Improving the Quality and Comprehensive Utilization of Raw Materials as the Key to Successful Economic Development of Coal Mines

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ABSTRACT

The main indicator for any developing country, and Russia is not an exception to the rules of the world economy, the industrial component of the economy is the fundamental rule for its development and the opening of new markets for the coal industry, the authors emphasize the economic development of this industry and its impact on the economy of the country. The article provides a description of the possible directions for innovative improvement of the Russian coal industry. The possible use of extracted raw materials is examined. A scheme of a possible operation of the coal companies is designed. In the article considered the possible variants of coal enterprises development. The complex use of extracted raw materials are described. In the theoretical part of the article we characterized the survey shows while when used three, four stages of processing of the necessary crushing and screening equipment, to obtain crushed stone with excellent quality is possible. In this opinion, the quality and range of products will depend on the set of equipment. The article also suggests the stages of transition to a modern procedure for grant allocation: the selection of investment projects for the development of projects in the coal industry; Execution of calculations and granting of state subsidies for the development and modernization of mines and the sale of optimal depreciation rates for the coal industry.

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1. INTRODUCTION

The product quality can be attributed to a number of the most important indexes of the organization's activities. The better qualitative characteristics largely determine the success of the enterprise in market

conditions, the pace of technological progress, increase production efficiency, innovation, saving all the used resources.

It should be noted that the production of a high quality wins both the individual producer and the national economy, in this case the export potential and revenues of the balance of payments, the economic stability of the enterprise increase (Shevchuk, 2008).

In addition, special importance is the careful and rational use of natural resources. The solution to this current economic problem involves the development of efficient waste-free technologies by the integrated use of raw materials, which simultaneously leads to the elimination of huge ecological damage rendered "cemeteries" of waste. The concept of "waste production and consumption" for many material products becomes conditional. They become precious, sometimes scarce raw materials.

At the same time, many industrial wastes and urban agriculture, which is of great practical interest, are not sufficiently in demand for a variety of reasons. In this respect, the promotion of possible areas of application of the waste and the achieved effect is important.

In the legislation a number of countries the main purpose of a state recognized by the environmental protection and the implementation of laws, establishing rules for the collection, recycling and waste reduction as the main sources of environmental pollution and as a consequence controlled very strictly.

2. THEORETICAL ANALYSIS

The producers-insight of the necessity of a focused, painstaking work for improving the quality of products, a course of action for the quest for new materials, which might be innovative, for the production of their output goods is the basis for long-term economic prosperity.

If you examine quarries, producing crushed stone, you will see that they use the rocks which lie at a depth of approximately 40-50 m or are outcropped. The color of this rock may vary from red to light gray.

The quality of the products directly depends on the host rocks and the degree of processing. Even in such "normal" fields we may find the product of a poor quality. And this product is distinct in a high price, which is formed by a great number of presale preparations.

But over the years in the Rostov region, mining enterprises have accumulated a large number of man-made materials, which will not yield in the quality of products to "traditional" quarries with the proper way of processing.

Technogenic raw materials (deposits) are unused products of the mining and processing of mineral raw materials evolved from the mass of extracted mineral during the process of field development, dressing and chemical and metallurgical processing. These residues after pre-treatment, and sometimes without it, can be used in the production or consumption (Mikhailov, 2012).

Furthermore, working mining enterprise can also use these raw materials in a complex, not referring to the cost price of the contents and formation of waste rock dumps.

Themselves coal enterprises are on a par with the largest industrial polluters. The harm to the environment is applied not only directly in the mining process, but also many years after its termination. The source of this contamination is the waste heaps. However, just to reclaim the slag heaps is impractical,

because the heaps are rich sources of valuable raw materials and fuels for many processes. Despite difficulties and risks, the prospect of using raw dumps is obvious, because their utilization allows to solve simultaneously a number of economic, social and environmental problems.

Directly in the extraction and enrichment of coal by-products serve mining and overburden, waste coal. Mine dump breeds most often represented by mudstones, siltstone, sandstones, and limestones.

The metabolized mudstone, siltstone, and Sandstone have a high density and, as a rule, it is difficult soak in water. They can be attributed to non-plastic or low-plasticity clay raw materials.

Compared with the clays of the mudstones have higher strength, which is 2-4 MPa in situ. The siltstone compared to the mudstones have a more coarse-grained structure (Dvorkin & Dvorkin, 2011).

For use in the manufacture of building materials of most interest are waste coal, characterized by the lowest fluctuations in composition and properties. Waste coal is usually represented in the form of lumps the size of 8-80 mm.

Depending on the method of producing wastes and their class size content of the coal, and accordingly the chemical composition and the number of plasticity vary within wide limits. The largest number of coal waste is flotation. Waste gravitational enrichment of class 1 – 13 mm number of coal may reach 5%, and the waste class 13 – 150 mm 2-3%. The waste of coal the carbon content ranges up to 2%. A very important limiting factor in the use of waste of enrichment of coals is the presence of sulfur. Its content, for example, in rocks of Donbass reaches 3 – 4%. Moisture content of waste depends on the method of obtaining them. The natural moisture of the clay 4 – 5%. Waste flotation of coal extracted from the sludge tanks, have a moisture content 25 – 30%.

Unlike dump breeds of coal mines waste coal have higher carbon content, the more stable the material composition, lower content of Sandstone and a high content of shales, sulphur content increase and reduction of mechanical strength.

Products firing blank rocks related fields coals are burning rocks. Their varieties are Gliese-clay and clay-sandy rocks, burned in the bowels of the earth in underground fires in coal seams, and dumping the feather burning mining rock.

Natural deposits of burned rocks are widely distributed in different regions. The true density is 2.4 to 2.7 g/cm3, the average density is 1300 – 2500 g/cm3, a compressive strength of -20 – 60 MPa. On basic physical and chemical properties, they are close to clay, annealed at 800 – 1000 S0. Chemical and mineralogical composition of burnt rocks varied, but common for them is the presence of active alumina in the form of radicals dehydrated clay minerals or in the form of active alumina, silica and ferrous compounds. Unlike ash and slag burning rocks contain almost no glassy components and is characterized by high sorption capacity. The content of unburned fuel in glagah up to 2 – 3%, in a dump of burned rocks it can be more significant.

To burnt rocks along with the natural raw materials are burned-out and empty mining rock that contains minimal (less than 5%) amount of carbonaceous impurities and mineral clay-sand part, burned in varying degrees. Breed mixed with waste coal, oil shale, sulfur, etc. Under the action of air oxygen coal and sulfur oxidize and ignite spontaneously, and under the influence of high temperatures (up to 1000 S0) the rock is subjected to natural firing. Organic impurities thus partially burn out. The most intense burn of the breed

in the heaps of mines with katsushima or anthracite coals. The degree of roasting of burned rocks depends on many factors. Uneven flow of water into the hot rock layer, the uneven amount of air that is in contact with the surface of the rock in the waste heap, as well as a large number of small fractions, impeding the access of oxygen to the heat sources, leads to the fact that roasting occurs very unevenly, despite the high temperature in waste heaps. The result is a material of different degrees of roasting (from lightly-baked to baked) with different physical-mechanical properties. The heterogeneity of the material in the heap is one of its significant drawbacks. The particle size ranges from 40 cm to fractions of a millimeter. In heaps there are dense and porous varieties of burned rocks.

Wastes from the extraction and beneficiation of coal are mainly used in the production of ceramic wall materials and porous aggregates. In chemical composition they are similar to traditional clay materials. As a harmful impurity in them there is sulphur in sulphate and sulphide compounds.

Upon receiving the plastic brick way waste additive up to 15%. Introduction carbonaceous rocks up to a certain limit can increase the binding ability of the ceramic batch and especially the resistance to compressive forces. With a relatively high content of these species in the mixture (up to 20 – 30%) drastically reduced the binding ability of clay raw materials. Facilitating the migration of moisture increases the drying properties of raw. Introduction the optimal amount of fuel-containing supplements resulted in more uniform firing improves the strength characteristics of the products (up to 30 – 40%) saves fuel (up to 30%), and also eliminates the need for the introduction of the charge of coal and increases the productivity of furnaces.

The best additives in the ceramic mass is tailings anthracite coal. If the main ceramic raw materials used mudstones, siltstones or other breeds, products which after firing have a poor structure, non-frost resistant and have poor insulating properties, the carbonaceous wastes are used as persuasi and emaciated additives, which are introduced into the charge in quantities of 30 – 40%. For this purpose effective of the breed with the maximum amount of the burnable part and a high content of volatiles, which in the firing process do not participate, as removed from the flue gases before the temperature of their ignition. Productive additives to such ceramic raw materials can serve as waste from flotation enrichment of coal gas.

It is also possible to use this raw material for the production of high-strength crushed stone, as mentioned above the host rock may be different. This sandstones, limestones, mudstones, siltstones.

Just need find the very "balance" in the treatment. And the output products will be of a high quality that differs from the similar ones only in color. Specifically the color will vary from gray to dark blue. It concedes to competitors by no other qualitative aspects.

The survey shows while using three, four stages of processing of the necessary crushing and screening equipment, to obtain crushed stone with excellent quality is possible.

In our opinion, the quality and range of products will depend on the set of equipment.

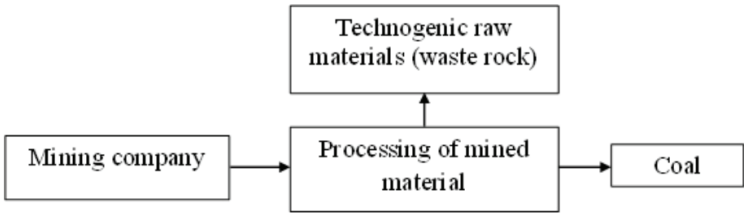

Figure 1: The standard scheme of work of the coal companies

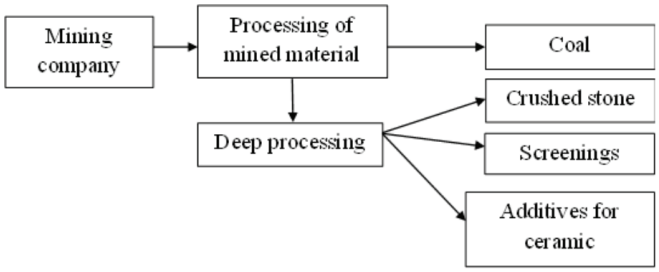

Figure 2: The scheme of work of the coal companies in a new cycle

Our solution of the problem of non-waste production is recycling, when at the end of technological process the raw material is missing, as it manufactures products which have consumer properties.

The development of scientifically based classification for the integrated use of technogenic raw materials and mining wastes is an important element of improving the system of planning of mineral resources, such as coal and any other industry.

Of course, it is possible to obtain not only the rubble, screenings and supplements to any industries in addition to coal from man-made materials or mined shaft material. But our research aims to obtain less cost-efficient technological scheme, which is possible to get a quality product with.

One of the variants of the classification of the existing promising directions of use of mineral wastes is shown in Figure 3 (Yurchenko et. al., 2010).

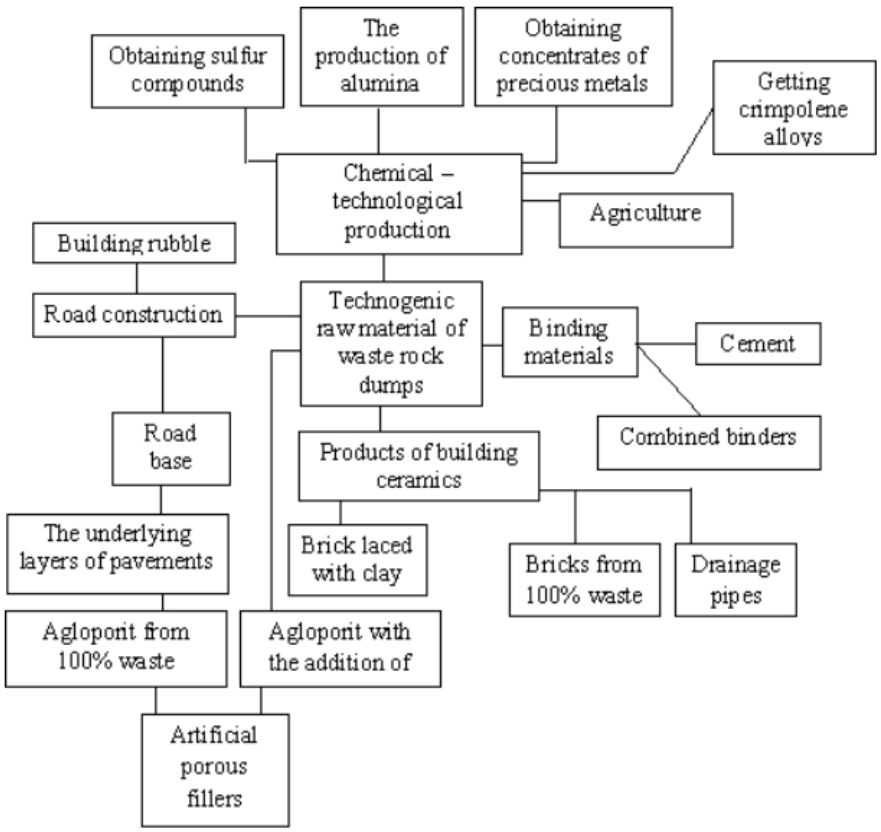

Figure 3: Classification of mineral waste coal in the directions of their possible use

Specific product color (crushed stone, gravel, etc.), in our research, can be explained by the presence of dark cement. But as a result it is the same Sandstone, only "modified" on the habitual background of the familiar one.

There is no any danger in use of this product. This statement is confirmed by laboratory tests.

Another difference of products against similar ones is the low selling price. As several elements forming the total cost will miss in the non-standard quarry. Whereby the low price of goods can be achieved.

Mineral resources are among exhaustible and non-renewable natural resources, so the main problem and feature of their conservation is the rational and integrated use in the process of exploration and development in order to prevent wasteful and thriftless exploitation of mineral resources, losses of mineral raw materials (Kuznetsova, 2011).

In the legislation of a number of countries the main purpose of a state is acknowledged to be the environmental protection and the implementation of laws, establishing rules for the collection, recycling and waste reducing as the main sources of environmental pollution are controlled very strictly.

Regulatory framework of environmental protection in Russia is determined by the Constitution of the Russian Federation, Federal laws, legislative acts, government decrees, decrees of the President, sanitary and construction norms and rules. All citizens of the Russian Federation have the constitutional right to a favourable environment. Environmental protection and ensuring environmental safety are governed by the Federal laws of the Russian Federation.

The legal basis for the use of production wastes and the mined natural resources is the Subsoil Act" from 21.02.1992.

The Subsoil Act regulates relations arising out in connection with geological studying, use and protection of subsoil in the Russian Federation, its continental shelf and also in connection with the use of waste mining and processing industries related to it, peat, sapropels and other specific mineral resources, including underground waters, brines and brine of salt lakes and bays of seas. It contains legal and economic basis for rational use and protection of natural resources and protects the interests of the country and citizens of the Russian Federation and the rights of subsoil users.

As a consequence, the efficiency of the economy is expressed by reduction of material production, decrease unit of output in specific consumption of raw materials, fuel, energy and other material costs. In a number of sectors improving the efficiency of material resources' use is reflected in the increase in yield with each unit of consumed raw materials. The struggle for the reducing of material production is of great economic importance (Kushlin et. al., 2010).

The range of use of the recycling product can be wide. That is why the integrated use of raw materials may become a factor which will increase competitive capacity of the coal organization. Because the multifaceted production gives more chances for sustainable development in the modern market economy.

But in addition to expand the range of products of the coal enterprises, it is theoretically possible to increase the competitiveness through organizational and managerial measures.

The coal industry is one of the most labor-intensive industries. Social responsibility in the industry to society is crucial, especially in the field of reduction of workplaces and salaries. Given these circumstances,

in modern conditions of development of economy it is advisable to implement the practice of development and application in coal mining industry of the contract. In fact, industry contract in the coal industry will be implemented in the form of public-private partnerships in many areas. With its help a concrete dialogue between business and government. Moreover, the mutual obligations and claims against each other regarding their possible failure to become absolutely specific.

Industry parties can be the government of the Russian Federation (Minenergo of Russia) and the coal business (in the face of major coal companies, which constitute more than 70% of annual production). The main part of the industry contract is of indicative five-year plan prepared and approved by the parties.

It should be noted that, keeping the tradition, the issues of cooperation of the Russian coal miners and machine builders are under constant attention of the Ministry of energy, where through the branch head of the Institute provided methodological guidance, supervised and is coordinated their interaction, systematization and synthesizes accumulated experience.

The idea is the development of reliable and mutually beneficial cooperation of the Russian coal miners and machine builders are based on the principles of public-private partnerships, stated in a policy and programmatic government documents.

Co-financing of works within the above mentioned programs are carried out with attraction of means of the budget of the Ministry of energy (typically no more than 20% of the total cost of each work) and from private investment sources of participating enterprises implemented innovative projects.

It is quite obvious that borrowing state budget financial resources in the implementation of these intersectoral innovation in a relatively close future (as a rule, the implementation period of the projects does not exceed 2.5 years) repeatedly compensate formed scientific and industrial potential, the creation of new and effective jobs, higher load on the infrastructure of the enterprise, additional tax deductions and other related positive factors.

Russia has a large potential for the development of many forms of PPP, but its practical implementation requires the solution of several fundamental issues. First, both sides of the partnership should clearly understand that an effective PPP cannot be seen narrowly only as attraction of additional resources in capital projects at all levels of government. You need to consider the real interests of both parties. The specific mechanisms and partnerships, developed long-term world experience provide the Foundation for a mutually beneficial and responsible distribution of the powers of the parties, are not prejudicial to the interests of each of them.

The main task now – to understand the peculiarities of the Russian model of interaction between government and business. In Russia there is a bizarre symbiosis of the non-liberal model of state capitalism, the remnants of the oligarchic model. Effective partnership really only with the full clarity and predictability of further development strategy of the country.

Theoretically, the mechanism of support of the enterprises of the coal industry is designed to solve the problem: safeguarding of coal sales by maintaining energy balance in the long term; implementation of direct production subsidies; complex social issues; prevention of environmental shifts. Therefore, the procedure of subsidies should be aimed at improving the efficiency of coal mining, ensuring self-sufficiency of the mine as possible self-financing. Such target setting changes in the dynamics of the structure of financing

of the investment Fund and the structure of state subsidies. In the first phase of subsidies, the process of achieving self-sufficiency mines of the state funds should be made available not only to cover current expenses here, the basis of investment-innovative model of development of the mine. In the second phase, when the mine sustainability, running costs themselves, public funding is directed to maintenance capital construction. To achieve this goal provided that the value of state subsidies is based on the principles of providing effective technical and depreciation policy.

The optimal parameters of a generic process should ensure the application of depreciation rates, based on the conditions and intensity of use of the equipment, permissible shelf life, the coal industry is about 3 years. The cost of coal when it is optimized because it minimizes the costs associated with carrying out capital and current repairs of equipment. If the pattern of the influence of generic process and the depreciation policy on the cost of coal will be taken into account in the choice of the project of development of each mine, such an approach will ensure the full value of the investments. Businesses that will be payback of the project in the future will not have the need for external investment in the provision of a simple generic process; a sinking Fund which will be created at the time of the recoupment, will be able to fully provide a replacement of the main equipment at the end of the period of its operation. Thus, the need for additional investment will occur in the implementation of capital construction or a new quality of the investment project.

Offered for consideration the following stages of the transition to the new order of allocation of grants: the review and selection of investment projects for the development of the mine; the calculation and granting of mine state subsidies for the modernization and renewal of fixed assets in the amount sufficient for the transition to the full method of reproduction, the full financing of the mine in a period of transition during which use of the optimal for the coal industry depreciation rates will increase the share of depreciation in the cost of production of coal; the yield on the optimal parameters of attenuation (after transition to an effective depreciation policy cost stability); the calculation and provision of government subsidies shaft when reaching a new level of cost and its structure; the introduction of rent relations.

3. CONCLUSION

The article considers the possible variants of coal enterprises' development. The complex use of extracted raw materials are described. The schemes of energy companies' work on the new cycle are adduced.

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