

SCIENTIFIC BASIS OF ORGANIZATION AND MODELING OF MINING PRODUCTION AS A COMPLEX ECOLOGICAL AND ECONOMIC SYSTEM

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Abstract

A difficult situation has currently developed in the main mining regions of Ukraine which is caused by extremely heavy load on the environment from the development of mineral deposits up to the level of ecological disaster. In these conditions, it becomes especially urgent to create the new approaches to such mining developments, which should ensure both minimum environmental damage and increase in the economic efficiency of production, which is the subject of research carried out by the authors. In this work, on the basis of the methodology of integrated approach to economy and environmental factor of mining production, the scientific foundations for the organization of cost-effective development with maximum use of the economic potential of natural resources, which ensures minimum environmental damage, were developed by the authors. The conclusions on the work concentrate the conceptual foundations of such approach as well as the principles, conditions and opportunities for its implementation with the current level of equipment, technology and methods of organizing the mining production.

Introduction

Ukraine is one of the largest mining countries of the world. On a production capacity and scale of mountain works its mining complex is included in four the largest among countries with the developed

mining industry. This complex is conducting in the structure of industry of Ukraine and its economy, by submitting one of the most large sources of the financial entering the state budget.

However lately the basic mining regions of Ukraine ran into a serious problem, consisting in that over the protracted intensive development of deposits of minerals brought to considerable violations of the state of natural environment in by Donetsk, Pridneprovsk, Kirovograd, L'vov-Volynsk coal pools, Krivorozhsk iron-ore pool, Nikopol-marganets pool. To beginning 2000 years these violations attained such scales, that the indicated regions appeared on verge of ecological catastrophe.

The followings displays have such violations: scale changes of the geomechanical state of bowels of the earth, which result in the mass moving and bringing down of surface, technogenous earthquakes, mountain-rock shots; that brings violation over of the hidrogeological state of bowels of the earth, causing the uncontrolled moving of considerable volumes of underground waters, to drainage of large areas of earthly surface, water-flooding of considerable territories, solinization and sources of drinkable water-supply; violation of chemical composition of air as a result of the troop landings of toxic and chemically active gases from work of equipment, explosive works and gas-outcoming of breeds, broken mountain works; change of chemical composition of soils as a result of their contamination the pulverulent particles of useful minerals and in passing extractive mountain breeds, which have cardinally different chemical composition from composition of soil.

All of these processes sharply put the problem of necessity of urgent decline of the techogenous loading from activity of mining enterprises on an environment, that decisions of problem of ecological safety of mining production and his enterprises.

1. Basic complications of decision of ecologically-economical problem

The decision of foregoing problem restrains a temper the followings factors: by absence of the scientifically grounded going near development, planning and introduction of technology and techniques which provide the decline of the negative influencing of

mining production on an environment; by the insignificant volume of technological and technical decisions which would provide ecological safety and economic effective development of deposits simultaneously; by absence of the scientifically grounded directions of development of mining enterprises in the conditions of intensification of production, complication of geotechnical and economic their operating conditions; by the low rates of conducting of researches of system-economic aspects ecologically safe functioning of mining enterprises.

Researches of row of organizations are devoted the decision of problems of ecologisation of mining complexes of Ukraine. The most meaningful fundamental results are got the group of scientists of such universities of Ukraine, as the Krivorozhsk national university, Dnipro National mining university East-Ukrainian national university the name of V. Dal, Donetsk national technical university and. During the last researches were 10 years conducted and the complex of developments of conceptually-theoretical and applied character is executed for the decision of this problem. These developments are taken in the general problem-oriented work «Development and introduction of high-effective technologies of ecologically defence orientation of production complexes of Ukraine» which includes developments on such directions: conceptual theoretical bases of the ecologically-economscfl going near providing and organization of ecologically defence mining production; analytical researches, laboratory and industrial experiments on the different aspects of planning of technological processes and mountain equipment for perfection of production processes in sending of decline of their harmful impact environmental and providing of economic efficiency of development; scientific grounded methods of calculation of parameters and methods of management the processes of guard of bowels of the earth, earthly surface, water environment and atmosphere at development of deposits; scientific bases of development of system-economic aspects of the complex use of natural resources, increase of ecological safety of mining production, organization of production and management enterprises; technological decisions on realization of development of deposits of minerals with the use of facilities, removing the dangerous

production troop landings ecologically; scientific bases of processes of cleaning and disinfecting of mine waters; to recommendation on determination of ways of further improvement of ecologically-economical activity of mining enterprises.

Theoretical positions of this work served basis for development of new technologies and modernization of activity of mining enterprises which do not have analogues in world practice and oriented to the decline of the negative influencing of mining production on the state of natural environment with the simultaneous providing of high economic efficiency of mining. The substantive conceptual provisions of this work are set forth below.

2. Features of innovation-investment activity in area of mining production, as basis of introduction of ecologically defence technologies

One of major terms of providing ecologically of the safe and economic effective functioning of mining production is the grounded innovation-investment policy of enterprise, taking into account influence of ecological factor on parameters and results of development of minerals [6, 8]. Absence of account of this factor during organization, planning, planning and management of mining operations can result in serious negative economic and social consequences. The exact estimation of character of this factor and his displays in the concrete terms of development of deposits allows correctly to forecast all of its consequences (which can have catastrophic displays), plan, organize and develop economic activity of enterprises, providing high economic results at minimum negative influence on a natural environment.

Actuality of account of ecological factor in activity of mining enterprises especially increases in market economic conditions in connection with the necessity of decision of contradictions of economic task on a joint «nature-market». This task arises up in connection with natural incuriosity of business enterprises in the investment of financial means in nature protection measures, for lack of line arrived, to proloungation in time of offensive of responsibility for the inflicted ecological harm, lacks of coincidence of interests of enterprises and recipients (population, other enterprises, state). The

special attention is required by the questions of management the processes of technological innovations, as the last not only determine affecting of production natural environment, but indissolubly related to control of inventories of natural resources and their rational use (booty without losses and decline of quality), that determines the economic results of development straight.

Market relations stipulate the necessity of consideration of ecological problems of mining production from point of ecologically-economical approach. It is special underlined in conception of steady ecologically-economical development, formulated in the «Global program of actions - Notice on 21th age», accepted at conference «environment and development», conducted under an aegis UNO (Rio de Janeiro, 1992). Positions of this program are required by introductions of the system of estimation of activity of industrial enterprises from point of prevention of possible negative ecological consequences from their functioning. Thus, grounded, that achievement of the put purpose is impossible a way only technological development, for this purpose it is necessary to subordinate it achievement all of innovative activity, because ecological problems engulf all of complex of technological, technical, organizational, scientific, economic aspects of production. Only by the complex going near his innovative development it is possible to attain balance as between society, production and natural environment.

To the present tense within the framework of modern innovative strategy in industry folded two on principle different going near the decision of its ecologically-economical problems. The first direction is direction of investment of financial means in «de bene esse clean technologies», when simultaneously with a basic production nature protection measures are conducted (for example, building of cleansing buildings, research ecologically of safe places of storehousing of wastes, application of the systems of disinfection (recuperation) of wastes, special measures of defence of environment from powerful production factors (shock waves from industrial explosions, noise affecting environment from working mightily technological equipment, radiation, electromagnetic radiation etc.). However, at such approach considerably financial production inputs increase and unit of mining enterprises cost. In addition, as world

practice showed, limit of harmful influence of production on an environment by a way only isolations of production processes, does not result in the substantial improvement of the state of environment and cardinal decision of this problem, braking of negative processes is here arrived at only. Another negative aspect of such approach is that in certain terms financial expenses on nature protection measures can appear higher than expenses on liquidation of consequences of harmful influence on an environment and these measures will be economic unjustified although ecological harm will remain high.

More justified from the economic point of view is other going near the decision of ecologically-economical problem, namely is the ecologically oriented restructuring of industries of industry of exploiting natural resources. Under restructuring the change of character and methods of production-economics activity of enterprises is understood. The purpose of such restructuring is: minimization of volumes of engaging in exploitation of natural resources (supplies of deposits) at the receipt of necessary amount of commodity products; reduction of volumes of wastes at the production of basic goods for чeт of the most complete extraction of useful component from the obtained source of raw materials; application of technologies, eliminating harmful influences on an environment at implementation of technological processes (for example, passing to the biological kinds of fuel, nonexplosion separation of useful mineral etc.), in case formation of wastes the last must in good time join in the single production chain of their use as sources of raw materials for other productions.

Innovative activity of enterprises in the conditions of restructuring must execute the followings functions: acceleration of structurally-technological alteration of production; decline of ecological risks at introduction of innovations; increase of level of skilled and scientific and technical potential; providing of co-operation of science, production and financial-credit sphere. Taking into account the last function evidently, that «ecologisation» process of structurally-technological alteration of enterprises must be examined in indissoluble connection with innovative and investment activity.

It is necessary to mark that besides realization of the ecologically

oriented restructuring of basic production of industrial enterprises, a large value is acquired by reformation and development of market mechanisms of ecologisation, namely creation of favourable organizationally-economic terms for an innovative enterprise in area of ecologically safe production. From all of types of innovative activity their special kind was already selected in this direction – ecologically clean technologies. With every year amount of users ecologically grows clean products in the whole world, including in Ukraine. A basic task here consists of creation of terms, when enterprises, realizing such technologies, will be able to get an economic effect from their activity commensurable with the sizes of capital financial investments in a production.

3. An economically-lawful mechanism of providing of activity is in ecologically defence activity of mining enterprises

A large value in ecologically-economical direction has legal base. Due to realization of effective economically-lawful mechanisms of management an economy such terms of production activity of enterprises, at which to the managing subjects is economic advantageous to observe a nature protection legislative base, reduce the level of harmful influence on a natural environment, must be created, to warn (but not to liquidate) his appearances, search the methods of rationalization of production due to the use of new resources-saving and ecologically defence technologies of mining, and also technologies of processing of its by-products.

The economic mechanism of ecological management, certain the base laws of «About to the guard of natural environment, operates in Ukraine». Due to the economic instruments of this law bases of requiring payment natureusing and economic tool are worked comes forward the unique mean, allowing to provide the receipt of financial resources, necessary for the removal of harmful influence on a natural environment. However, the substantial lacks of domestic economic mechanism of ecological management are the followings: he is unable to interest commodity producers in conducting of nature protection measures due to the personal money funds; not corresponds with other economic indicators and levers of economic activity; it is not enough operatively and effectively reacts on the

dynamics of economic and ecological processes in the state.

Claim of the economic going near a management natureusing in the state predetermines the necessity of scientific development and introduction in practice of reliable economically-lawful mechanisms of making healthy of natural environment at all levels of management. It is thus expedient to carry out introduction of economic mechanism of adjusting of natureusing not only by administrative instruments, but also «economic dictate», that creations of such terms for production activity, at which to the managing subjects it was legislatively regulated and achievement of ecological aims is economic advantageous in all of economically-lawful and production sphere of his activity. Claim of the economic going near a management natureusing and guard of environment does not mean the waiver of administration-lawful methods of management. Government (administrative) control must be in an equilibrium with the methods of the market (economic) adjusting. Simultaneous realization of economic measures, strengthening of state control and adjusting, can stimulate enterprises to inculcate new ecologically defence technologies, instrumental in the cutback of spending of facilities of state and local budgets due to setting to of load of ecological responsibility on enterprises, to the economy expense of resources (because of introduction of the reserved technological processes), change of orientation of investing on ecological aims, to the improvement of the administrative ecological adjusting.

Presently positive tendencies, directed on introduction of conclusions of conception of steady ecologically-economical development, register in the industrial regions of Ukraine. It means that the process of gradual building (integrations) of ecological factor began in the system of modern production, and also in the economically-lawful mechanism of functioning of market. An ecological enterprise develops as a result of it, and, consequently, the market of ecological business is formed. That the sphere of ecological technologies becomes the object of profitable commercial activity. As a result of it there is a certain infrastructure, including a few independent directions business of activity in area of mining production, main from which followings: creation ecologically of safe and resource-saving technique and technologies of realization of

development, providing a high performance and economic efficiency of implementation of technological processes at minimum negative influence on a natural environment; utilization of wastes of processing of obtained useful minerals (wastes of production) as sources of raw materials for other productions; use of the materials got in passing; production of devices for control of the state of environment; ecological reproduction.

4. Direction of utilization of wastes of mining production and his economic value

It is necessary to mark that mining industry of Ukraine and its enterprise carry monoproduktive character (booty of one concrete mineral at development of deposit) mainly, which the far of hard, liquid, gaseous and aerosol wastes appears at. That mastering of deposits carries complex character neither on the use of the obtained source of raw materials nor on the use of the materials got in passing. In accordance with conception of steady development its converting must one of actual directions economic activity of enterprises of this production become into multifood.

In Ukraine perspective and financial viability of the use of different materials, got during realization of basic production is more than twenty years probed already, and developed row of concrete recommendations on development of this direction. In theory, experimentally and experimental a way set and grounded possibility of the use of such products as raw material both for an own consumption mining enterprises and for the needs of national economy. Speech goes about the use: wastes of production – for the book-mark of the produced space of mines (sands, clays, rubble stone), for the production of build materials (agloporet, ceramzeet, cuts, clays) and ceramic wares, in travelling and hydrotechnical building, as a fertilizer in agriculture; liquid wastes (mine waters) – as a source of economic and drinkable water-supply, in irrigational aims, as a source of lowpotential warmth and other.; gaseous wastes – as a fuel, electric power, priming of cars, for the production of chemical goods.

Results of theoretical, experimental researches and experimental tests, showed that a multifood production at the complex mastering

of deposits was the substantial factor of decline of basic unit of mining production cost, because the additional types of commodity sources of raw materials turn out in this case. Due to this factor the prime price of basic commodity raw material goes down on 10-20% and more. Pre-condition of drawing on this reserve is a presence on Ukraine from the developed industrial infrastructure of potential users of passing products and their participating in investing of projects of utilization of the materials got in passing from a mining production.

Development of industry of processing and utilization of wastes on modern technical and technological basis in combination with the innovative model of steady development allows complex to decide the ecological, economic and social questions of alteration of economic mechanism of mining industry. To the most essential constituents of this aspect behave: engaging of the second raw material in an economic turn; development of the specialized powers on processing of wastes; issue of the special equipment for utilization of wastes; production of new types of products (build materials, fuel bricks, methane and other); introduction of control the system by utilization of wastes within the framework of created technoparks and innovative-technological centers; increase of technological level of basic production of mining enterprises due to introduction of front-rank scienceful technologies; conducting of the special research works on the having a special purpose programs; creation of new workplaces. From the resulted list of questions evidently, that in realization of directions innovative strategy of development of mining industry an important role belongs to science. Only with its help the technical retooling of active production vehicle of enterprises and transformation of industry can be continued in polyproductional.

An important form, specifying practical development of industry of processing of wastes, is organization of enterprises of small business (in composition mining enterprises and combines or functionings independently). By priority direction of development industry of processing of wastes, infrastructures of its service on the basis of progressive scienceful technologies there is creation of technological parks (techoparks).

5. Role of state administration in the decision of problem of economic tasks ecologically to safe activity of mining enterprises

The acceleration of practical realization of measures on creation of polyproduction requires development of legislatively-normative base and mechanism of government control of nature using with addition or making alteration in a code about the bowels of the earth, Mountain law, law of Ukraine on «wastes» (in part of limitation or prohibition of booty of resources from the bowels of the earth, if in this region there are the second resources which suit to raw material).

Organization of account and effective state administration the rational use of natural resources, in economic activity it can engaging of wastes of mining production be well-to-do by realization of the followings measures: by development of the program of the use of natural resources which are obtained simultaneously and in passing with basic mineral resources; drafting of the State cadastre of the second mineral resources; by acceptance of the program of development of technologies of processing of wastes of production and mineral materials obtained in passing. The decision of the indicated problem does not have technological limitations and depends only on the volumes of financing.

The decision of most problems which a mountain enterprise runs into in a great deal depends on a public policy in this sphere and efficiency of functioning of instruments of economic mechanism of state administration in the field of using the bowels of the earth, and similarly from the relation state and mining enterprises. On scheme 1 the structure of connections and relations which must be realized for providing of efficiency of mechanisms of state administration in area of using the bowels of the earth and realization of the ecologically defence functioning of mining enterprises is presented. For the decision of the indicated problem the use of the followings organizationally-economic instruments is needed: development of functions of audit; risk estimation (financial and ecological); guarantees from the side of the state for an investor; tax deductions for a mountain enterprise; regional coefficients.

We will consider each of these instruments more in detail. Necessary and expedient is introduction of mechanism of audit on

the first stage of process of preparation to delivery of license to realization of activity in area of development of deposits of minerals. It is thus necessary to conduct the followings types of public accountant estimation: geological, geophysical, hidrogeologics study of territories and determination of their prospects for a search and secret service of deposits of minerals; a geologically-economical audit is an overvalue of present fund of minerals on economic and ecological criteria and monitoring of raw mineral-material base; an ecological audit is research of the state of geological environment and development of dangerous exogenous geological processes. On the basis of results of audit the feasibility study of development and exploitation of deposits must be executed with the purpose of determination of their investment attractiveness.

Feasibility study – allows to define the amount of monies on geological works which must it will be be expended on realization of development. Information on commercial profitability of using the bowels of the earth must become a base for determination of level of financial risk. It will allow the state to indemnify itself against economic losses in the process of grant of privileges a mountain enterprise.

The level of ecological risk also needs to be taken into account in the process of acceptance of administrative decisions. In Ukraine yet finally the effective methods of calculation of level of ecological risk are not developed and, accordingly, the mechanism of ecological insurance does not work. This direction is examined as one of effective organizationally-economic instruments in the future. The conclusions of audit and technically-economical estimation, except for the state, also will be useful: to the investor for a decision-making in relation to an investment facilities in creation and development of mountain enterprise, and to finansial-credit establishment for the ground of expedience of delivery of credits for realization of projects on creation of enterprise and providing of his production activity.

After treatment of the got results and information as evaluated by the level of risk, owe its systematization is conducted and formed regional, and also national informative systems in the field of using the bowels of the earth.

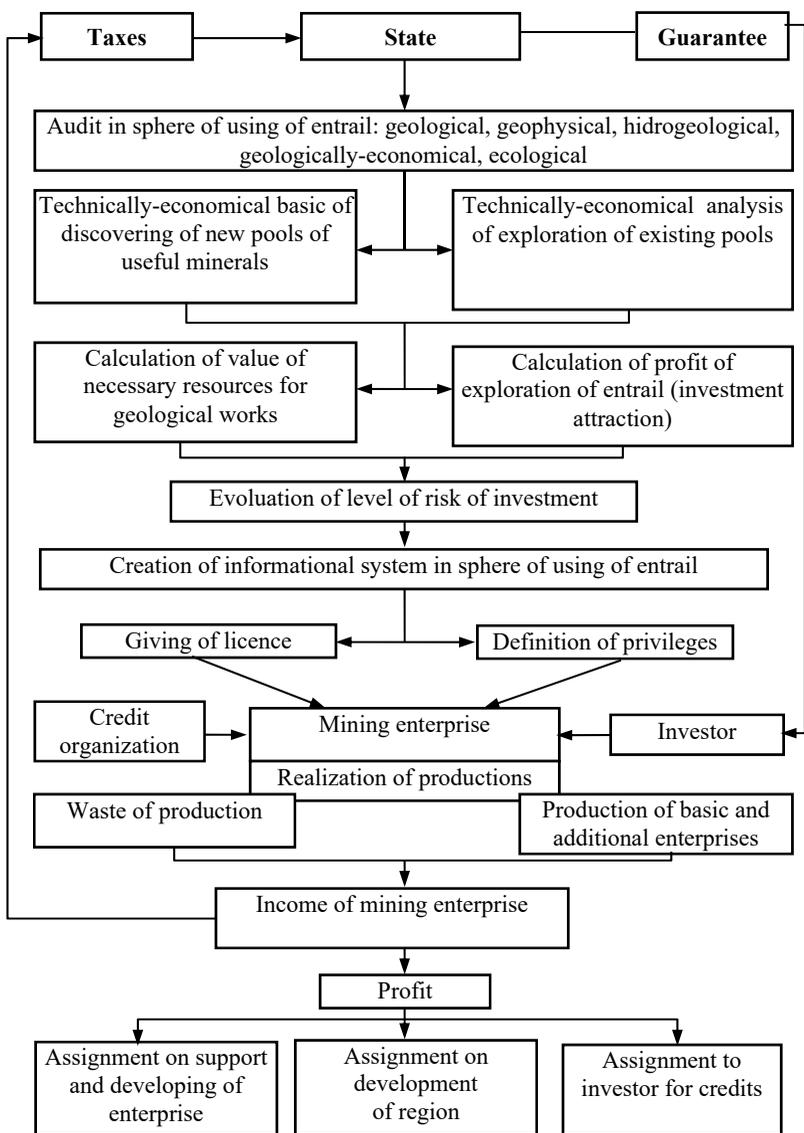


Fig. 1. Structure of connections “State – Mining enterprise”

The public specialized organs of power give out a license to mountain works and determine a requirement in privileges for a separate enterprise taking into account geological, hidrogeological, ecological, economic terms.

6. Basic indexes, reflecting efficiency of ecologically-economical measures

Coming from described higher, there is a necessity of quantitative ecologically-economical estimation of nature protection activity in area of mining production and his efficiency. Such estimation can way of life carried out on the basis of comparison of economic results of production with the volumes of consumable natural resources for realization of production and by the level of the tecnogenous loading on an environment from his activity. As a result of it the change of having a special purpose options and estimation of innovative strategy of development of production is required, when taking into account the traditional estimation of economic efficiency of innovations the necessary and priority is become by consideration of criterion of ecological efficiency.

Descriptions of ecologically-economical activity of mining enterprises can way of life described plenty of indexes and parameters. However there is a row of indexes which are most representative and in the most complete measure describe a situation in the decision of this problem. We will consider such indexes.

Naturally-resource potential of Pr , characterized the volume of gross domestic product (GDP) in a value term, which can be got as a result of engaging in development of concrete deposit (or his parts) taking into account expenses, necessary on realization of development and realization of nature protection measures. Position at which nature protection measures provide the receipt of such product is thus taken into account (for example, due to utilization of wastes of production)

$$P_r = Q_m \cdot C_m - S_m + Q_p C_p \quad (1)$$

where Q_m – volume of commodity product, got as a result of working off the supply of deposit or his part; C_m – price of commodity product; S_m – sum of financial production inputs commodity blown

through; Q_p – volume of commodity product, got as a result of nature protection measures; C_p – price of commodity product, got as a result of nature protection measures.

Naturecapacity of economy – characterizes a type and level of ecologically-economical development. Select two levels of indexes of natureful: macrolevel (all of economy) and productive (industry).

On a macrolevel under naturecapacity l understand the expenses of natural resources (or resource of N) on unit of GDP V , national income et cetera Measuring of these indexes can be made both in a cost form and by a naturally-cost.

$$l = N / V \quad (2)$$

At of (productive) a particular branch level indexes are determined the expenses of natural resource calculating on unit of eventual products of V_p , made on the basis of this resource:

$$l = N / V_p \quad (3)$$

Natural resourcereturn O is a size, reverse l

$$O = V / N \quad (4)$$

Among indexes, included in a formula (2), there is GDP which is traditionally utilized in a world economy for the estimation of economic development of countries. He is expected by a method by the sets of compatible national accounts. The tendency of basic orientation is presently noticed at the calculations of results of functioning of economy only on GDP. However, from data of UNO and World bank this index does not reflect veritable economic realities, as does not take into account the overall cost of harm from depletion of natural resources and contamination of environment (ecological aspect). Investigation of the first failing is that activity, directed on liquidation of ecological harm, is taken into account in GDP as contribution to the increase of welfare of country. For example, at the receipt of wood the forest is destroyed. Facilities, rescued from the sale of wood as an income, joins in GDP, but harm, inflicted nature by elimination of the forest, is not taken into account here, harm to the air pool (to the cleanness of air, amount of oxygen), soil waters, биоразнообразию and other As a result of it there is a paradoxical situation, when high GDP does not yet mean that a country develops steadily, because a great deal depends on that, due

to what factors arrived at his high value. Consequently, adjustment of method of calculation of this index is needed. This conclusion is supported in conception of steady development, i.e. for determination of net gross product (NGP) it is necessary to subtract from GDP a sum ecological harm (EH) and charges on renewal of natural environment (P)

$$NGP = GDP - EH - P \quad (5)$$

In the light of written, the World bank in order of experiment already began to assess the economic situation of countries on a new method by an index «index of veritable economies». Calculations, executed on a new method, show that many countries, oriented to the booty and export of raw material does not get the positive increase of economy.

The observance of the criteria resulted higher is closely related to unsolved while, but by an important problem for the vital functions of society – by the problem of resource-saving. This problem is the result of the economic state of affairs in connection with narrow-mindedness of natural resources. Term «resource-saving» underlines the base idea of evolutionary economy, formulating a new paradigm in control the system by an enterprise, namely idea of minimization of the use of natural resources as an instrument of increase of efficiency of control the system by an enterprise. Its realization is examined as one of basic modern directions intensification of production.

The most evident index in regard to resourceusing is an index of rationality of the use of resources

$$K_n = 100\% \cdot Q_h / Q_n, \quad (6)$$

where Q_h – is an amount of resources, utilized a production; Q_n – is an amount of resources, withdrawn from a natural environment.

The special case of this index is a «index of plenitude of the use of matter» within the limits of region which is attitude of volume of the made products toward the volume of the consumed matter for certain period of time.

As a summarizing index utilize a coefficient, showing the stake of extraction of useful components from the certain amount of the obtained raw material in a value term

$$K_k = (C_n / C_c) \cdot 100\% \quad (7)$$

where C_n – is an output, actually made from mineral raw material value; C_s – is a total value of components in raw material, taken for a base.

Besides the considered two indexes of the use of natural resources, in the conditions of mining industry additional coefficients are used on the separate types of wastes, on the value of which the economic results of mining production depend straight. By basic indexes describing position with wastes are: on hard wastes is a coefficient of nonwaste production on the breed of K_p , specific rock yield taking into account its use of K_{pi} , coefficient, characterizing correlation broken and recultivated earths γ

$$K_p = q_1 + \frac{q_2}{Q} 100\%, \quad (8)$$

$$K_{pi} = Q - \frac{q_1 - q_2}{D}, \quad (9)$$

$$\gamma = S_n / S_{ot}, \quad (10)$$

where q_1 – amount of breed, utilized as book-mark material or for other aims; q_2 – amount of breed, utilized as raw material for making of build materials, for filing up of areas of bringing down etc; Q – general amount of breed, appearing as a result of conduct of mountain works; D – annual booty of useful mineral; S_n – area of earths, recultivated and passed for the use agricultural or other to organizations; S_{ot} – area of destructured (subject of recultivation) earths

On liquid wastes is a coefficient of nonwaste production on sewages of K_v , level of the use of the waters taken away in passing on the production needs of K_{vi} , degree of cleanness of the thrown down sewages γ_e

$$K_e = \frac{g_1 + g_2 + g_3 + Q_1}{Q_o} \quad (11)$$

$$K_{ei} = (g_e / W) \cdot 100\% \quad (12)$$

$$\gamma_e = P / PAH \quad (13)$$

where g_1 – volume of the water taken away in passing for own production needs; g_2 – volume of water, utilized for the needs of

agricultural enterprises; g_3 – volume of water, utilized for the needs of contiguous enterprises; Q_1 – volume of upcast of the waters taken away in passing, proper the concerted norms of quality (volume of the normatively cleared waters); Q_0 – general volume of the water taken away in passing at a booty; W – general volume of the utilized water on production needs; P – actual maintenance accordingly of the weighed matters; PAH – the possible amount of harmful matters is maximum in water (accepted in accordance with the rules of guard of superficial waters from contamination sewages).

On the dust-gas troop landings is a coefficient of nonwaste of production on the troop landings in the atmosphere of K_v , degree of cleanness of the troop landings in an atmosphere γ_i

$$K_v = (M_y / M_o) \cdot 100\% \quad (14)$$

$$\gamma_i = C_{mi} / PAH \quad (15)$$

where M_y – total amount of the utilized harmful matters; M_o – is a general amount of outgoing (appearing) harmful matters; C_{mi} – maximal amount of matter of concrete kind in atmospheric air.

The possible amount of harmful matter is maximum PAH (according to sanitary norms)

A coefficient of nonwaste in a general view is attitude of mass of the utilized wastes toward mass selected in the process of production

$$K = 0,33 \cdot (K_p + K_e + K_v) \quad (16)$$

The resulted indexes reflect the degree of ecologically-economical efficiency of activity in area of defence of environment. However yet created the systems of such estimation which allowed most full and comprehensively to reflect all of factors and features of influencing exactly of mining production on an environment are, ecologically-economical consequences from this influencing, and also concrete measures on protecting of environment from such influencing.

Conclusions

Arising up lately in the basic mining regions of Ukraine the serious problem of the extraordinarily high technogenous loading on a natural environment demanded decision of a number of tasks, directed on providing of possibility of the further large-scale and

economic effective mining at the maximal decline of display of harmful for ecology production factors.

The analysis of terms which resulted in such consequences, and also economic and technological feasibilities which are possessed by the scientifically-industrial complex of Ukraine, executed authors showed that this problem can be decided. Its decision must be carried out on the basis of the new going near methods and organization of functioning of mining industry and its enterprises.

The successful decision of this problem is possible at development of measures on such directions:

- substantial expansion of innovation-investment activity of mining industry in the direction of investment of facilities in development and creation of innovative environmentally clean technologies of development of deposits and booty of mineral resources;

- wide introduction ecologically of clean technologies due to a transition in mining industry from a policy simply protecting of environment from the harmful influencing of production, to the policy of priority of technologies which eliminate or maximally reduce the level of influence on the environment of production-technological factors;

- creation the state of legislatively-legal base of activity of mining , stimulant their personal interest in an ecologically safe production by combination of normative legislative bases and economic stimuli as tax deductions, policy of fines and so on;

- stimulation of the complex mastering of deposits with providing of profitability from a multiproductive production due to engaging in processing of wastes of mining production, industrial use of the materials got in passing both for the internal use and for realization external users;

- creation of the single system of estimation of ecologically-economical activity of mining enterprises, allowing correctly setting the level of ecologically-economical efficiency of their functioning.

Complication and many-sided nature ecologically-economical problems so high, what only during complex realization of measures on all of the indicated directions realization ecologically of safe mining production is possible in activity of mining industry and its enterprises.