. However, the full potential of the oil sector in Russia is far from being fully realized. The growth of efficiency in the field of oil production and refining can increase the cost of private enterprises in the oil industry by tens of billions of dollars and provide a much more significant contribution to GDP growth in general. By 2020, oil production in Russia will fall by 19%. According to experts, in the coming years, the development of fields in Eastern Siberia and on the shelf will not be able to compensate for the decline in production at the old fields.

5. Conclusions

Supply-chain management requires an oil and gas company to integrate its decisions with those made within its chain of customers and suppliers. This process involves relationship management by the company. Both customer relations and supplier relations are key to effective coordination of supply-chains. Often, the interaction between suppliers and their customers are adversarial in nature, based on a negotiated contract that spells out all the terms and conditions by which all parties are required to comply. Instead, a firm can create long-term strategic relationships with their suppliers. In most cases, it is a collaboration process between the oil and gas operating company and its suppliers. The oil and gas industry in Russia is connected through supply chain process, so they have to face almost the same and serious problems. After the crisis in the country, which took place in 2009, a lot of serious negative consequences appeared in this field of activity. This was especially reflected in seismic studies, which were abandoned by a huge number of large companies operating in the oil industry. Western Siberia is considered the main region in which oil is produced, but even here, there has recently been a decline in oil production, as well as in the Ural-Volga region. There are several main problems that the oil industry has to face:

A slowdown in the rate of oil production due to the rise in prices for these works, as well as due to the fact that the fields are located in hard-to-reach places;

Low oil recovery, which leads to irrational use of the resource;

The use of outdated and worn-out equipment and machinery in the process of oil production;

Poor utilization and use of associated petroleum gas;

Irrational use of innovative technologies in the process of oil production

However, even with such significant problems, the oil industry of Russia produces high-quality petroleum products, the characteristics of which satisfy the requirements of the world market. It needs efficient supply chain system to links the supplier to international costumers. It can be noted that good supply chain system for the oil industry in the Russian Federation to develop quickly and efficiently. This is due to the fact that the country has a large amount of oil resources, which,

however, are unexplored, so it can be argued that the state has enormous and valuable resources.

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