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THEORITIC-PRACTICAL APPROACHES OF ENERGETIC METHOD OF OPTIMIZED VARIANTS OF OPEN-MINING PROCESSES

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ABSTRACT

Energetic approach lays on particular nature and mechanic-technologic factors of determinate and occasional (probable) character, as: quantities of mineral resources, openings (additionally supporting substances, useful lots, dead lots, tares of moving mechanisms.

This method accepts following of quality requirements to the useful mineral resource, lots in common, sequrity work conditions, even financial sources economy, indicated with their technic equivalent. It do not abolis, but suppose sizeshaping methods. After quantities of lots,energetic method optimizes distances of movement, on third place resistance of movement on the road of the lots, analizes "dispersion" of technologic process by supporting operations.

Forth, it analiyzes and indicates total coeficient of dead lots, as much as total coeficient of useful activity on the main movement direction of movement of useful lots.

Fifth, -It analizes times Тдв of movement, and this stges at the main decidion process for one cycle of lot moving separate or following connected facilities. Other parameters of mining source are derivativ of the mentioned above

$$k_{от.i}.Q_i.L_i.W_{ср.i},(\frac{tm}{t} \equiv \frac{tm}{\gamma m^3} \equiv \frac{1}{\gamma}\frac{t}{m^2}) \rightarrow \min,$$

I=1,2,3

Where:

Ei- total energyadsorbtion of I-variant of process

Qi- lot quantity in clear units- measure

K o t I-coeficient of total lot (useful and tare)

L пр.i- distance of lots movement

Wпpi-movement resistance of lot unit

Tпpi- time of movement of a cycle—movement. In accordance with reception of quantity of energy/ total and comparable/ for one production cycle.

$\prod_{1}^{k} k_{п.д.к.i}$ - total coefficient of useful activity of production process –basic direction.

INTRODUCTION INTO PROBLEM

As post-graduate student at LGI I started studying theory and practice of open mining of mineral sources by the book "Open mining of mineral resources sources"Уолстехиздат 1951, and the work "Bases of the theory of opening of quarry fields" M. 1953 (dissertation of E. F. Sheshco as Dr. of technical sciences), and his other printed works, as other Soviet authors. For solution

Me, as follower of dialectic materialism, and building engineer, as much, as private sciences, I was not fully satisfied of approaches, applied for solution of open-mining project tasks, and applied in management of exploitation of different stages of mining production.

Still at our first meeting with E.F. Sheshco in Moscow at the Department, I told him, that so much complicated system of mine, had or should have value of tension, similar to building construction.

At buildingmechanics buildingconstruction could tough and secure projected, and then used with the expression of warrantable tension. Of course, economically. Because, in my mind there was a physicomechanic analogy between building construction and mine: mine as complexed not static, but dynamic system.

I answered that I had such a vision. As a student at the scientific group "Building mechanics" at Sofia Polytechnic, I read the scientific report "Act of the Law of passing of quantity in quality at the Building (theoretic) Mechanics, in the presence of three professors static (mechanics), and it had been met with praises.

So, ahead of E. F. Sheshco, It became a formation of my scientific program "tensity" as law, craters of evaluation of the open-mining processes, basically connected to the topic of my dissertation "Rational schemes of opening of East Maritsa Lignite source".

Up to the mentioned moment, I have been concluded with the equalization exams of mining engineering and objects of candidate minimum. There was coming developing of formalized theory on the base of generalization of project and executive-mining practice.

Sometimes, somewhere, the great Russian composer M. I. Glinka, used to say: "People make music, and we-composers arrange it."

So, I had to study, to be introduced with, to assimilate project and open-mining practice after thinking and analyses, and to feed my corn of scientific and practice contributions. So, briefly, by the influence of my scientific manager Prof. B. V. Bokii, I

connected my life with "Open mining" Department of Lengyproshacht, and "Investors direction "Maritsa East", which controlled complex studying of coke source, and began source of mine "Troianovo-1" with 3 mln t/year, and I worked on the project of this mining of 5 million tones/year, so I took an active participation.

By the indicators of total and comparative energyadsorbtion, which had (in the case of my dissertation), size of useful physic work, related to one tone of worked material, to find generalized indicator of the accepted in practice private criteria of optimization of the variant of project decisions. And when useful work have been referred not to tone of material, but

$\frac{1}{\gamma}t$ or to m^3, to $\frac{tm}{m^3}=\frac{t}{m^2}$,

Which tension have been increased γ times. So, my basic program, expressed ahead of Sheshco, has been completed. With it first stage of the theory of energetic optimization finished. It was a partual energetic appreciation of open mining lot flow by energy consumption of the useful physical work.

Second stage should take into consideration "the second beginning of thermodynamics, giving energy dispersion when making any useful work. We definated a generalized coefficient of useful work.

$\prod_1^k k_{\text{п.д.к.i}}$ Of mining lot flow.

Increasing with reciprocal value $\frac{1}{\prod_1^k k_{п.д.к.}}$ energyadsorbtion-general and comparative (Q=1) from the useful work of lots flow, and variant optimization by choosing lowest energyadsorbtion, mentioned in the Law in the resume.

I should stop on this second stage of my mathematic aparate. But history of mechanics shows, that scientists tried to get a summary of the mechanic laws (after Galilei, Newton), and to develop It from united begging. Mopertui have offered the principle of activity-i.e. Multiplication mass by speed by path of division- all the three are observed parameters of the moving body.

According Mopertui division is a law, by what GodFather have ordered movements of bodies to be made.

By vibration task L. Oiler generalized "Law of smallest activity, called so lately. Lagrange have improved, that variations of smallest activity give conditions (differential) ones of leading three Newton Laws of movement of a point or body.

There are formulas of the smallest activity of different physic processes- Lagrange, Hamilton, Einstein, going to Plank constant, showing that energy has a structure and it is transmitted in microspace processes in quantity parts, called "energy quant " and "quant of smallest activity", or constant of Plank.

In my long-year studies of open-mining processes, Idiscovered analogues between change and dispersion of energies in micro and macrospace.

In this case- transformation of specific portions of energy. Icalled it still before my pension in 1975 smallest activity and macroquant energies in open-mining processes.

Actually, they are an energyadsorbtion of process for unit of mass, for unit of path, and unit of time cycle.

Or, from my point of view, there exists Quant mechanics, except for the microworld, but for the macroworld with it macroquants of energy and activity.

Quants of energy will exist then, when unit of mass microobjects, and unit of path of lot flow are real distance and microspace and time is considered as frequency (cycles) of energetic activity.

With it, I think, I prove correctness of Einstein, that "God do not occupy in playing in dies".

Quant phenomenon, as I'll show above by formulas, have much more complexed determination of this, which follows of the logic and aparate of classic Newton mechanics. It's, maybe for nowadays, an end of my most difficult scientific-energetic program.

2. Basic energetic exchange and its application for choosing of optimal open-mining lot flows

Our energy aparate method lays on particular nature mechanic-technologic factors of determined and of a probable character. We will name with capital Latin letters macroparameters of open-mining variants off lot flow. And with differential differences, as much as shunting quantities. Macro quantities of the lot flow are $Q_и$, $Q_о$, $Q_д$ - lot weight and useful mineral resources indexed "о", opening and useful mineral resource, "д" –additional nature mineral lots.

Machines and their moving organs have dead weight-coefficient of tare weight.

Length of lot flow have two macro quantities- L' and L – respectfully distance between centers of weight of starting off field (fig 1 and fig 2), or the distance of the trace on, the road of lot flow, $k_{р.т}$ = L / L-coefficient of developing of the trace;

$L=\sum_1^k l_k$; l_k – section with particular strength of movement w $_{k,\ for}$ which engine, auto traction-engine and etc. is defined the speed $k_{V;}$

$$V_{\text{дв.i}}=\sum_1^k V_k;T_{\text{дв.i}}=\frac{L}{\sum_1^k V_k};W_{\text{ср.i}}=\frac{\sum_1^k W_k l_k}{\sum_1^k l_k}$$

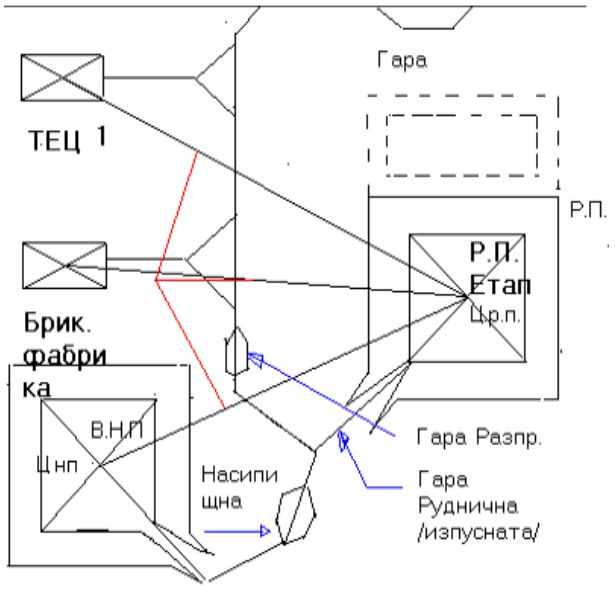
- avarage strength of movement on the trace of the road $L_{i..}$ … $P_{л.i}$ –weight of engine or auto-traction-engine; q_o –weight of the waggon

q –volume of the wagon; $k_т = \frac{q_o}{q}$ -coefficient of tare;

$k_{от.i} = 1 + 2\frac{q_o + P_л}{q}$ - coefficient of total tare of the autotrain

i = 1, 2, 3,… - number of lot flow variant

So, making such an analyses in my dissertation of movement of mine lots by (auto) train, conveirs and hydrotransport (for generalization of the analyzes), I got to formula an optimality criteria of lot flow by energy equal to the necessary useful physics work, in the type of dimension as energyadsorbtion and tension. My first (not full Law (criteria) is exactly:



Легенда:
Directresses Li, where i=1,2,3
Stations

Fig.1 "Maritsa East" -First Industrial Complex

$$k_{от.i}.Q_i.L_i.W_{ср.i}, (\frac{tm}{t} \equiv \frac{tm}{\gamma m^3} \equiv \frac{1}{\gamma}\frac{t}{m^2}) \rightarrow \min \qquad (I.1)$$

With this generalizing criteria, as I told, finished the first stage of my program. There have been laid private criteria for different occasions:

H_o – min (minimal power of opening in the ranges of dispose of transport and section trnch

Criteria Qo, t –-- min -или Qo, куб. m ----- min –applied for choice of variant of transporting and cutting trenches when opening the mine

Criterias L or L / L` - min –---, Крт = L / L-----min - of the coefficient of developing of the trace for the choice of spoil, or given-received field for users.

When $Q_i = 1$, total enegyadsorbtion for the usefull phisics work of lot flow passes to comparable one. It becomes

$$k_{om.i}.L_i.W_{cp.i}, (\frac{tm}{t} \equiv \frac{1}{\gamma}\frac{t}{m^2}) \rightarrow \min; \; here \qquad (I.2)$$

$(Q_i = 1)$

With this first stage the program finished. Defense of my dissertation passed with encouragement from

Scientific Union of LGI- Leningrad Mining Institute – to continue my air energetic development.

In Bulgaria, at MGU. Due to heavy family illnesses, and death of my wife of stomach cancer, and I was ill of strong hepatitis, I was in a big difficulty. So my scientific program have been almost interrupted, without being fully forgotten.

Second stage have been realized by introducement of criteria of total energyadsorbtion –total and comparable, of the type:

$$\frac{k_{o.т.i}.Q_i.L_i.W_{ср.i}}{\prod_1^n k_{п.д.к.i}} \rightarrow \min \qquad (II.1)$$

here $\prod_1^n k_{п.д.к.i}$ -general coefficient of useful activity of lot float, as multiplication of private ones.
or when Q=1

$$\frac{k_{o.т.i}.L_i.W_{ср.i}}{\prod_1^n k_{п.д.к.i}} \rightarrow \min \qquad (II.2)$$

Here $K_{п.д.к}$ – private coeficient of useful activity, component of the total KUA (coeficient of useful activity).

So, It was kept the requirement of indication of energy of dispersion, when executing lot flow in variants I= 1, 2, 3…

The Third, generalizing, but new again, at the same time concluding stage of optimization of open-mining lot floats, by now, lays on:

Universalization of "The second beginning of thermodynamics of all the macroparamaters of energyadsorbtion- total and comparable", as it have been accepted, but this parameters disperse also.

Dispersion is considered and indicated by private subparameters of every macroparameter type. Subparameter types and its empiric coefficients- correlation of dispersion – written by us in small Greek letters. Most corresponding letters of the capital Latin letters of the macroparameters.

2. Second base of my generalized Law of optimization lays on the generalization of the Law of classic Newton Mechanics, as I said above, by the magnitude of "smallest activity".

Generalizations made by L. Oiler, Lagrange and other great scientist. Without more details, our basic Law (Criteria) of optimization of open-mining lot flows is of the type:

$$\frac{V_{ср.i}^2}{Q_i.L_i} = \frac{\gamma_i k_{о.т.i} \mu_i \lambda_i}{\upsilon_i \tau_i} \frac{1}{T_{д.в.i}} = \frac{\gamma_i k_{о.т.i} \mu_i \lambda_i}{\upsilon_i \tau_i} \varphi_i \rightarrow \min \quad \text{(III.1)}$$

$\varphi_i = \frac{1}{T_{д.в.i}}$ - Frequency (frecvention) of open-mining lot flow, substitution of time movement, without indicating of technologic and sudden stoppings –under-parameters.

But multiplied with L, full formula (III. 1) is the comparative cinematic energy (alive power), what I-variant of open-mining lot flow radiates (disperses) for unit of useful lot. And L length is real quantity of lot flow, it may be macro or micro amount. First right fraction and middle parts are a macroquant of activity of mine lot flow.

Consequently, left part is " macroquant of energy" of lot flow, for which its names I have been ironized by lots of "omniscents".

As much as lot flows-variants, have been timely constantly optimized ago, made so by their microparameters at time, it follows from formula (III.1), and its multiple L (III. 2), that it is not enough.

It is known, that every constant in variation makes zero, so main practice interest should be aimed to the casual quantities (magnitudes – correlation), in the attitude (magnitudes-correlation), in the attitude of useful lot length of the road, change of volume of lot moving resources, to values – fluctuations of the speed. My major theoretic conclusion Is, that basic law of macro-quant dynamics (III. 1 and 2) is more common, and it includes in it Law of quant mechanics, where когато Q_I is a microobject, and L_I is some real distance, - and $T_{дв.i} \neq 0$, но $\rightarrow 0$.

I'll point down one more our fundamental result of developments by now:

It is the proved by us (formula I. 1 and I. 2. fact), that there exists in nature reality "pressure of movement" at the material part, except for the wild strains (pressures) famous: elastic, plastic and distructing pressures, proved by test examples of material in testing stations.

So, three Optimality Laws could sound so:

1. Optimal variant of open-mining lot flow is this one, that has lowest tension (comparative energyadsorbtion) of making useful physic work, i.e. for the main energy expense (Stage I of my candidate dissertation in Leningrad).
2. Optimal lot flow is this one , that has lowest tension of lot movement and lowest energyadsorbtion.
3. Optimal project or produce execution of open mining lot flow is that one, in which together with smallest energyadsorbtion (lowest tension of movement of the lot) by the determined microparameters of lot flow , should be indicated lowest tension of the lot flow (and of determined macroparameters of flow should be indicated "lowest macroactivity" and "lowest macroquant of energy" of dispersion of subparameters of macroparameters of lot flow, in accordance to "Second beginning of thermo-dynamics".

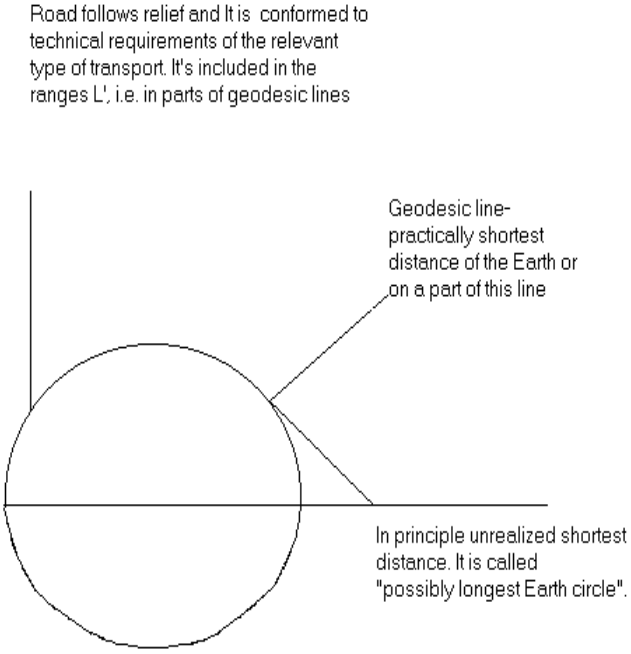


Figure 2. To the change of influence of the Earth shape and It's releif on the shortest movement distances of burdons and any surface movements.

4. In the end, we will present the choice of optimal open-mining lot flow according criteria of optimal psycho-physic and creativity-inventors workability , on which base we differ phisic, psycho-fiziologic and creativity-inventors workabilities. Analitic equation of optimal criteria is:

J = 15 j – pfisic workability of person angered at the working process.

Nфр – number of workers only with physic workability

Кпс.Nпс – coefficient of psycho-fiziologic workability of workers group of the increased quallification staff.

Кти.Nти –Coefficient of creative-inventors ability of workers group of flow serving staff.

Nпс – nomber of workers with increased psychic workability.

Nти –nomber of workers with creativity inventors ability,

Кпс > coefficient of correlation of higher price of psychic workability of person of the following workers group only with physic workability

Кти > 1 coefficient of correlation of indicating of the highest valueof creative-inventors ability of this worker, engaged with their physic workability at the moment.

Main Law (criteria) критерий of optimality of variant of open-mining lot flow , according condition of psychophysics and creative-inventors workability of the person engaged in the process is:

Э = 15 / Nфр + Kпс.Nпс + Kти.Nти /, j ----- min, - /IV.1/

а при Q .= 1 t, follows:

э = Э / Q i = 15 / Nфр + Kпс.Nпс + Kти.Nти / : Q i, j, ---min, /IV.2/

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