

Diversification of the Economic Foundations of Depressive Mining Region

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Abstract: The study is devoted to modernizing management mechanisms in order to increase the gross regional product and welfare of the region. The analysis of the self-empowerment of the enterprise on the use of methods, tools and instruments of production management of depressed regions. On materials companies Sadonsky lead-zinc plant simulated performance of alternative technologies for the extraction of metals. Proved the possibility of profitable production of major and minor products in the diversification of production systems based on a combination of traditional technology with laying hardening mixtures and new technology with the leaching of metals. The algorithm selection and diversification strategy formulated model for determining the economic effect of technological diversification of mining production.

Key words: Management, region, depression, technology, mining, metal, diversification, combining tab voids hardening mixture leaching model, the economic effect of mining production

INTRODUCTION

In post-reform Russia, the survival of industrial enterprises during the market development depends first and foremost on their own capabilities. Most of all, it relates to those enterprises that were planning ones and unprofitable prior to reformation. These enterprises include almost all mining companies of the North Caucasus. The depressed regions of the North Caucasus have the right to interact with other regions of Russia and make the part of the national socio-economic system.

In the mining industry the economic levers of acceptable level are used due to the stock quality and quantity optimization; to optimize the deposit development projects and substantiate the conditions of raw materials.

The inclusion of primary processing wastes in production is the most effective one in world practice as its production costs are already paid. The possibility of innovative technologies are widely used in the development of substandard mineral raw materials for example, at the mines of Bolivia, USA, Canada, CIS where the uranium mining industry enterprises of the USSR extracted metals from substandard raw materials and waste products on an industrial basis (Rundkvist, 2006).

MATERIALS AND METHODS

The purpose of management tools modernization study is the gross regional product increase and the region welfare improvement at the same time and on equivalent basis.

Own capabilities concentration directions are determined taking into account the range of new methods, mechanisms and instruments of production management use which include: the range of goods expansion; the strengthening of functional linkages for production units; the involvement of new raw materials in production.

The modernization effectiveness criterion for production facilities in the region are the economic indicators of regional enterprises. The simulation of alternative technologies values is performed according to the materials of SSTS companies.

The effectiveness of production facilities modernization is proved by the possibility of by products obtaining from modernized facilities.

The model determining the economic effect of technological diversification is developed on the basis of the performed research.

RESULTS AND DISCUSSION

The main cause of social instability is unemployment which up to 9 times more than an average Russian level. Grants make up at least half of the regional budgets and in Chechnya and Ingushetia they make up to 90%. By the economic potential, the gap between Russian regions reaches up to 30 times. The total share in Foreign trade turnover of Russian Federation and the volume of Foreign investment makes less than half a percent.

The subsidies did not allow to introduce advanced technologies here: for example, the energy saving

technologies with the filling of voids by hardening mixtures and the transition to the hydrometallurgical methods for metals extraction. Therefore, the termination of state support has led to the bankruptcy of former ferrous metallurgy leaders: Sadonsky lead-zinc plant, Tyrnyauszky tungsten-molybdenum plant and others. The responsibility of mining companies is increased by the fact that they are major employers and largely determine the social status of the regions.

The basis of the North Caucasus mining production company technological modernization may be nature and resource saving technologies of primary and secondary raw materials (mill tailings) extraction and processing (Golik *et al.*, 2008).

At the enterprises of the North Caucasus as well as in other regions of Russia the technological level of mining production went down to the level of 80th from the last century. The main source of budget replenishment is the mineral resource exports while in the pre-revolutionary and Soviet Russia, it was less than self-consumption.

The agriculture and recreational complex was determined as the strategy and objectives for the socio-economic development of the North Caucasus regions (Energy Strategy of Russia, 2011). The knowledge-intensive and employment providing mining complex gives the priority to the sectors with a minimum employment. The Caucasian tourism provides only 2% of the gross regional product and makes only 6% of Russian tourism.

Two main groups may be presented among the trends of economic efficiency increase:

- Accelerated profit gain due to mining of high-grade ore with the loss of the poor grade ones
- Discounted profit during the extraction of different grade ores at the fullest extent of subsoil use

The economic policy of mining companies includes the resource base increase during the revaluation of deposit reserves as the result of technology modernization. It is used by mining communities that according to outsourcing rights profitably mine raw materials lost by the main production and make a profit which was not made at expensive public infrastructure.

Since, the 80th of the last century the drillhole leaching at Semizbay field is currently the only technology. Mine refuse was leached for >30 years at Manybay field.

The production modernization effectiveness is determined not so much by the production increase from metal-rich areas but by the completeness of bowels use increase.

The regional economy is strengthened on the basis of enterprise consensus. Thus, the prospects of mining industry at the Republic of North Ossetia Alania include the merging of its mining enterprises with the enterprises of Kabardino-Balkaria and Karachay-Cherkess Republic with the coordination of actions in terms of production and selective extraction of ingredients from bulk concentrates. In practice, these measures are used to create a special hydrometallurgical plant with its branches in the regions.

The need to diversify mining production occurs during the release of metals decrease to the critical value according to economic criterion. The task of regional economic management development is to prevent it according to economic laws and best practices.

The basis for the strategic management of industrial clusters is an operative account of production condition and the environment influence.

The principle of strategic orientation is the collaboration between a head and an outsourcing company. Thus in RNO-Alania Sadonsky lead-zinc plant and the steel works "Electrozinc" OJSC may act as the customers and business companies may act as collaborating organizations.

Due to the advanced mining of areas with a high content of metals half of the stocks became unsuitable for traditional methods of underground development and requires the development and adoption of new technologies such as:

- The leaching of metals from ores at all stages
- The extraction of metals with the mechano-chemical activation

The diversification here is based on new raw materials involvement in the production of new raw materials the inactive resources that were not previously participated in the economic circulation and were harmful for the environment during storage by new technologies at the former mining area (Ermishina, 2011).

The new economic concept of metal production is developed by the following provisions:

- The technologies are evaluated by taking into account the resource status change, including the loss
- The state of economy is the consequence of the technology correctness
- The use of new business forms such as outsourcing

The profit from diversification is achieved if more metal is recovered from the depths at equal cost and the

success is achieved by increasing the completeness of mineral resources use by extending the life of enterprises and by the improvement of the ecological situation in the region.

The results of alternative technology modeling performance for the conditions of RNO-Alania are given in Table 1.

Table 1: Comparative indicators of metal extraction technologies

Indicators measurement unit	Technologies	
	Basic	New
Subsoil use: dilution (%) loss	30	0
Metal extraction by (%) mining operations	100	200
Production of zinc (t/year) concentrates	7000	10500
Concentrate cost: (rub./t)	10000	15500
lead	555	555
zinc	360	360
Cost: lead concentrates (ths. rub.)	3900	5800
zinc concentrates	3600	5600
annual metal mining	7500	11400
Performance by rock mass (m ³ /year)	170	340
The volume of developed (ths×m ³) voids per year	220	220
Tailings developed (ths×t)	800	-
Additional concentrates: (t/year)	-	440
lead, zinc	-	680
Cost: concentrates from (ths. rub.) processing	-	11400
Construction materials	-	200
Other metals (expert)	-	400
Preparation of water for boilers	-	200
Total cost of additional (ths. rub.) products	-	12200
Technology use results (ths. rub./year)	7500	19700
Annual savings (ths. rub./year)	-	12200
Savings from production (%) diversification	-	160

The prices of the year 1991

Table 2: RNO-Alania products of modernized complexes

Industrial complexes and traditional technologies	Innovative production technologies	New goods of production
Sadonsky L.Z.P. Metal mining	In-situ leaching of metals	Gel concentrate of metals and salts, construction raw materials, desalted water, chlorine, hydrogen, oxygen, acids and alkali
Sadonsky L.Z.P. Mine refuse processing	Combined mechano-chemical activation	Gel concentrate of metals and salts, the raw materials for construction, desalted water, chlorine, hydrogen, oxygen, acid and alkali
Sadonsky L.Z.P. Mine discharge processing	Electrochemical purification with electro dialysis desalting	Gel concentrate of metals and the salts, the raw materials for construction, desalted water, chlorine, hydrogen, oxygen, acids and alkali
“Electrozinc” OJSC. Pyrometallurgical processing of ores	Hydrometallurgical processing of ores	Metals and salts, building raw materials, desalted water, chlorine, hydrogen, oxygen, acids and alkalis
“Electrozinc” OJSC. Processing of metallurgy	Combined mechanical and chemical processing	Metals and salts, tailings by complex methods building raw materials, desalted water, chlorine, hydrogen, oxygen, acids and alkalis
“Kavdolomit” OJSC. Extraction and primary processing of dolomites	Mechanical activation in disintegrators	Thin and ultrathin dolomite components
Terek river. Extraction of sand and gravel materials	Washing of alluvial and bottom sediments	Gold and native metals, raw materials for construction, silt fraction and other components

The effectiveness of industrial complexes modernization for the mining industry of RNO-Alania is manifested in new products production (Table 2).

The economic situation in the regions is determined by the modernization success of industrial mining sector in order to adapt the production to unstable market demand and the sufficiency of own funds for the organization of new goods production.

The regional industrial complex development priority is the concentration on innovation activity and the compensation of market risks. The main diversification trend may be the production of metals from the lost raw materials (Golik, 2010).

In the context of national depressive region the economic management takes into account not only the regional features and the ability of manufacturers for innovation but also legal and other conditions of the regions.

For the regions of the North Caucasus the diversification links make the priority one: the use of substandard raw materials, the use of reserves for the flexible development of enterprise potential and the implementation of innovative projects for production development (Kozyrev, 2001).

The choice of diversification strategy is carried out according to the scheme (Fig. 1).

The effectiveness of management activities is provided by bringing current expenses to the future period at the rate of savings and taking into account the analyzed indicator weight according to joint characteristics by the study of standardized coefficient matrix.

The diversification of mining enterprises and comprehensive utilization of resources is 2-3 times more effective than the development of new businesses,

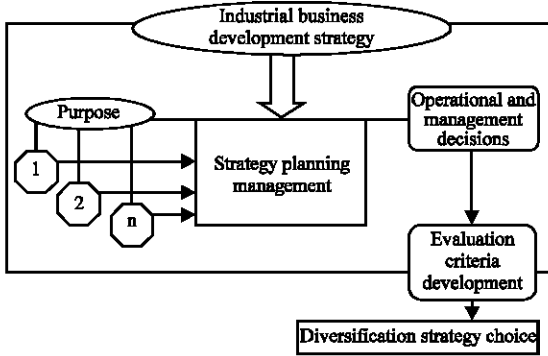


Fig. 1: Diversification strategy choice scheme

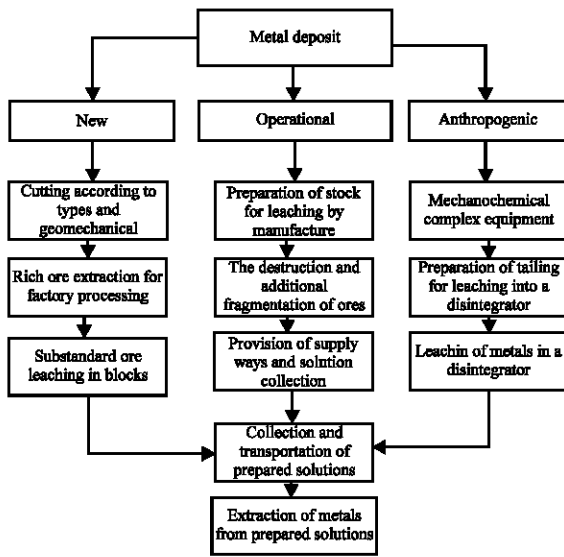


Fig. 2: Combined scheme of metal extraction

primarily due to the use of existing production assets and reserves, including, the ones which were considered as lost (Kaplunov *et al.*, 2003).

The main issue of technological diversification practical implementation at the mining enterprises of the regions becomes the cooperation of actors by taking into account the economic feasibility (Fig. 2).

The discounted profit from production, processing and disposal less the costs of complexes building for the environmental technology functioning may be used as ecological and economic efficiency criterion. The economic effect of technological diversification:

$$\vartheta = \left[\frac{3\delta}{A\delta} K_R^A K_P^T + \left(\frac{\Delta \vartheta_o + \Delta \vartheta_k}{A_\phi} \right) - \frac{3_\phi}{A_\phi} \right] A \times r$$

Where:

ϑ = The economic effect of technology combination within an industrial complex

- $3_o, 3_\phi$ = The costs per basic product unit the base metal and optimized technology options, cur
- K_R^A, K_P^T = The dynamic factors of production and time volumes
- $\Delta \vartheta_o, \Delta \vartheta_k$ = The given operating and capital costs of a basic and an optimized technology options, cur
- A = The annual production output according to optimized technology, u
- r = Market transaction risk ratio

CONCLUSION

The economic well-being of depressed mining enterprises may be achieved by consolidated diversification of mining and processing cluster areas based on a combination of traditional and new technologies.

The leading role of the volume and the quality of extracted ore increase is performed by leaching technology in blocks and a a disintegrator.

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