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Prerequisites and Conditions for Sustainable Development of Chemical Enterprises in Russia

Valery Maksimovich Tumin and Alexey Georgievich Koryakov

Moscow State University, fine chemical technology named after M.V. Lomonosov, Russia, 119571, Moscow, pr-t Vernadskogo, 86, Elena Vitalievna Seroshtan, Belgorod State Technological University named after V.G Shukhov, Russia, 308012, Belgorod, Kostyukova st., 46

Abstract: In the article the basic prerequisites and conditions for the sustainable development of the enterprises of the chemical industry of Russia. Identified the main trends of the current state of the chemical industry, showing the reasons which led the basic industry of the Russian industry to a crisis state. More detail the issues of innovation and sustainable development of the commodity chemical companies.

Key words: Sustainable development · Chemical plants · Industry · Prerequisites · Conditions · Competitiveness

INTRODUCTION

The crisis in the global economy in recent years actualized need for a detailed analysis of the assumptions and factors and tools that promote the development of both the economy as a whole and its individual sectors. Accents of the world economy increasingly shifts from maximizing the dynamic economic growth of the immoderate consumption of resources to the model of sustainable development in view of the limited availability of natural resources and the need for a harmonious development of not only economic but also social and environmental components of society [1].

The basis for the effective functioning of the national economy, needs of Russian citizens, economic, social and environmental, should be a strategy for the sustainable development of the industry and its priority sectors, which include the chemical industry.

Thanks to the widespread use of chemical materials and technologies in various fields of manufacturing chemical industry is one of the main factors for the competitive level of the industrial output of other sectors that significantly affect the formation and development of the export potential of the Russian economy [2]. At the same time, the chemical industry is one of the most resource that significantly affect the environment industries. At the current level of development of the industrial enterprises of the chemical industry is characterized by significant scientific and technical potential and a low innovation activity [3]. Striking a balance between economic efficiency of production companies and reasonable consumption of their resources while minimizing harm to the environment based on the principles of sustainable development is an important national economic task, some of the scientific approaches and solutions which are described in this article.

The Current Status of the Chemical Complex of Russia: Modern competitiveness of Russian chemical enterprises is based mainly on the use of comparative national advantages (presence of natural raw materials and energy resources) and the application of the mechanism of price competition. Use of competitive advantages connected with formation of innovation economy, the mechanism of non-price competition, based on high-tech products and unique technology - what is the basis of competitive rivalry in the global scale in the modern economy in Russia is still poorly developed [4].

Corresponding Author: Valery Maksimovich Tumin, Moscow State University, fine chemical technology named after M.V. Lomonosov, Russia, 119571, Moscow, pr-t Vernadskogo, 86, Elena Vitalievna Seroshtan, Belgorod State Technological University named after V.G Shukhov, Russia, 308012, Belgorod, Kostyukova st., 46.

Table 1: The age structure of production capacity in the chemical industry (% of total capacity for such products)

	Operating life		
Production	to 10 years	10-20 years	over 20 years
Polyethylene	24	19	57
Polypropylene	67	-	33
Polystyrene and copolymers of styrene	6	1	93
Polyvinylchloride	19	39	42
Chemical fibers	0,2	11	89
Synthetic rubbers	9	10	82
Car tyres	12	8	80
Mineral fertilizers	5	19	76
Caustic soda	-	-	92
Soda ash	-	-	100
Sulphuric acid	-	19	81
Methanol	23	45	32

The possibility of further growth in chemical production intense constrained by a high degree of wear of the equipment and outdated technologies. In Table 1 presents the age structure of capacities at the enterprises of the chemical industry.

Terms of use much of the equipment is 20 years or more [5, 6] for comparison, the chemical industry in the U.S. equipment life by an average of about 6 years. [7] Depreciation of fixed production assets of the domestic chemical industry as a whole is about 54% and equipment 67.2%. Maintain high growth industry can no longer physically on many commodity items facilities are loaded by more than 80-90%.

Of great importance to the level of production costs in the chemical industry have indicators of energy and materials. It is estimated that the energy intensity of chemical and petrochemical products in the 1.5-1.7, specific material - 1.2-1.4 times higher than in industrialized countries [8].

Significant wage costs in Russia are caused not by the average level of the wage, which is much lower than in industrialized countries and irrational and inefficient use of labor. For the chemical industry of the developed countries is characterized by a steady upward trend in labor productivity, which increased at an average annual rate of 1.5-2% [9].

In the chemical industry of Russia comparative labor productivity is lower than in the industrialized, newly industrialized and some developing countries.

Chemical production is quite energy intensive, in Russia for the production of one ton of ammonia only spent 1,200 cubic meters of gas, which is one third higher than the European average. In Russia on 1 tons of crude oil accounts for 11 kg of ethylene, 28 kg in the USA, Japan 35 kg, 42 kg Germany [10]. In the coming years, unless things change drastically, the Persian Gulf and North Africa will be able to compete with Russian exports at the expense of cheaper gas, lower transport costs and due to the proximity of export ports.

The dependence of the cost of production of the chemical industry from raw materials is confirmed by a high proportion of the article "Raw and Materials" in the cost structure (Figure 1).

Factors such as inflation, strengthening the ruble, which would lead to a loss of competitiveness and a decline in exports, the growth of domestic energy prices to world, the rise in prices of goods and services of natural monopolies will lead to a leveling of price competitiveness of the Russian chemical industry.

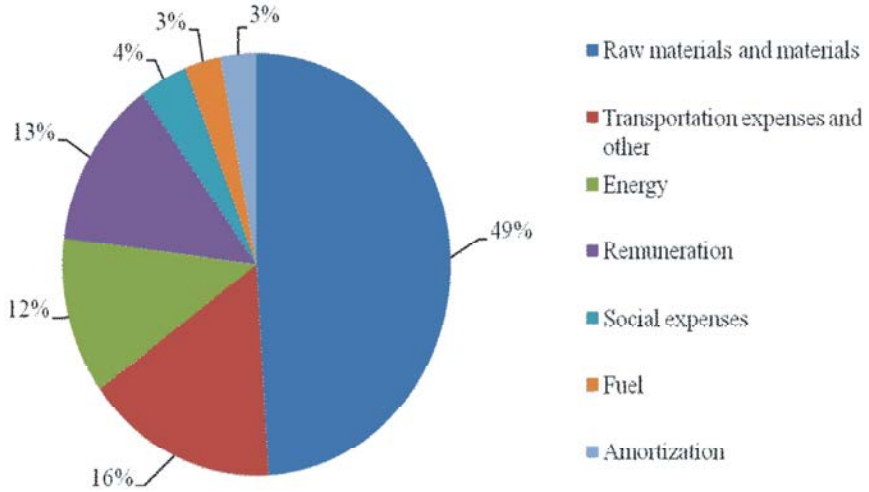

Fig. 1: The structure of the cost price of chemical products in Russia

An increase in the domestic consumer market could improve the prospects of the industry, but the lack of effective demand on the part of domestic consumers of mineral fertilizers, constitute the basis for export of a chemical complex (30-35% of foreign currency proceeds) substantially limiting the growth of the industry using the existing base - price competitiveness through available and inexpensive raw materials. In the current conditions, threat of competitiveness of the Russian manufacturers of chemical products is as protectionist policies of certain states concerning the chemical and petrochemicals and intensification of the export potential in the countries with cheap or even cheaper than in Russia hydrocarbons (in particular, the countries of the Middle East region) product, which is the basis of the export of Russian chemical centre. This regard, it can be concluded that in the coming years practically all enterprises of the Russian chemical industry may find themselves in a struggle for survival [11].

The final assessment of the state of domestic chemical complex and its conformity with market requirements (in terms of volume, assortment, quality and prices) indicates that:

- Majority of businesses on the main parameters determining the level of technological competitiveness of the chemical products lags behind requirements of the internal and external markets;
- For many types of products the availability of production capacity exceeds the modern requirements of the domestic market in products due to the low solvent demand of the basic branches - consumers;
- Structure of the production capacities there is no broad range of products required by the market, mainly small-scale and fine chemicals, the need for which has been satisfied largely through imports.

Prerequisites to Sustainable Development of the Chemical Enterprises: Despite the serious problems of development of chemical industry in Russia, in particular its focus on cheap domestic raw materials, dependence on trends in commodity markets, etc. should allocate certain positive preconditions of the further ensuring its sustainable development in modern conditions:

- Provision of essential raw materials industry;
- Low commodity prices relative to domestic production of world prices;
- Understanding of the need to develop the industry of scientific and technical capacity to ensure the restructuring of the industry;
- Large domestic market that is able to develop in the course of development of the economy as a whole.

Describing the above-noted prerequisites for sustainable development of the chemical industry in Russia we define the following aspects of security:

- Innovative software.
- Financial security.
- raw material supply.
- Staffing.
- Resourcing.
- Ensuring environmental safety.
- Establishing an effective territorial structure of production.

Only the effective and harmonious development of all the above aspects can provide, according to the authors, the conditions for sustainable and balanced economic development of our industry. The format does not permit a detailed analysis of each of these aspects. Let us consider the two most important - innovation and resource supply.

Innovative Maintenance: The analysis revealed the inability of the Russian scientific and technological capacity to provide competitive capacity development of innovative projects for many large-capacity and low-tonnage by product, as evidenced by the orientation of the domestic business to foreign technology. This applies in particular to the development of the production of polyethylene, polystyrene, polyvinyl chloride, polypropylene, polyethylene terephthalate and many other types of products.

Projected corporate institutions and enterprises Commissioning of the above types of products include the use of foreign innovation projects leading to sustainable growth of the share of expenditures on imported technologies in the total expenditure on technological innovation industry (Table 2).

The analysis of innovation activity, subjects of research, design and development work carried out by research institutions and innovative small enterprises, showing their diversity and different degrees of readiness for implementation. However, despite the variety, the following main areas [12]:

Table 2: Imports of some of the major types of chemical products and technologies (by 2011)

Name of products	Import volume		Reason import	Investment projects	The supply of technology and equipment
	Thousand tons	Million $			
Polypropylene	53,2	46,2	Deficit	Expansion of production due to commissioning of new capacity 100 thousand tons per year at «Stavropolpolymerproduct», Budennovsk	Import procurement
PET	560	410,1	Deficit	Expansion of production due to commissioning of new capacities of 120 thousand tons per year at«Polyef», Bashkortostan	Import procurement
Terephthalic acid	46,0	19,6	Lack of own capacities	Import substitution due to commissioning of own capacity 230 thousand tons per year at «Polyef», Bashkortostan	Import procurement
Polyethylene	181,7	160,05	Deficit	Expansion of production at the expense of: input of the new capacity to JSC «Tomsk petrochemical complex»; expansion of production in JSC «Kazan Orgsintez»	Import procurement
Polycarbonate	16,0	14,8	Lack of own capacities	Import substitution due to commissioning of its own power «Khimprom», Kazan	Import procurement

Research work focused on modifying application properties have produced a complex product that enables it to improve its quality, to expand the range and to the greatest extent, take into account the requirements for the production parameters for specific applications;

Research on the development of new types of products, provided the requirements for materials and technology to create high- technology options;

Improvement and the creation of new process technologies addressing resource conservation and ecology;

Productivity of equipment, devices, production lines and improve process control systems, industries and enterprises.

The main organizational structures responsible for conducting research and development of innovative projects in the country are: the Russian Academy of Sciences, other academies, universities, government research centers, research organizations, industries, corporate agencies, firms, small innovative companies.

Important is the organizational, economic and legal support effective innovation system:

Creation of an effective mechanism for consolidation of various forms of ownership structures and the development of priority directions of scientific and technical progress;

Perfection of the economic mechanism of resource support function of the innovation system;

Implementation of measures for the protection of intellectual property;

Developing infrastructure (science cities, techno-innovative economic zones, federal, state and industry funds to support innovation).

Implementation of measures to ensure the sustainable development of innovative chemical complex is essentially a means of implementing economic policy. Implementation of this policy will only be possible if effective organizational forms and methods of reconciling the interests of the state and business.

The main socio- economic outcomes of innovative renewal and development of the chemical complex is: improving the scientific and technological progress in industries from consumer chemical products and resource conservation, addressing environmental and national security, raising the level of competitiveness, etc.

According to the estimation, for the implementation of the priorities of the strategy of development of the chemical complex based on its innovative renewal of a capital investment in excess of 1.6-2 trillion rubles.

Chemical manufacturers will be able to compete successfully on the world and domestic markets. This will require further investment in the modernization and expansion of the Russian chemical industry. Expansion into new markets will not be possible without the support of innovation. To do this, the chemical industry should establish close links with research laboratories, universities of the Russian Federation, actively introduce innovations in the practice of their activities.

Raw Support: Sustainable development of the chemical complex is impossible without solving the problem of ensuring enterprises first of all hydrocarbon raw materials, on which 80% of chemical products.

Despite the presence of a significant potential hydrocarbon resources, the problem of providing future needs of the production of chemical products in this raw material is serious, complicated and requires a number of measures, in particular:

Table 3: Resources of hydrocarbons, oil and oil refining in Russia and a number of industrialized countries, thousand tons [11]

	USA	Germany	Japan	Russia
Oil production	354	3,0	-	314
Oil processing	795	114	209	175
Petroleum	342	26	40	24
Fuel oil	44	12	36	45
Pyrolysis oil refinery raw for chemistry	9	10	14	3
Liquefied gas refineries	22	3	5	1
Natural gas production, bln m3	563	530	20	2

- Qualitative change in the structure of consumed hydrocarbons in the areas of maximum effective use of associated petroleum gas in significant volumes of flared currently flared;
- Increasing the depth of oil processing and receipt of additional resources, raw materials for chemical production;
- Maximum recovery from natural gas, ethane and other hydrocarbons for the production of chemical products;
- Development of efficient technologies to obtain on the basis of gas processing of a wide range of chemical products;
- Improvement of economic-legal mechanism providing for priority use of raw materials for the production of science-intensive competitive chemical products on the domestic the enterprises.

Russia has significant reserves of hydrocarbon, mining, vegetable and other kinds of raw materials, which were the base for the creation of the prereform period, a relatively well-developed chemical industry. On the basis of hydrocarbon raw materials in the chemical and petrochemical industry produces more than 70% of production of polymer chemistry (synthetic resins and plastics, synthetic rubber, chemical fibers and threads, paint materials, synthetic detergents, fertilizers and others). Given that as of hydrocarbons are products of processing of oil, associated gas and natural gas, have the potential resources of this kind of raw material and efficiency of its processing are important factors of stability of the chemical complex. Below are some data characterizing the resources of hydrocarbons, oil and oil refining in Russia and a number of industrialized countries (Table 3).

Comparative data on the resources of hydrocarbon raw materials, volumes of oil and petroleum products in Russia and some other countries, there is sufficient evidence of potential hydrocarbon resources for the development of the country's chemical and petrochemical industries.

It should be noted that the problem of chemical and petrochemical hydrocarbons is a complex and multi-variant, as its solution requires the coordination of investment policies in the implementation of the long-term, capital-intensive activities in the whole complex

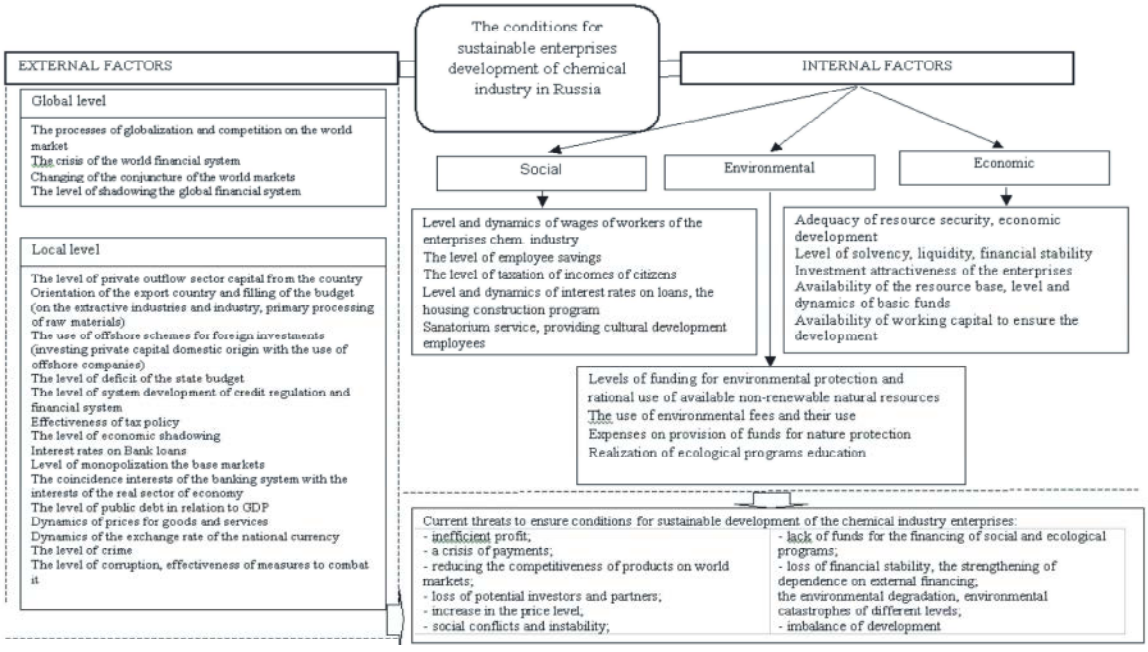

Fig. 2: The system of factors that create the conditions for sustainable development of enterprises of chemical industry in Russia

of related industries (oil, gas, oil refining, chemical and petrochemical industry). Actual problem of development of the state program for the rational use of hydrocarbons and the development of chemical industry, a broad-based involvement corporate vertically integrated entities and businesses that can provide the necessary concentration of financial resources.

The sustainable development of chemical enterprises

An extremely difficult task is the need to improve the theory and methodology of management of the complex development of the economy and businesses, in order to address sustainable development.

Opportunities that should be used in the formation of a set of measures to ensure the sustainable development of the chemical industry in Russia are represented by the following:

- Further growth in chemical production;
- Increase in world prices for chemical products due to an increase in energy pen.
- Reorientation to production in high premium sector;
- Integration of production chains;
- Reduction of energy consumption and increase the competitiveness of domestic products.

The authors proposed a scheme in which the system is represented by the factors determining the sustainable development of the chemical industry in Russia at the present stage (Fig. 2). The diagram is a list of threats that may be realized as a result of the adverse impact of factors external or internal to the chemical industry.

CONCLUSION

The analysis showed that the modern chemical complex in Russia does not meet challenges of global competition, the need of reforming the technical and technological base, the reorientation of the production of new products of fine chemical technology. To achieve this goal requires a range of macro-, meso- and micro - economic conditions that were considered in the article. The main institution carrying out necessary transformations in the chemical industry must act, the state, through its industrial policy. Available in Russia and mentioned in this article are prerequisites to sustainable development of the chemical enterprises will create the basis for a successful transformation.

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