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ЭКОНОМИЧЕСКАЯ ОЦЕНКА МЕСТОРОЖДЕНИЙ ПОЛЕЗНЫХ ИСКОПАЕМЫХ НА ПРИМЕРАХ БЛОЧНЫХ МОДЕЛЕЙ ОТКРЫТЫХ ГОРНЫХ РАБОТ

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Аннотация.
Важнейшей частью процесса планирования является сравнение фактических и плановых значений за определенный период. Проверка и сопоставление запланированных и расчетных значений запасов полезного ископаемого, которые представляют собой блоки запасов, включенные в модель добычи, со значениями, идентифицированными во время добычи в тех же блоках, приводит к более точной оценке запасов. Это должно стать основой, на котором должна быть построена модель планирования добычи полезного ископаемого на конкретном месторождении. Мониторинг отклонений фактических значений запасов и добычи в блоках в течение / после определенного периода времени со средним значением по месторождению является другим важным фактором экономической эффективности. Идентификация систематической ошибки, например, видимое колебание значений добычи и качества полезного ископаемого вокруг некоторого уровня, подтверждает использование неподходящей математической модели определения химического или петрографического состава полезного ископаемого в отдельных блоках, а также неверную интерпретацию результатов анализа технологических операций при воплощении модели добычи в жизнь. Несмотря на то, что ежедневные планы основаны на тактических и стратегических планах, через определенный период нарастает расхождение между плановыми и реальными показателями запасов и добычи. Если фактическая добыча не соответствует пространственно-плановой модели запасов полезного ископаемого, необходимо обновить и модель, и планы добычи.

ECONOMIC EVALUATION OF THE MINERAL DEPOSIT ON EXAMPLES OF SURFACE MINING BLOCK MODELS

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Abstract.
A very important part of the planning process is the comparison between the actual and planned values for a certain period. The inspection and comparison of planned and calculated values of mineral deposits that represent blocks of reserves included in the extraction by a model, with the values identified during the extraction in the same blocks leads to a more accurate specification of a deposit model as a basis on which the extraction-planning model has been built. The monitoring of the dispersion of actual values during/over a certain time period with an average required value is another important factor not to be neglected. The identification of a systematic error, e.g. a visible oscillation of values around another than planned average value, proves for example: the use of an unsuitable mathematical model of chemical composition mixing in selected blocks; the incorrect analysis of technological operations during the transfer of mining processes into a model. Even though daily plans are based on tactical and strategic plans, after a certain period the reality starts diverting from plans. In case that reality does not correspond spatially to a planned status, it is necessary to update both the model and plans.

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1 Introduction

The evaluation of the economic effectiveness of the mining business belongs to the division of the recent economic environment in two segments. The first is the basic activities which should necessarily to be done to obtain a contribution from a project from the point of view of an optimum utilisation of the Earth, human and financial resources. The second segment is the contribution or minimum impact from the point of view of environmental protection. To set the mining activity in these both segments, the complex approach must be used. Meanwhile, most of works in the field of deposits evaluation are devoted to the first segment of mining only [1-5]. The minority of papers observe the issues of environmental segment of mining [i.e. 6, 7].

2. Examples and Results

Example 1: Let us consider an example of an open pit quarry in a limestone deposit with a quantity of reserves sufficient for 200 years of extraction at an estimated extraction rate of 1.5 mil. tons of raw material per year. The average content of the CaO in a deposit is 51.75%. Each year the extraction has been limited not only by the required quantity but also by the required quality of the selectively extracted raw material. Let's use the existing deposit model to test two possible variants of the extraction course. The variants will vary according to the following: in the 1st variant the extract is required to have 20 000 t of reserves from each block of reserves included in the plan for a corresponding year. As for the 2nd variant, if a block is involved in the extraction plan, than a minimum of 40 000 t of reserves or the entire block, if it contains less than the required 40 000 t of reserves, has to be included in the extraction plan from this block of reserves in a corresponding year. Both variants prefer an extraction from three top quarry sections:

- ***1st variant****: 10 years of extraction under the following conditions: minimum quantity of reserves from one block of reserves included in the extraction in the corresponding year (min/block) is 20 000 t, annual extraction in the quarry is 1.5 mil. t, required average extracted grade of CaO is 51.8 to 52.2 % of CaO.*
- ***2nd variant****: If a block is included in the extraction, then the min/block is 40 000 t of reserves, other conditions are the same as in the 1st variant.*

As it is obvious from the above stated, a condition for the inclusion of blocks of reserves into the plan is met also by those blocks of reserves, in which the reserves are smaller than the required minimum, due to the extraction of reserves in the past, if these blocks of reserves are limited by the deposit relief. The result of modelling is the planned status of a quarry after ten years of planned extraction of the deposit (Fig. 1 and 2). The result of the extraction plan for the next ten years according to the 2nd variant differs from the results of the extraction planning for the same time period according to the 1st variant, as the requirement for a higher concentration of production has included a higher number of blocks of reserves on the top quarry sections into the plans. When developing plans in accordance with the requirements of the 1st variant, even in the 3rd year it was necessary to include blocks of reserves from the fourth section into the plan (counting from the top), because having included blocks of reserves only from the top sections in was impossible to meet certain requirements of the plan. Tables 9 and 10 give a comparison of the economic evaluation and results achieved in both variants.

Economic analysis of the 1st and 2nd variant:

Even though input conditions of the 1st and 2nd variant varied only minimally, only in the requirement of a higher concentration of production in the 2nd variant, it is obvious that the analysis reflects the intention of the management to concentrate production in the quarry in a very sensitive way. A simple calculation provides the following results:

1st variant: income: 75 mil Sk, expenditure: 55,5 mil Sk, gross profit: 19,5 mil Sk,

2nd variant: income: 75 mil Sk, expenditure: 54.9 mil Sk, gross profit: 20.1 mil Sk.

Variants of the course of extraction in the deposit are assessed by the management from the aspect of intentions regarding mining front course, from the viewpoint of the economic analysis of individual variants (Tab. 1, 2). Plans can also include investment goal planning, which is then evaluated by a sensitivity study indicator.

Table 1. Comparison of incomes and costs of two variants of the extraction process in a limestone quarry

Income/Expenditure		1st Variant	2nd Variant
Income:		Identical quantity of extracted material of approximately the same grade. If we project/assume income from extraction activities, then income is the same.	
Expenditure:			
Fixed costs:		Identical in both variants	
Variable costs:	Drilling work costs:	Higher costs, scattered production, more time consuming variant.	Lower costs due to the production concentration.
	Explosion work costs:	Identical in both variants	
	Loading costs:	Higher costs for fuel, tyres and loader maintenance due to the larger operational area.	Lower costs for fuel, tyres and loader maintenance. Disintegrated raw material quantity is the same as in the 1st variant.
	Truck transport costs (loader – primary crusher):	Lower costs for fuels, tyres and truck maintenance due to the extraction of raw materials in the fourth section, which is closer to the primary crusher than blocks of reserves in higher sections.	Higher costs for fuel, tyres and truck maintenance due to the extraction of raw material in higher sections, which are farther from the primary crusher.

Table 2. Comparison of incomes and costs of 1st and 2nd variants over a ten years course of extraction in the limestone deposit

Income/Expenditure		1st Variant	2nd Variant
Income:		50 Sk/t limestone = 1500 000 * 5 = 75 000 000 Sk	
Expenditure:			
Fixed costs:		15 Sk/t limestone = 1 500 000 * 15 = 22 500 000 Sk	
Variable costs:	Drilling work costs:	2 Sk/t limestone = 3 000 000 Sk + 10% more for the equipment transport	2 Sk/t limestone = 3 000 000 Sk
	Explosion work costs:	2 Sk/t = 1 500 000 * 2 = 3 000 000 Sk	
	Loading costs:	8 Sk/t limestone = 12 000 000 Sk + 10% more on fuels, tyres and loader maintenance	8 Sk/t limestone = 12 000 000 Sk
	Truck transport costs (loader – primary crusher):	6 Sk/t limestone = 9 000 000 Sk.	6 Sk/t limestone = 9 000 000 Sk. + 10% increased costs for fuel, tyres a truck maintenance due to the extraction of raw material in more distant higher sections
	Primary crushing costs:	3 Sk/t limestone = 4 500 000 Sk	3 Sk/t limestone = 4 500 000 Sk
	Total variable costs:	**33 mil. Sk**	**32.4 mil. Sk**

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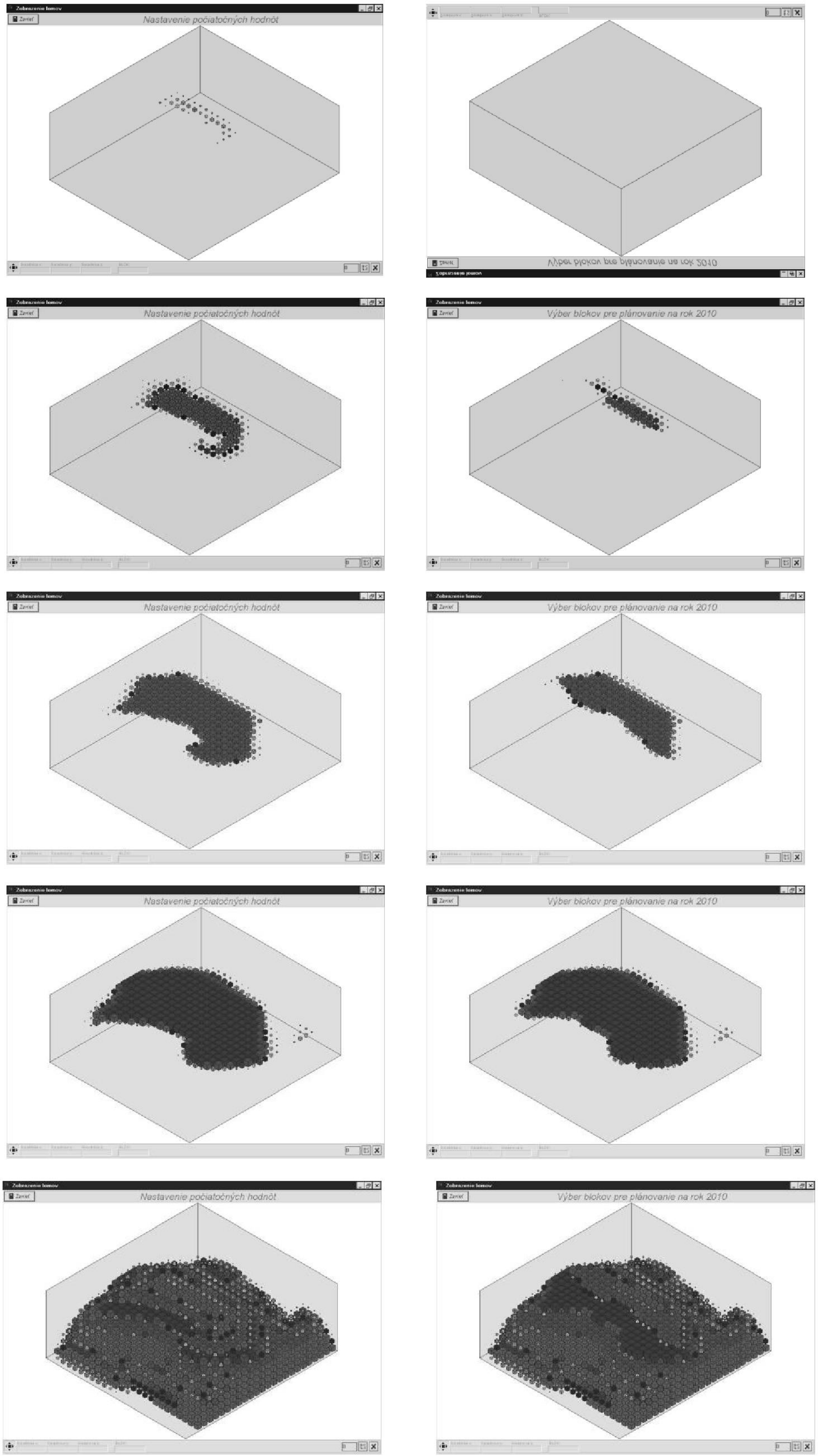

Figure 1. 1st variant: A model of individual sections in the deposit (from the top to the bottom – 1st, 2nd,3rd and 4th section) before (left column) and after the modelling of the extraction course in a deposit over ten years (right column).

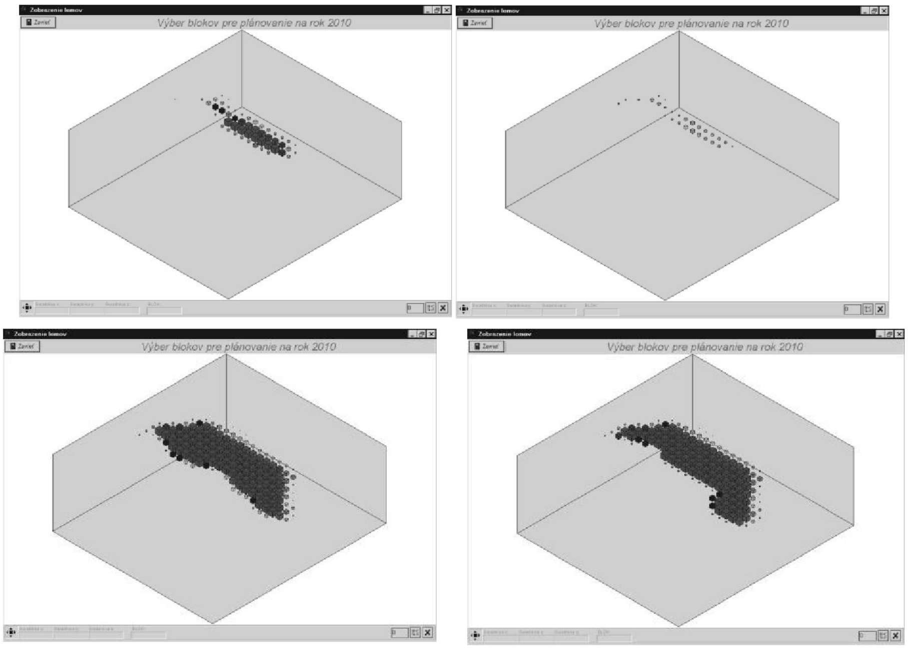

Figure 2. Comparison of the mining front status on the 2nd (top) and 3rd section (bottom pair of pictures). The change was caused by different business strategies over ten years. The right pictures documents a mining front's development with the 2nd variant and the left column document a mining front status after the modelling of the extraction process after ten years, in accordance with this variant.

Example 2 *(according to Amstrong, M. – Dowd, P.A., 1994)* [8]: Let us imagine that a deposit model mined by the underground mining method is available, in which two methods have been used to assess the medium values of the industrial component chemism in individual modular blocks of this model reserves. Later after the subject part of the deposit had been excavated, the actual medium chemism values in these blocks of reserves became know.

The three stated tables display the content of elements (metal) estimated by two various mathematical models, as well as the medium values of chemism detected after the mining of these reserves (Fig. 3). For the sake of simplicity let us assume that all the blocks of the reserves have the same volume.

Method 1:

10	30	10	55
5	20	50	35
40	15	40	30
5	35	10	10

Method 2:

15	35	20	35
15	20	45	25
40	10	30	30
15	35	20	10

Reality:

20	35	15	40
15	20	45	30
35	15	35	25
10	35	20	5

Figure 3. Mathematical models of the chemism distribution in blocks of deposit reserves and actual average values detected after the extraction of reserves.

A quick calculation shows that the sum of the elements´ volumes is identical for all three tables (400 units). Then the average value of the element content is equal to 400/16 = 25 units for one block of reserves. The management of the mine, having selected the extraction process in the deposit, can use only one model, hence they have the possibility to use the model in accordance with either method 1 or 2.

The prediction of profits:

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Let's assume that the subject of economic extraction is only represented by blocks of reserves with a minimum content of 30 units. Thus, only blocks of reserves stated in Fig. 4 could become the subject of extraction.

Method 1:

	30		55
		50	35
40		40	30
	35		

Method 2:

	35		35
		45	
40		30	30
	35		

Reality:

	35		40
		45	30
35		35	
	35		

Fig.4. The selection of the blocks of reserves, which will be extracted in accordance with mathematical models, and comparison with actual quality in the blocks OF reserves.

Method 1: sum = 315, medium value = 39.4,
Method 2: sum = 250, medium value = 35.7,
Reality: sum = 255, medium value = 36.4.

Based on the mentioned facts the profit from one block of reserves can be estimated using the very simple method of considering the difference between the assumed and boundary (30 units) medium values of mined blocks of reserves, as follows:

Profit from one block of reserves = a medium value of chemism in a block of reserves – 30

Thus the assumed profits in a deposit model for individual mathematical models and in reality are as follows:

1st method: profit = 315 - 8x30 = 75
2nd method: profit = 250 - 7x30 = 40
Reality: profit = 255 - 7x30 = 45

The predicted profit for the 1st method is almost twice as high as the actual profit. The 1st method has offered an additional, economically unsuitable block for the extraction.

Brief financial analysis

The existing considerations have not accounted for the time factor. However, the economic effect of the estimation error also depends on the time. At the beginning of mining activities a majority of mining companies extract high-grade parts of a deposit to gain money to cover investment costs. For the sake of argument let us assume that no technological constraints exist in the deposit part extracted by us, so when blocks of reserves are selected for the mining, a company can plan extraction in any order.

1st method: 55, 50, 40, 40, 35, 35, 30, 30
Reality: 40, 45, 35, 35, 35, 30, 35, 25

Hence a corresponding sequence from the profit viewpoint is as follows:

Predicted profits: 25, 20, 10, 10, 5, 5, 0, 0
Actual profits: 10, 15, 5, 5, 5, 0, 5,-5

It can be imagined that a profit decrease by 15 units in the first year of production can cause financial problems for the mining company, especially when the company counts on such profit to ensure swift settlement of debts.

It is also possible to predict what happens if these profits are updated with regard to the first year values. The result can be determined by dividing the predicted profit by the expression $(1+i)^n$. The following discounted profits have been determined for a case when i = 10 %, and the blocks have been extracted in a constant ratio (portion) each year (Tab. 3).

Table 3. Assumed profits of a mining company, which manages the extraction by a mathematical model – Method 1

n (business year)	0	1	2	3	4	5	6	7	Σ
Predicted profits	25	20	10	10	5	5	0	0	75
Actual profits	10	15	5	5	5	0	5	-5	40
Discounted predicted profits	25	18,2	8,26	7,5	3,42	3,10	0	0	65,48
Discounted actual profits	10	13,64	4,13	3,75	3,41	0	2,82	-2,57	35,18

Hence the total predicted discounted profit (sum for individual years) is 65,48, which, compared with the actual discounted profit of 35,18 represents a loss of 53.75% with regard to the assumed profits.

Example 3 *(according to Amstrong, M. – Dowd, P.A., 1994)***:** Let us assume five blocks of reserves, for which the following profits have been predicted:

Predicted profit: 40, 30, 20, 10, 0 total sum = 100,
Actual profit: 20, 20, 20, 20, 20 total sum = 100.

Let us focus on the fact that the profit value is the same in both cases. This analysis has not considered the time factor. If we discount these figures for the 1st year using i = 10%, then:

Discounted predicted profit: 40; 27.3; 16.5; 7.5; 0 total sum = 91.3,
Discounted actual profit: 20; 18.2; 16.5; 150; 13.7 total sum = 83.4.

The sum of the discounted predicted profit is 91.3 compared with the value of 83.4, which corresponds to actual values. Hence not only the time effect is visible, but also the economic impact on the mining company can be imagined.

However, it is not always possible to extract the highest grade blocks as the first, mainly due to technical, technological or spatial consequences. Let us assume that blocks of reserves will be extracted in a reverse order:

Predicted profit: 0, 10, 20, 30. 40 total sum = 100,
Actual profit: 20, 20, 20, 20, 20 total sum = 100.

This result leads to the following updated values:

Discounted predicted profit: 0; 9.1; 16.5, 22.5; 27.3 total sum = 75.4,
Discounted actual profit: 20; 18.2; 16.5; 15.0; 13.7 total sum = 83.4.

A pleasant surprise for the management! However, it must be borne in mind that the actual values concerning the quality and quantity of extracted raw material become known only after the completion of mining activities.

Other Possibilities of Deposit Modelling and Extraction Course Planning

Optimisation of the quarry final form

Let us assume such an approach to the deposit modelling and extraction course planning in a open pit mine deposit, which would lead to the extraction of the part of a deposit that, from the economic aspect, would ensure positive business results in a deposit. An completely different philosophical approach to the deposit modelling and its extraction from the one presented in the previous chapters of this book is based not on the gradual development of the extraction in a deposit, which also fulfils the tactical and strategic goals of the economical and selective extraction, but displays a global view that specifies a final status of the quarry after its economic extraction.

The extraction optimisation in a quarry leads to the identification of such blocks and to such an order for the extraction in a quarry that provides the best possible value, while maintaining the slope stability and mining rule requirements.

For such a model it is necessary to define the economic value in each block of reserves. This can be defined as follows:

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- by income ***I***, which equals to the value resulting from the sale of raw material from the reserve block,
- direct costs ***DC***, e.g. costs, which can be related directly to the blocks of reserves, e.g. drilling and explosive work, as well as loading and transport costs,
- indirect costs ***IC***, which represent total costs that cannot be directly related to individual blocks of reserves, e.g. time dependent costs like wages, depreciations, etc.

Thus the economic value of the block of reserves ***BEV*** can be defined from the following equation:

$$\text{BEV} = \text{I} - \text{DC} \quad (1)$$

It must be stressed that the economic value of a block is not identical with profit or loss. These quantities can be defined as:

$$\text{PROFIT (LOSS)} = \Sigma\ (\text{BEV}) - \text{IC} \quad (2)$$

Block reserves, which, due to the unsuitable reserve quality are designed for the dump, have a negative *BEV* value, as income from such blocks of reserves is zero.

The optimisation criterion for the final quarry form, being subject to stability and mining restrictions, can be defined as follows:

$$\text{MAX Z} = \Sigma\ (\text{BEV})\text{J} \quad (3)$$

Approach to final quarry form modelling

The most common approach is a simulation and dynamic programming. Optimisation criteria for the final quarry form are:

1. maximization of the total quarry value,
2. maximization of one ton of a saleable product value,
3. maximization of the quarry lifetime provided that the value of a ton does not drop bellow a certain level,
4. maximization of the ore content in the extracted part of a deposit.

Example 4: Let us consider the situation in Fig. 5, which represents a section of the block model. Let us assume that the maximum slope gradient is identical on both sides of the quarry section and is equal to the block reserve's width. Then, before mining the block of reserves **T** it is necessary to extract all the blocks of reserves marked as **t**. In a 3-D view the spatial image of those blocks of reserves, which must be extracted before starting mining block **T**, would form a cone. Obviously a cone formed using this method for each block of reserves would depend on the various slope gradients of blocks in different directions.

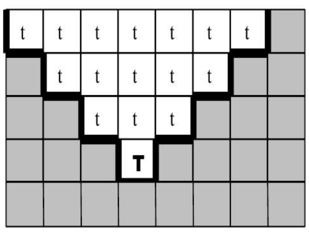

Figure 5. The section of the block deposit model. Let us assume that max. Quarry slope gradient is the same on both sides of the quarry, and the mining in blocks of reserves marked as „t“ ensures economic extraction, which defines the final quarry form.

A positive technique of the moving cone

The moving cone algorithm is a simulation algorithm that defines a final quarry form by means of the simulation of the extraction in a quarry (Fig. 6). The basic element of simulation is the minimum required quantity of dislocated rocks in a cone. The algorithm can be described as follows:

1. It starts on the surface and searches blocks of reserves. Ore bearing blocks of reserves usually have a positive economic value.

2. If the sum of economic values of BEV blocks of all blocks contained in a given cone is positive, this volume can be an extraction object and such a cone can be called positive.
3. The search continues until all blocks in a model have been tested.
4. The final quarry form is defined by the form after the extraction of all positive cones.

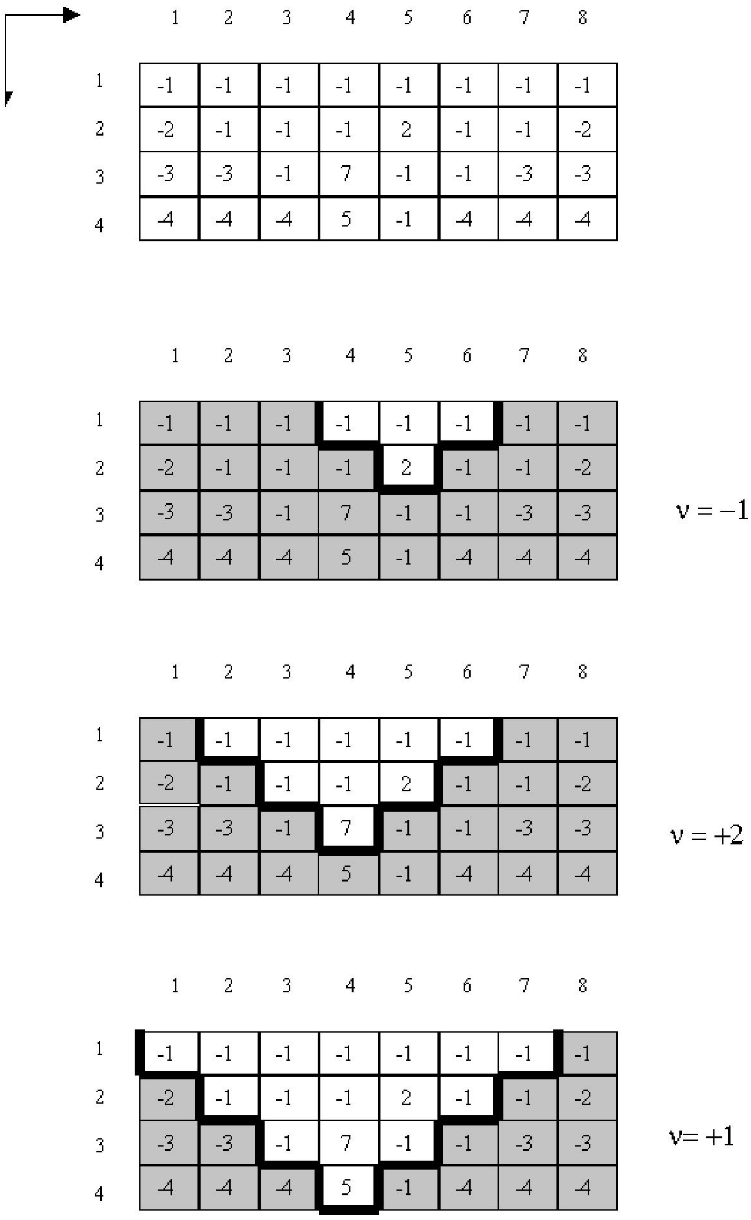

Figure 6. The technique of a positive cone for the optimum final quarry form.

The example of the use of the moving cone technique is as follows:

- Let us consider a simple situation as displayed in Fig. 6. The first positive economic value of the *BEV* block is in the block of reserves 2, 5 (i.e. 2nd row, 5th column). The sum of all economic values of blocks of reserves BEV in a cone, which must be excavated, if the block of reserves (2, 5) has to be extracted, provided that the general angle of the quarry slope gradient is respected, is –1.
- The second block of reserves with a positive economic value of the *BEV* block is (3, 4). The value of all blocks of reserves in a cone, which must be excavated, provided that all mining and stability ratios in the quarry are preserved, is +2.
  - The third detected block of reserves with a positive economic value of the *BEV* block is the block of reserves (4, 4). The value of all blocks of reserves in a cone, which results from the

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extraction of those blocks of reserves, which must be mined along with the block of reserves (4, 4), is –1.
- As the modelled part of the deposit does not contain any other blocks of reserves, which we wish to mine, our calculations are completed. The optimum form of the quarry is then defined by the extraction of the block of reserves (3, 4) and of all blocks of reserves, which must be mined out above it in order to maintain the general angle of the quarry slope gradient, because this variant provides the highest (and single) positive *BEV* value of all extracted blocks of reserves in a cone.

One great advantage of this procedure is its simplicity; however it is also a source of limitation in the use of the model for such a simple form as has just been presented. Other more complex approaches and algorithms enable the resolution of more realistic cases, but being an example of certain typical methods and possibilities of evaluation of open pit mining of deposits the above described technique is sufficient and suitable.

O'Hara Model for Surface Mining of Deposits

Based on the examination of facts detected in open pit mines, and using empiric relations, this model generalizes the situation in the open pit mining of industrial mineral deposits. The drawback of this model is that the detected empiric formulas cannot be simply extrapolated into the conditions of any quarry, e.g. in Slovakia. Its advantage is that it depicts relations between technical and economic variables, which characterize the mining business in an open pit mined deposit. When implementing the model to quarries, e.g. in Slovakia, it is necessary to modify empiric formulas, in which input variables are different from those calculated in the O'Hara model. For example, the number of working days in a year, USD exchange rate in 1998, for example, when this model was presented, different rate of update in our economic environment, etc. [9]

The view of an investor on investment into a mining company

A decision about investments into a mining firm has significant short term and long term consequences for the investing organization in the area of competitiveness, or even the survival of a mining company in the market. A decision about investment means

1. investing capital funds into some investment project or assets,
2. raising funds to increase the firm's assets.

Responsibility of the Management for the Firm Operation

The fundamental goal of each trade firm is to maximize its assets, or the assets of its owners. In cases such as a share holding company the main goal is to increase the value of the firm's shares. The share price usually depends on its investments, finances and decisions about dividends. The optimum combination of these three facts can maximize the value of shares.

It is worth mentioning that the accumulation of assets should be more important for the firm than the maximization of profits. There is a substantial difference between these two possible strategies. For example, a firm can increase its profit by selling their shares. This method, however, can only very rarely lead to the increase of the price of shares in the market.

A decision about the investment in the area of the mining industry is connected with the division of resources for the deposit and capital. With the strategy of maximizing the firm assets the company management has to pay particular attention to investment and financial decisions.

Investments are likely to be the most important of the firm's decision, as these decisions deal with the transformation of capital into other forms of assets, with the expectations of gaining a positive return in some specific areas. The investment defines a firm's portfolio composition, as well as the relativity of business risks for the firm. The main component of the investment decisions is the aspect of the capital budget. Budgeting is a component of capital investments, which deals with the division of funds for projects. The assumed profits from these projects will be implemented sometime in the future.

Having made the investment decision, the firm has to make a financial decision. This consists of the selection of resources and scheduling the resource requirements in time.

The budgeting process results in the decision to accept or refuse the investment project. Generally the budget helps the management to decide the following questions: "*Is project A, or B good enough to guarantee a return on investments?" and "Is project A better than B? "*

The Mining Industry – the Unique Investment Environment

The investment environment connected with the mining industry is quite unique when compared with the environments of other typical production industries. The main differences of the mining industry are:

1. *Intensity of capital*: The risk of investments in the mining industry is very big. Also the volume of funds required for a new project is immense, depending on the commodity type, extraction method, mine size, annual extraction, location and a large number of other parameters. Investments in the mining industry are at the level of tens to hundreds of millions of Slovak Crowns.
2. *A long pre-production period*: After the proper surveying of a deposit it takes several years before the deposit starts to be intensively extracted. The time needed from gaining mining rights until the start of production (in a new deposit, which has not been mined so far is from 4 to 6 years. Current stringent environmental protection requirements may even double this time period.
3. *A high rate of risk*: Along with the risks connected with the volume of required capital and long term placing of capital in the pre-production period there are also other risks, connected with business activities in the mining industry. These risks can be divided into geological, engineering, economic, environmental and political. We can mention, for example. Risks connected with the price of mineral raw materials in the world markets that can be very variable. Another risk connected with the mining industry is political. We can recall the nationalisation of assets in Chile in the seventies.
4. *Non-renewability of resources*: The non-renewability of resources leads to the introduction of charges on extracted reserves and time limits of the mine lifetime.

Investments into a Daughter Mining Firm

Investments into a daughter mining firm are different from investments into a parent company. Parent companies have already been established, and risks in the area of the firm development as well as financial risks are not so significant. Moreover, decisions regarding daughter companies are analysed through the historical experience of the parent firms.

The dynamics of a daughter mining company depends mainly on the investment decisions. The success of investments in a daughter mining company depends mainly on the development of:

- mining company,
- management,
- financial resources,
- marketing.

Development of a Daughter Mining Company

The evaluation of investments into the property, project or operation in a mining venture requires the following:

- to define the category of type or kind of the investments, and define which group is represented by the investment (junior, senior),
- to identify its position in the mine's life cycle,
- to independently assess project advantages.

The Mining Company Management

First of all an investor invests in the management that runs the mining company. Namely, investment revenues come from the production of the managed by its management. Unfortunately, there are no quantitative criteria to define whether the management is good or bad. Its assessment is purely subjective. The management must be first of all honest and remain on the investor’s side. Though honesty cannot be easily assessed, if a management creates a daughter company, which will own 100% of the project shares, or if it surprisingly dissolves private investments in the firm, the best thing from the investor’s perspective is to leave the project.

Often very good geologists and mining engineers are available, however they often focus not only on managing the mine to progress towards prosperity, but gradually on building their own firm, which will manage a mining venture. Making money for their shareholders is only secondary for them. From the investor’s viewpoint the management is ideal, when the earned money is invested into the property,

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not into the venture overheads, employees´ wages, etc.

For junior companies financial resources are necessary to back up the project or business plan. From the investor's perspective such management is good, when it is able to predict future situations, and, if necessary, for the sake of shareholder' profits, terminates relations at a suitable moment, before negative changes occur.

Marketing also depends on the management. A technically successful extraction is not important unless it results in an increase of the share price. Unfortunately, markets are not effective enough to enable efficient marketing to be reflected in the increase of the firm share price immediately.

3. Conclusion

The economic evaluation of projects focuses on the financial environment in which the aim is to invest in a project in such a way so as to gain value at its termination which refund paid in investments and at the same time to bring financial means which can be used for the further development of the firm e.g. investing into new technologies or to increase the company's assets.

The economic evaluation of projects respects recent trends in adjudicating the economic effectiveness of projects developed in the most advanced economic systems and at the same time adapts it to particular project conditions. This approach respects not only economic but also mining, geological and environmental factors and their effects on the project results, thus giving a view of the complex interrelations of all project variables. The financial analysis is also suitable due to the reason that financial experts, based on the study, have the possibility to understand whether the project is profitable and what its main risks and advantages are.

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СЕТЕВЫЕ ЭКСТЕРНАЛИИ СОЦИАЛЬНОГО БЛАГОПОЛУЧИЯ

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Аннотация.
Революция в области информационных технологий оказывает радикальное воздействие на экономическую трансформацию и на непрерывное благополучие всех социальных групп. Соответственно, именно рост непрерывного благополучия является тенденцией инновационного макроэкономического развития. Инновационное макроэкономическое развитие рассмотрено в статье как сумма признаков, новых методов, методов и инструментов, которые способствуют единству социальных и инновационных тенденций в национальной экономике. В таких рамках формируются следующие новые структуры и взаимосвязи: 1) развитие инновационных и социальных технологий непрерывного благополучия; 2) рост сектора услуг, внедрение гибких форм организации работы в высокотехнологичном производстве, а также формирование новых социальных лифтов; 3) усиление фрагментации культурного и политического плюрализма, формирование глобальной идентичности, культурных ценностей и т.д.; 4) тенденция к непрерывной трансформации современного общества, благодаря которой идеи, культура, все отрасли промышленности находятся в постоянном сближении.

THE NETWORK EXTERNALITIES OF SOCIAL WELL-BEING

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Abstract.
The information technology revolution provides a radical impact on the economic transformation and on the continuous well-being of all social groups. Accordingly this continuous well-being is the trend of innovative macroeconomic development. This innovative macroeconomic development is considered as the sum of features, new techniques, methods and instruments that contribute to the unity of the social and innovative trends in the national economy. In this framework the following new structures and interrelations are being formed: 1) the development of innovation and social well-being technologies; 2) the growth of the service sector, the introduction of flexible forms of work organization in high-tech production, as well as the formation of new social lifts; 3) increasing fragmentation of cultural and political pluralism, and formation of global identities, cultural values, etc.; 4) the tendency to continuous transformation of the society, so that the ideas, culture, all industries are in permanent convergence.

1 Introduction

The concept of "continuous well-being" in modern sense implies the doctrine of stability and cooperation. It reflects the continuous adjustment of economic processes and phenomena under the influence of social and environmental humanism.

Diffusion of continuous well-being compiles emotional and moral, cultural and social processes and associated with the assimilation of innovations, new fashions, forms of communication, education and creativity. Diffusion occurs as a result of the active susceptibility of people. Continuous well-being requires effective social interaction - a product of negotiation between individuals and social groups. Effective social interaction represents a complex set of fundamental communications. Now we observe the changes in the structure of society due to increasing of professional and educational level, to the change in people's conciseness. Technological modernization (including the forming of Internet-economy) changes social interactions because Internet maintains and updates the social networks and raises social capital [1].

In these circumstances, the economy of continuous social interaction is being formed. This happens in the following several key areas:

a) the increase of the quality of health, education, income, leisure;

b) the improvement of psychological, emotional, moral, ethical conditions of people (lifestyle, forms of vitality, opinions, vital interests, values, behaviors, etc.);

c) the improvement the health conditions, taking into account the geographical characteristics of the regions and territories.

So the social achievements as a factor of continuous well-being in wide sense can be considered as a specific feature of Internet-economy. Individual incentives of the Internet use grow along with a number of participants. At the same time this growth contributes to the increase of beneficial use due to network externalities and to the reduce of costs of information and learning externalities.

This helps to form a continuous culture of well-being, which means the situation where individual tastes reflect the social characteristics (age, sex, employment, education, and so on), and social values, lifestyles. In the social economy, the quality of consumption plays the following special roles:

a) being continuously promoted in order to support innovative production and provide incentives to creative work;

b) being an important differentiating feature of the status of all social groups;

c) being the main source of pleasure and satisfaction.

Under these conditions, the role of Internet-technologies in social life increases significantly, updating the forms and methods which influence on the human and society nature.

We consider radically changes in relationships between science and various forms of social interactions. These shifts in social interaction of people have set a number of new problems. They demanded traditional concepts rethinking in the following ways:

- about the meaning of life;
- about the relationship of the individual destiny with social history;
- about the role of individuals in a society;
- about the possibility, borders and criteria of well-being.

Ordinary people are the most vulnerable social groups witch need a stable supply of decent quality of life, health and leisure.

2 Materials and methods

Well-being of the population has been a subject of research for a long time. Practice shows that even considering differences in the initial state of health, the higher levels of social interaction and activity are associated with lower mortality. At the beginning of the twenty-first century, there has been a demographic change associated with the increase in life expectancy around the world. Under these conditions, the problems of well-being of the population come out on the top. The process of the population well-being depends on the development of economy and society in general. In Russia the same trend that appeared in the last decades in the developed countries has been taking place. Its clear manifestation is associated with the intensity of Internet-using, as well as with computerization of everyday life, the result of which is the increase in obtaining informational goods and services expenditures. "The consumer targets, - said A. Sen, - not a particular good, but the group of goods with common properties and characteristics (computer models, sorts of coffee i.e.). So it simplifies his selection in terms of increasing market opportunities" [2].

The diffusion of the Internet-technologies is responsible for the growth of the costs of information search and acquisition. And the introduction of these technologies in all sectors of economy and society has not been completed yet [3]. People are getting deeply involved in Internet activity. In Russia, a large proportion of people are involved into Internet-economy. The growth of population well-being and the high labor activity lead to more intensive development of Internet in Russia. Currently there has

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