

INNOVATIVE DEVELOPMENT OF THE RESOURCES FRAMEWORK AS A FACTOR IN GAS CHEMICAL COMPLEX ENVIRONMENTAL SAFETY IMPROVEMENT

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ABSTRACT

In the article the influence innovative development of the resources framework on the efficiency growth of operating effectiveness of the system environmental safety of the gas chemical complex is investigated. Conceptual positions of rational functioning of gearing of the resources framework under present-day conditions are grounded. The estimation set of resource-saving systems generating, as a factor of perfecting the company expenses' management is presented.

UDC & KEYWORDS

■ UDC: 66 ■ Effectiveness ■ Innovation ■ Resource framework ■ Waste

INTRODUCTION

Astrakhan gas complex is the largest enterprise on production, processing and transportation of gas, sulfur, and liquid hydrocarbons in the south of Russia. The proposed structure of the company consists of modules with the Resource Framework, production, refining, marketing and resource-saving; production relations are defined by material, financial and information flows which are different in nature and purpose, as a result of their overall business interaction Products Value Creation System (chain) is formed (Fig. 1). The focus of the system is determined by the general logic of the production process: the extraction of natural raw materials from the depths, then its multi-stage processing and sale.

Main text

Within this system, as a result of transportation and technological treatment of the product, commodity chains of sulfur, gas and oil are generated from the initial condensate mixture. They end in the product markets, going to a wholesale buyer or a broker on the basis of trade contracts. Organizational restructuring has made quantitative and qualitative changes in the system, but the main Products Value Creation Chain remains constant. The intraorganizational logistics deals with logistics operations that are performed within the organization. Within the gas chemical complex the following main objectives are:

- Transportation on the complex territory, for example, transportation of the gas and condensate mixture produced in the mines through the pipelines directly to the processing site for the Gas Processing Plant, from the plant production to the storage of finished products or in main the gas pipelines and product pipelines.
- Transportation to the loading docks in wagons, oil loading docks which belong to the organization or outside the plant, for instance by motor vehicles to the port berths.

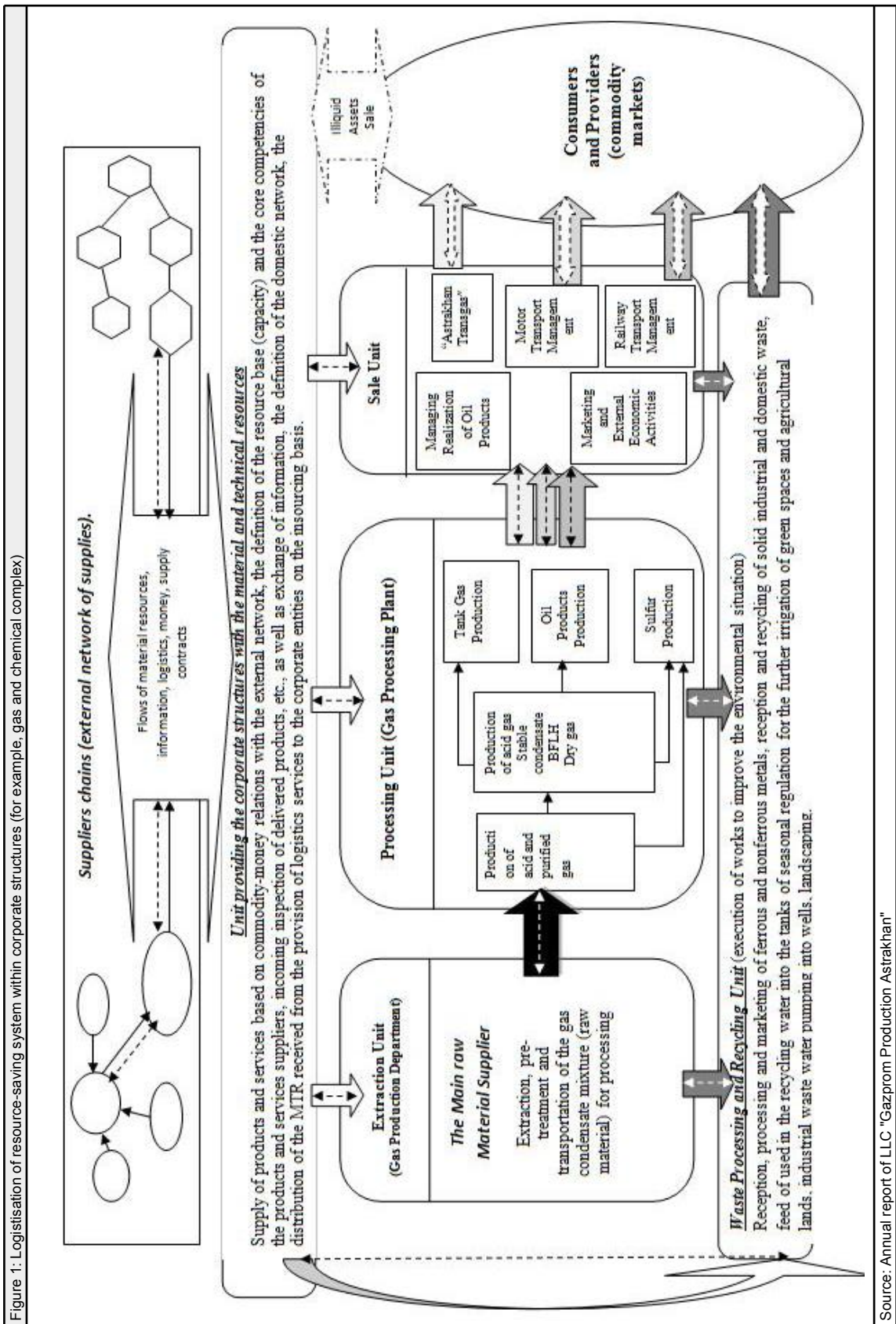
The peculiarity of the Resource Framework processes in the Gas Complex is the presence of the two not directly related to each other supply networks of raw material resources - external and internal. Unlike the traditional industries, where these networks are connected in the process of production, and supplied raw materials are

included as the material and the real part in the finished product, consequently, the quality of the produced goods is directly dependent on the resources (raw materials, spare parts, components, structure elements, etc.), in the gas complex material and energy resources, which ensure production, transportation and technological updating of the condensate mixture, come from the external network of the Resource Framework, but they are not included directly into the commercial gas and oil, i.e. they do not directly affect the quality of products. It is in the external network where basic logistics concepts are implemented in the management of the corporate structure: optimum traffic control and monitoring of the use of limited material, energy, labor and financial resources are ensured; relationships with suppliers; creating minimal inventories; the maximum reduction in the time of processing, storage and transportation of goods; guaranteeing of necessary flexibility of production; reduction of the duration of the logistics cycle of orders, etc.

One more feature of the Resource Framework of corporate structures in the gas industry is the simultaneous implementation of supply from the external network for several processes which are interdependent and interrelated of the production chain, but different in technological treatment and according to the product specifications, used equipment, materials, spare parts, chemicals, etc. The proper application of the logistics principles (choice, and relationships with suppliers, on-time delivery, packaging requirements and transportation routes, storage methods, storage conditions and organization), simplifies the solution of the complex, multidimensional problem of the corporate Resource Framework and has a direct impact on the overall results of operations (cost the final product, the efficiency of production processes, cost reduction, quality improvement, innovative development, etc.).

The third feature of the Resource Framework in the oil and gas industry lies in the fact that since the supply of resources required for the implementation and maintenance of the industrial processes has certain specifics depending on the stages of the redistribution of the gas-condensate mixture and its transportation, and mining technology, processing and transfer of petroleum products are different in the character and the production method, the level of training of the personnel involved in the supply of material resources is demanded not only higher qualification requirements, but also that it is particularly important for the competitiveness of the corporate structure in modern conditions, the personnel need the skill to determine in proper time the place and the direction of the possible use of innovative materials and equipment that appear on the vendors market.

Using the logistic principles the Resource Framework in corporate structures provides the flexibility of production, has a direct impact on the regulation and efficiency of gas production, gas processing processes in the mine or the gas plant, as well as on the pumping of the condensate mixture and the transportation of the petroleum products. The modernization of the borehole and wellhead mine



Source: Annual report of LLC "Gazprom Production Astrakhan"

equipment, the processing stations of the Gas Plant, repairs of the infield and main gas pipelines directly depend on the supply of modern and quality equipment and materials that provide the growth and the quality of the produced and processed raw materials. In our opinion the logistic functions do not only determine the connection of the interests of the participants in the Product Value Creation Chain of the corporate structure, have a direct impact on the volume and quality of the products offered in the form of logistics services (procurement, transportation, inventory management, etc.), but, what is especially important, help implementation of innovations developing processes of resource-saving and environmental protection.

The other feature of the Resource Framework system under consideration is that the unit of production in the internal network of supply after the extraction process and preparation of the gas-condensate mixture (separation, throttling process, heating), i.e. in a sense, processing of the raw materials begins at the mine, is the only supplier of feedstock for the gas plant, who is the supplier for the sale unit, and the supplier-buyer relationships are made between them on the non-commodity basis, i.e. in the form of insourcing – plan targets, offsetting of the supply of raw materials, etc., as opposed to working with suppliers of products from the external network to whom mutual settlements are made with entities in the supply agreements, but the other logistics functions - the volume of gas flow, timely delivery or vice versa timely cessation of pumping (e.g., in case of emergency) - largely determine the process of the safety regulations and the level of development processes of the Resource Framework, and thus directly affect the amount of greenhouse gases in the atmosphere, the degree of surface contamination of soil and water pollutants.

In the mining unit, the network of the Resource Framework (equipment and materials for production) and extracted raw material are not related by the material and real flow, but what is important to note, they are bound by the terms of the production process; the implementation of the logistics innovations will improve the level of efficiency of delivery of the upgraded equipment and better materials that will not only increase the amount and quality of the extracted raw materials, reduce the labor expenditures, reduce the costs, but also reduce the adverse impact on the environment of the mining process, to extend the overhaul and operating period of the wells, to reduce the number of the technological purges and the volume of flared gas in the wells (direct impact on the environment). Further along the Product Value Creation Chain, when the gas condensate mixture is fed to the plant as an element of material support, the innovations in logistics and upgraded equipment help to improve the performance and reliability of the gas processing equipment, machined depth of raw materials, while reducing emissions and leakages. In the sales unit, Resource Framework network supplies the equipment, materials and spare parts for the transport of the finished products within the complex, for instance, delivery of the petroleum products through the pipelines directly to the point of shipment, from the manufacturing plant to the storage of finished products – to the warehouse of lump or liquid sulfur, to the loading docks in wagons or trucks, the reservoir tanks which belong to the organization, to the scaffold bridges of light and dark oil products for running the tanks of the rolling stock or outside the plant, such as vehicles to port berths, in the main gas and product pipelines. It should be noted that it is in the sales unit, connected with the shipment of the product, together with the improvement of the Resource Framework processes, the possibilities of using the logistics and

innovation principles are most widely represented directly in the production processes.

In our opinion, the effectiveness of the innovation depends on the ability of the production systems to deal with the proposed introductions adequately, it must be relevant, timely used, adapted to the local standards and working conditions. The peculiarity of this innovation lies in the fact that its introduction, as a rule, makes it possible to find a solution to several problems, or at least reduce the adverse impact of the significance of a number of negative factors, and the cumulative positive effect (synergistic effect) of the implemented improvements, always stimulates the development of the resource-saving processes and provides the growth of the level of performance of the system as a whole.

An unprepared application of the innovations to the fragmented collection of the business processes specific to corporate entities can only aggravate the problems which they try to solve by introducing, for example, information technologies into the Product Value Creation Chain for the consumer. Only after we fully elucidate the nature of the supply markets, the supplier capabilities, the customer needs, the routes and transport times, the mechanisms of the expenses formation and after we define the outside and internal business processes, and we schematically represent the interaction and interdependence of the production and the Recourse Framework processes and finally form the relationship between the key partners in the delivery chain, the company can secure a sufficiently competitive advantage, taking advantage of B2B applications based on the supply chain in its activities. In order to succeed in transforming the supply chain and incorporating it into the formation of the corporate structure value, the staff of the organization must fully understand not only the business processes, but also the information standards which ensure the smooth interaction between the customer and the supplier. An average manager can easily get lost in the extremely rugged, intricate and ever-changing landscape of B2B standards, reverse auctions, e-concentrators, private or public stocks, and particularly - in open languages of hypertext documents description. Today, many companies involved in transactions with suppliers and customers need to automate the business processes in real time, and such automation should include all the trading partners. The traditional business methods, such as e-mail, faxes, telephone calls, postages, not only involve time delays and multiple and time-consuming input of the data into the information systems, but also require special attention and skills of highly qualified purchasing staff in the performance of rather routine work (an inefficient use of labor resources). The ability to create and develop dynamic B2B relationships, the ability to realize their potential in the shortest possible time, will automate the business processes to a fairly wide range of new and legacy applications and systems, both within the corporate structure, and among the supply chain partners.

Transition to e-commerce should teach companies to combine their information systems and applications with information resources of their suppliers and customers, besides, such integration should promote the safe and reliable operation in real time, to encourage the desire of supply chain partners as quickly as possible to respond to consumer demands and provide the possibility of dynamic changes in the business plans as soon as new conditions arise. It is necessary to use different mechanisms and instruments of interaction between the participants in the supply chain depending on the requirements and specific tasks of the product value creation for the consumers.

The main task of the Resource Framework for the corporate structures in the gas industry, as noted, is the simultaneous accomplishment of supply from the external network for several interdependent and interrelated processes of the production chain, but different in the technological tasks of the product redistribution and therefore the specifications of the equipment, materials, spare parts, chemicals etc.

The typical equipment for gas production and processing require the extensive preparation of the order, the various agreements, the elaboration of technical specifications, meeting all the requirements for the safe operation. In this case, the pricing mechanism is static, since the prices are formed as a result of the preliminary agreements. Combining the supplies reduces the costs associated with processing of a purchase order; products are specific (i.e., do not apply to consumer goods); the number of certain products (or stock-keeping units - SKU) is significant (the typical equipment is used for hundreds, sometimes thousands of wells at the same time); all suppliers are well-fragmented; the purchase is based on the pre-contracts and there is a possibility to create a product catalog, "e-concentrator", provided by certain basic suppliers.

For the functioning of the corporate structures, a large amount of the related products for the customer service and support of the primary and secondary production processes are required. In this case, a corporation needs to work on the electronic exchanges and auctions, extracting additional benefits from the economies of scale and situations of a single choice of a supply source, when prices are set on a dynamic basis (real time), i.e. are determined and recorded at the time of purchase. The mechanism of online sourcing and harmonization of the price is ideal for cases where: the products are consumer goods (or close to them in the characteristics), which allows their sale and purchase by default; sale and buying volumes exceed the transaction costs considerably, and the qualification of buyers and sellers allows them to operate in dynamic pricing successfully; companies use one-time purchases to smooth over losses due to sudden changes in demand and offer; logistics and execution of orders in some cases can be performed by outsourcing companies; demand and prices are characterized by high variability.

The integrated innovative approach to organization of the Resource Framework process at all the stages of the Products Value Creation Chain and the equipment upgrades will provide a synergistic effect on improving not only economic indicators and results of operations of the corporate structure (increase in production volumes, revenue and profits growth, reduced costs and losses etc.) and having a positive impact on environmental performance indicators of resource-saving work and environmental protection (energy saving, reduction of fines and regulatory fees for standard, extra and accidental emissions into the atmosphere and soil and water), but what is especially valuable, it will help promote preservation, and in some cases, significant improvement of living conditions and human environment, reducing risks of occupational diseases of the plant personnel, their families and the entire population (decrease in health protection costs and because of efficiency savings - the increase in providing services of a better quality) and what is the most important, it will help to change the attitude of the public awareness to the ecology and the environment protection: from consumer indifference to preservation and active participation.

The desire to live in the comfortable and clean environment in the region of the business activity can become a guideline on the development and implementation of innovation for

the executives of major corporations and representatives of the business case.

But it is hard to imagine that all of a sudden entrepreneurs can change their views and turn into altruists and environmentalists because of moral reasons in respect of some abstract society. Many of them consider the territory of Russia as an area for "raiding" to get rich quickly and then settle in clean and prosperous countries. Doing business in Russia for these entrepreneurs is a means of obtaining excessive revenues and profits from the operation in the polluting industries and the use of technology, which in most cases, is outdated and largely prohibited by the law in countries with developed economy. In order to overcome the selfish nature of the business and make the entrepreneur get seriously engaged in innovation it is required to have a complex of controlling actions that create the conditions under which pollution is not only unprofitable (higher fines, revocation of licenses, etc.), but it is a rather dangerous business, due to possible prosecution, and especially the effective factor is the public outcry, and in some cases even the vast majority of counteraction of the society members. After all, the public mood of protest forced to accept and implement a program of resettlement of the Astrakhan region inhabitants from thirty-kilometer zone of the gas complex, which is dangerous to health, to a safe place to stay, or not to use nuclear power in Germany. Obviously, the oligarchy and the vertical-bureaucratic system cannot solve the basic issues of social and economic development, which include innovative development of the resource-saving. The real development is possible in a state based on the principles of free enterprise and at the same time consciousness of responsibility to evolutionarily-developed social and public-legal institutions.

What could make a business to innovate in the resource-saving? For example, let's consider the environmental pollution from the popping of gas in torches. Firstly, it is the high level of penalties, standard and extra payments for emissions of harmful substances, which extent in comparison with the income and profit will make the business unprofitable without modernization of the production and Resource Framework processes and equipment. Consequently, first of all, the effective state regulation and the effective mechanism for the inevitability of punishment for environmental offenses can make the business increase the amount of the business investment in innovations which implementation will reduce the environmental costs and protect the business from the threat of criminal prosecution. Secondly, it is possible to recycle for further use of the popped gas in the production processes (saving raw materials and materials produced for its recycling), as well as to extract additional profits in case of the supply of the processed volume of the associated gas to the consumers.

Astrakhan gas condensate field (AGCF) is characterized by a complex geology with salt tectogenesis, highly aggressive and toxic materials (26% hydrogen sulfide, carbon dioxide, 14%, the presence of mercaptans and other compounds), abnormally high formational pressure (primary - 61.2 MPa), high performance of the condensate factor, the temperature of hydrate formation, pressures of the condensation beginning.

Carrying out the environmental protection measures is always associated with significant costs. Rationale and maintaining an optimal level and structure of costs for environmental purposes is crucial for environmental protection and nature management, in particular, to develop and implement programs of the environmental safety in the

Table 1: distribution of costs of the environmental protection activities							
Areas of environmental protection	For reference: the value of key environmental assets	Current expenses		Capital investments		The cost of major repairs	
Unit	Thousand rub.	Thousand rub.	%	Thousand rub.	%	Thousand rub.	%
Environmental protection and sustainable use of natural resources, total	2,514,466.5	703,230.0	73	37,835.0	4	225,300.0	23
Including:							
Pa Protection and sustainable use of water resources	794,375.7	439,835.0	62	9,821.0	26	53,491.2	24
Protection of atmospheric air	1,624,811.8	223,205.0	32	15,085.0	40	168,591.3	74
Nature protection from pollution by waste	95,279.0	35,271.0	5	12,929.0	34	3,217.8	2
Land reclamation		4,918.0	1				

Source: Report of environmental protection of Gazprom Production Astrakhan LLC

production of Gazprom Production Astrakhan LLC. For distribution of costs please see Table 1.

The main part of the environmental protection costs - 73% (703,230.0 thousand rubles.) - in the period under review are the operating costs. They consist of the costs for maintenance and operation of the key assets of the environment preservation, the costs associated with the implementation of measures to improve the environment, the improvement of technology and the modernization of the environmental protection equipment to reduce the negative impacts of the industrial activity of the complex on the environment, as well as depreciation charges on the full restoration of the basic productive assets and the current repair cost. The comparative data placed in Table 1 shows that the current costs substantially (18 times!) exceed the annual capital expenditure on environmental protection. A large proportion of the current costs on environmental protection in the cost structure of the Company is due to high costs and energy consumption of the environmental protection equipment. Therefore, a part of the costs on using this equipment is the costs of the electricity bills, the personnel maintenance and the depreciation charges.

Execution of work on improving the environmental situation in the complex is concentrated in the processing and recycling module. The major logistical problems of this module are the collection, transportation, reception, processing and marketing of ferrous and nonferrous metal waste products, reception and disposal of solid industrial and domestic waste coming from all parts of the production chain. Feed of used for technological needs water from reservoirs for irrigation of greenery and farmland. Supply of the equipment and materials for recycling is carried out, as for other corporate entities in the Resource Framework block.

The problem of the waste production and consumption is one of the most important both in terms of stabilization of the ecological situation and as non-use of the potential of LLC "Gazprom Production Astrakhan". The Law on Protection of the environment places a responsibility on all persons and entities associated with transportation and disposal of what is called "waste to be processed." Waste to be processed is defined as follows: domestic, commercial and industrial waste, including all waste materials generated by a manufacturing or commercial enterprise.

The usable utilization of secondary materials is a choiceless method of a waste management system for a large gas processing company. It is necessary to develop the directions for reducing waste disposal and that will be certainly repaid in the long term. Currently, the category of the recyclable resources that have a real consumer demand includes waste of metals, glass, wood, paper and tires.

A waste management company accomplishes waste processing, re-involving them in the production process, and the profit from the secondary waste sale exceeds the fees for the disposal of production and consumption waste (Figure 2).



The structure of the indicators and the income from the secondary waste sale is shown in Table 2.

Table 2: Indicators of the secondary waste processing			
The name of parameters	Unit	Volume of processing	Cost of waste processing thousand rub.
1	2	3	4
Realization of secondary waste		4,877.6	7,728.1
Metal waste, type 3A	tons	2,785	3,743.0
1	2	3	4
Metal waste	tons	327	3,515.0
Waste containing precious metals	g	12412	105
Mixtures of spent catalyst	tons	1,167	233
Used tyres	tons	14	8
Debris waste	tons	10	1,7
Scrap, oversize	tons	22	31,9
Used oil	tons	124	11,3
Wastepaper	tons	7,7	4,8
Household waste	tons	392,7	69,5
Wood waste	tons	28,2	4,9

Source: Report of environmental protection of Gazprom Production Astrakhan LLC

As a result of the industrial activity during the year alone, 22 thousand tons of waste, of which 20.9 thousand tons of subdivisions and 1.1 thousand tons from outside organizations, were transported and accepted for processing and storage. According to Table 2, only 4.9 tons, or 22.3% was processed which indicates the need to attract

large investments to ensure economic benefits from the waste management activities. It is necessary to encourage the development of capacities of waste transporting and sorting, as well as modern facilities for processing of secondary raw materials, in the Society. But such a prospect in our opinion will remain a wishful thinking in the decisions and plans for the strategic development, not only because of the general economic situation in the country, the high level of operating and maintenance costs (which reduction can be achieved through the introduction of effective innovations), the difficulty to attract the necessary investment resources for the modernization and development of production, etc., but also the organizational and legal reasons. According to the diagram (Fig. 2) the fee for waste disposal for the year amounts to 659.5 thousand rubles., and the income from the sale of only 22.3% of this volume is 7728.1 thousand rubles., i.e. at persisting in the main production volume and the existing rate payments for waste disposal it is possible to extend areas to store and produce new dumps for more than ten years. The confirmation is the fact that the amount of the capital investment aimed at protecting the environment and natural resources of the company's own funds amounted 1086 rubles in the year 2010.

Conclusion

Support for innovation should become the core of the institutional development of the Russian economy, as well as the foundation of the state industrial policy. As part of a systematic approach of the state innovation policy it is necessary to increase the volume of the state funding of science, further filling the legislative framework of research, including the intellectual property, support of development of innovation sphere infrastructure.

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