Underground mining

Bashkov V.I., Eremenko A.A., Eremenko V.A., Kotlyarov A.A.

EVALUATION OF THE STRESS-STRAIN ROCK MASS STATE IN BLOCK MINING OF SUPERIMPOSED ORE BODIES AT THE ABAKAN DEPOSIT

The geomechanical rock mass state was experimentally explored in the mined superimposed ore bodies area at the Abakan deposit. It is established that goafs located in the vicinity of Glavnuyi and V.t. sections influence the redistribution of the stress concentration zones in a rock mass. Variations in the electroresistance of the rocks were detected before and after coyote blasting at deep levels. The different-energy shock foci were established.

Key words: blast, stress, electrometry, ore body, deposit.

Eremenko A.A., Eremenko V.A., Eruslanov A.P.

DEEP IRON ORE MINING UNDER HIGHER STRESSES AND CLUSTERED DYNAMIC EVENTS

The authors have studied theoretically and experimentally mining-induced distribution of stresses and dynamic events and localized the areas of higher mining-induced stresses and clustered dynamic events around mined-out stopes.

Key words: stress, dynamic events, deposit, horizon, block.

Eremenko A.A., Seryakov V.M., Eremenko V.A., Schepetev E.N., and Belyaev V.S.

THEORETICAL MODELING AND EXPERIMENTAL STUDIES OF THE STRESS AND SHOCK REDISTRIBUTION IN THE ORE MINING

The geomechanical rock mass state is evaluated in a protective pillar extending under the river at Podruslovyi area, the Sheregesh deposit. It is discovered that the block mining induces the redistribution of the post-blasting stresses and shocks.

Key words: stress, modeling, ore body, deposit, block.

The enrichment of minerals

Ermolovich E.A.

THE CALCULATION OF DISTANCE TRANSPORTING BY GRAVITY 70 % SLURRY WASTE OF FERRUGINOUS QUARTZITITES CONDENSED BY FLOCULANT MAGNOFLOC 155

The experimentally established analytical method the values of the coefficient m to clarify the calculation of head losses movement of filling of the slurry pipeline allowed to reliably determine the distance of transportation is in a gravity mode for the conditions of OJSC Combinat KMAruda.

Key words: hydraulic tab, slurry of ferrous quartzites, maximum distance transportation, a unit of pressure

Ermolovich E.A.

RECYCLING OF WASTE OF FERRUGINOUS QUARTZITITES IN THE FINE-GRAINED CONCRETE FOR PAVING TILES

The results of the laboratory tests of samples of paving slabs waste of enrichment of ferrfurorous quartzites in the composition durability, water resistance, abrasion resistance and cold resistance. Proved the possibility of recycling of technogenic waste in fine-grained concrete mixtures for paving.

Key words: wet magnetic separation, paving tiles, fine-grained concrete mix.

Subkov A.A., Shulenina S.M., Podznoev G.P.

PROSPECTS FOR THE USE A NEW GENERATION OF AUTOCLAVES (GEO AUTOCLAVES) IN MINING AND INDUSTRIAL PRODUCTION

A new concept of treatment of the poor is difficult concentrability ore mining and industrial wastes and other minerals of everything all the solution. To implement this concept offers anew generation of autoclaves high performance, low capital costs for construction and operating costs. Possible recycling of waste containing poisonous chemicals, together with the mineral raw materials and obtaining environmental friendly products.

Key words: autoclave, difficult concentrability, raw, industrial waste, leachate, firing, recovery.

Kondratieva A.A., Bragin V.I., Burdakova I.I., Glumova A.A.

UPGRADING POLIMETALLIC ORE’S TECHNOLOGICAL SCHEME USING COMBINATION OF COLLECTORS
Combination of reagent-collectors (butyl and isopropyl xantates of potassium, butyl dithiophosphate, N,N dithiocarabamate) was used to increase flotation indexes. It was found, that combination of butyl and isopropyl xantates of potassium allows to reach best indexes for lead and zinc products.

**Key words:** flotation, collector, galena, blende.

**Haritonov M.Yu., Vashlaev I.I.** MIGRATION OF NONFERROUS METALS AT THE MOVEMENT CAPILLARY UPWARD OF SOLUTIONS IN THE TAILINGS OF ENRICHMENT.

The results of laboratory modeling of the processes which occurs in a material of tailings enrichment at upward movement of water are presented. The process of migration of nonferrous metals was investigated with reference to tailings of sulfide copperr-nickel ores of Norilsk metallurgical combine.

**Key words:** copper-nickel ores, tailings, modeling, water migration, kinetic curves.

**Measurement, control, diagnostics**

**Vdovin S.O., Zharinov A.N., Karabutov A.A., Ly senko P.Y., Cherepetskaya E.B.** ANISOTROPY PARAMETER ESTIMATE OF GEOMATERIALS SAMPLES BY ACOUSTO-OPTIC ECHOSCOPY.

The principle of laser-ultrasonic defectoscope “GEOSKAN-02MU” has been described. Preliminary experiments on the study of the structure and properties of geomaterial have been presented.

**Key words:** laser-ultrasonic defectoscope, anisotropy of rocks, defects of geomaterials.

**Voznesenskii A.S., Buyanova D.S.** ESTABLISHING OF INFLUENCE OF FRACTURE OF THE ROOF ROCK ON THE RESULTS OF ELECTROMETRIC MEASUREMENT.

The results of the electric exploration computer simulation in Consol Multiphysics are presented to determine cracks in the roof rock. The differences of the vertical electric profile (VEP) curves for the case of absence and the presence of horizontal and vertical cracks in the roof have been described. The possibility to determine the crack orientation by the form of VEP curves is shown.

**Key words:** electric exploration, computer simulation, cracks, roof, mining excavation.

**Voznesensky A.S., Kutkin Ya.O., Krasilov M.N.** COMPUTER MODELING OF PIEZOELECTRIC TRANSDUCER OPERATION IN MONITORING STRUCTURE, PROPERTIES AND CONDITIONS OF ROCK MASSES.

The article discusses physical basics of examination of rock specimens by ultrasonic scanning and its modeling in the COMSOL Multiphysics environment. The authors compare the modeling results and measurements taken on real specimens. Availability of the reliable data within admissible inaccuracy for practical application is illustrated.

**Key words:** piezoelectric transducer, rocks, computer modeling, ultrasonic scanning.

**Gaisin R.M., Nabatov V.V., Buyanova D.S.** PHYSICAL SIMULATION OF ELECTROMETRIC ANALYSIS OF ROCK MASS AREAS WITH CONTRASTING BOUNDARIES.

The physical modelling of geoelectric measurements of objects that are terminated by the contract boundaries has been considered. The comparison of processing results by standard and relative methods is given.

**Key words:** electrotomographia, contrast boundaries, apparent resistivity, anomalistic objects, the proportion of resistivities.

**Nabatov V.V., Gaisin R.M., Buyanova D.S.** INTEGRATION OF GEORADAR AND ELECTROMETRIC PROSPECTING IN PRE-MINING EXPLORATION OF RESERVOIR ROCKS.
This article describes application of GPR (Ground-penetrating radar) and ERT (Electrical resistance tomography) complex for soil and rock conditions assessment before shield driving. It describes main problems and interpretation of results.

**Key words:** shield driving, GPR, ground-penetrating radar, georadar, ERT, electrical resistivity tomography, applied geophysics, main problems, interpretation of results, seismic exploration, interference factors, integration of geophysical methods, maximal depth of research, signal accumulation.

**Nabatov V.V., Morozov P.A.** KARST AND SUFUSION HAZARD ANALYSIS USING GEORADARS WITH RESISTIVE-LOADED ANTENNAS

This article describes the experience of GPR research for karst and suffosion risk assessment. Research conducted by superpower low frequency ground penetrating radar with resistively loaded dipoles (resistive vee dipole, loaded with the Wu-King profile).

Key words: karst risk assessment, suffosion, ground-penetrating radar, GPR, superpower GPR, low frequency GPR, high depth of penetration, low level of «ringing» noise.

**Novikov E.A., Shkuratnik V.L., Epstein S.A., Nesterova V.G., Dobryakova N.N.** THE POSSIBILITY OF ESTIMATION OF COAL OXIDATION BY USING ACOUSTIC EMISSION, STIMULATED IN IT BY THERMAL SHOCK

The results of experimental research of influence of coal samples oxidation on values of acoustic emission characteristics which stimulated in those coal samples under the influence of the rapid heating corresponding to thermal shock are presented in this paper. The obtained results are compared with estimates of coal samples oxidation, determined by the known physical and chemical methods.

Key words: thermally stimulated acoustic emission, coal, sample, oxidation, thermal shock.

**Suknev S.V.** USING OF TONI TECHNIK EXTENSOMETERS FOR DETERMINATION OF POISSON’S RATIO IN COMPRESSION

The results of measurements of axial and lateral strain in the specimen of limestone under compression with the help of Toni Technik extensometers were given. The possibility of the use of these extensometers for determination of Poisson’s ratio was analyzed.

Key words: compression, extensometer, elastic modulus, Poisson’s ratio.

**Suknev S.V.** A METHOD FOR DETERMINATION OF STATIC MODULUS OF ELASTICITY AND POISSON’S RATIO UNDER SPECIMEN TEMPERATURE VARIATION

A test method for elastic properties of rock is developed. Basic and upper loading stresses are determined by taking into account the conditions of strain reversibility and linearity. The examples of using the method for determination of elastic properties of carbonate rock under uniaxial compression and varying temperatures are given.

Key words: rock, compression, elastic modulus, Poisson’s ratio, low temperature.

**Tavostin M.N., Voznesenskii A.S., Kutkin Yu.O.** DETERMINATION OF MOHR-COULOMB ROCK MODEL PARAMETERS TAKING INTO ACCOUNT CONTACT PROPERTIES OF CRACKS

The methods and the results of the direct shear stress and the direct shear stress saw cut tests on sandstone samples are discussed. Parameters of the model Mohr-Coulomb are given. It has been proposed to increase the measurements accuracy through the simultaneously recording of the acoustic emission.

Key words: rock, samples, mohr-coulomb model, surfaces of weakness.

**Kulikova E.Yu.** SYSTEM OF ENVIRONMENTAL MONITORING DURING UNDERGROUND BUILDING

As a result of intensive development of underground space occurs a change in the natural systems and environmental pollution, which determines the need for environmental monitoring. This article describes the main tasks, levels and methods of environmental monitoring during underground construction.

Key words: environmental monitoring, man-made pollution sources, the control action, the environment.
The Moscow Coal Basin is the oldest coal extraction center in Russia. More than one and a half century of upgrowth of mining and other industries has cardinally converted the ecological and geological conditions in the area. The regional ecological policy assigns the top-priority objective to carry out the integrated eco-geological research.

Key words: ecology, ecological geology, environment protection, coal basin, geoecology.

Golynskaya F.A., Petrova K.I. GEOLOGICAL FACTORS SPONTANEOUS COAL KUZNETSK BASIN

Kuznetsk basin has a high level of endogenous fire, driven primarily spontaneous combustion of coal. This phenomenon is associated with complex conditions of occurrence of coal seams and physico-chemical properties of coal, which is devoted to the analysis of the article. Identified geological factors leading to spontaneous combustion of Kuznetsk coal.

Key words: Kuznetsk basin, spontaneous combustion of coal, endogenous fires, power, depth, texture, slope, faults, ash, moisture, sulfur, gas content, volatile content, petrographic composition, degree of metamorphism.

Savenok O.V. GEOLOGICAL PARTICULARITIES OF THE HARD EXTRACTION OIL STOCKS COMPLETION

In article are considered deposits with raised and anomalous high reservoir by pressures, are shown thermo recovery and vacuum separation of spongy titanium. It is brought geological aspects of the efficient completion of the hard extraction oil stocks and petroleum bitumen. Categorization collector hydrocarbon West Siberia is shown.

Key words: hard extraction oil accumulation, anomalous high reservoir by pressure, reservoir temperature, thickness of effective oil-bearing formation, efficient completion of accumulation, categorization collector hydrocarbon, reservoir filtration capacity properties.

Automated control systems

Kraev S.L., Kirin Yu.P. IDENTIFICATION OF PROCESS FLOW PERFORMANCE SITUATIONS IN PROGRAMMABLE LOGICAL CONTROLLERS

The article reviews the known approaches to identification of process flow performance situations in the conditions of incomplete a priori information on the process state. It is suggested to take the data on the process flow performance from the engineering procedure control effected by programmable logical controllers. The authors discuss principles of structuring the process flow performance situation identification system in the programmable logical controller in spongy titanium production.

Key words: process flows, recovery and vacuum separation of spongy titanium, performance situation, identification, programmable logical controller.

Mining machinery, equipment and transport

Gromadskij A.S., Khrutskij A.A. PROSPECTS FOR IMPROVING DRILLING BITS FOR DTH DRILLING

The ways to increase the efficiency of drilling bits for DTH drilling boreholes and wells in hard rock, and also were promising methods for breaking up rocks.

Key words: destruction of rocks, drilling bits.

Keropyan A.M. TECHNIQUE OF DEFINITION OF CONTACT PARAMETRES OF INTERACTION OF A WHEEL OF A CAREER RAILWAY TRANSPORTATION WITH A RAIL

As a result of the executed theoretical researches the simplified technique of the decision of a problem by definition of geometrical parameters and the contact pressure arising at interaction elastic wheel and a rail at them to load by vertical loading is developed. The developed technique is based on geometrical formulas with partial application of data from the classical theory of resistance of materials. The received results can be used at designing of mine and career railway vehicles, stone-cutting the equipment and other kinds of mountain technics.
Key words: a wheel, a rail, vertical loading, the stain of contact crossing at right angle cylinders, rapprochement of contacting cylinders, the big and small semiaxes of a stain of contact, contact pressure, approximating factors of the big and small semiaxes of a stain of contact.

Krasuk A.M., Russkiy E.Yu. RESEARCHES OF THE STRENGTH AND FREQUENCY PROPERTIES OF AXIAL FANS DRIVING WHEELS OF MAIN AIRING...

the loadings acting on the case of the driving wheel are considered, the intense-deformed condition of the case of the driving wheel is certain, dependences of pressure on frequency of revolving force are constructed.

Key words: the case of the driving wheel, the intense-deformed condition, frequencies of fluctuations.

Aerology, methane, safety

Gazizullin R.R. Kormshchikov D.S. INVESTIGATION OF UNDERGROUND LOCAL AERODYNAMIC RESISTANCE IN CASE OF REVERSAL VENTILATION

In this paper we introduce a classification of local aerodynamic resistance types and the factors influencing on the air distribution in mine ventilation networks in a period of reversing the air flow. Local aerodynamic resistance influence is investigated. Landing, mine roadway coupling in case of different air flow direction are considered.

Key words: mine, local aerodynamic resistance, modeling, air flow separation and junction.

Gorbunov S.A., Makarov V.N., Makarov N.V., Kornilova T.A AERODYNAMIC CALCULATION OF LOCAL VENTILATION FANS WITH VORTEX CHAMBERS

A promising method of enhancing aerodynamic loading and adaptability of local ventilation fans is proposed in the article. Using the complex integration concept of residue theory, conformal mapping method and the Schwartz–Christoffel equation, the author has derived formula for circulation of circular cascade with vorticity sources arranged at corner points. It is found that vorticity sources eliminate branching of flow at the corner points, i.e. ensure the smooth flow-around, which considerably increases aerodynamic loading and controllability of fans.

Key words: fan, circulation, vortex chamber, aerodynamic scheme, aerodynamic loading, vorticity source, circular blade cascade, conformal mapping method.

Kazakov B.P., Zaitsev A.V., Semin M.A. FORMATION OF MICROCLIMATIC PARAMETERS MINING ATMOSPHERE IN SHAFTS AND MAIN EXCAVATIONS IN DEEP MINES

The article presents research result of formation microclimatic parameters mining atmosphere in shafts and main excavations in deep mines. Effective surface bulk air cooler was analyzed and perspective technology of normalization microclimatic parameters was presents.

Key words: deep mines, excavations, shafts, autocompression, microclimatic parameters.

Kazakov B.P., Isaevich A.G., Malteev S.V. ACCURACY ESTIMATION OF THE QUADRATIC APPROXIMATION OF FAN AERODYNAMIC CHARACTERISTICS.

Two methods of accuracy estimation of quadratic approximation factory fan aerodynamic characteristics in research are presented – 1) based on the cross-sectional area between factual and simulative characteristics and 2) based on the ratio error of pressure and flow evaluation. Analysis of methods and conclusions about possibility of their usage are performed. Example of the VM-8M fan is considered.

Key words: computational ventilation network, aerodynamic resistance, booster fan, aerodynamic characteristics, approximation accuracy.

Levin L.Yu., Semin M.A., Zaitsev A.V. NUMERICAL SIMULATION OF COUPLED HEAT DISTRIBUTION PROBLEM IN MINE ATMOSPHERE AND ADJACENT ROCK FORMATION FOR ARBITRARY MINE ROADWAY NETWORKS

This research is about formulation and algorithmization of coupled mass- and heat distribution model in mine atmosphere and adjacent rock formation. Mine roadways of arbitrary topology are considered. Accompanied specific mechanical and thermal processes are taken into account and analyzed. Effective and efficient numerical algorithm
using dynamic meshing is proposed. Analytical estimation of heat flux insinuation depth is rock formation is given. Influence of physical time, rock formation heat conductivity and, required computational accuracy values are analyzed.

Key words: Mine ventilation, differential equations, air velocity, depression, head characteristic, temperature field, conditioning environment unit, mathematical model, microclimatic conditions, mine atmosphere, air conduit, heat exchange, heat flux, air-depression measurements, heat-humidity measurement.

Makarov V.N., Gorbunov S.A., Kornilova T.A. Calculation Procedure for Blade Channel Angle in Mine Fan Impeller

The author describes the method of utilizing vorticity sources to enhance aerodynamic loading and economical efficiency of mine fans, as well as their influence on flow in blade channels of impellers of turbomachines. Based on the principle of hydrodynamic analogy, it is found that angle of an equivalent diffuser is governed by energy characteristics of a vorticity source, and parameters and operating regime of a fan. On the strength of the calculated optimal angle of the equivalent diffuser, the author offers design procedure for radial-vortex aerodynamic configuration of higher aerodynamic loading and effectiveness fans.

Key words: gas suction fan, vorticity source, vortex chamber, equivalent diffuser, boundary layer, blade channel angle, separation vortex generation, aerodynamic loading, circular blade cascade, circulation, blade channel, energy method, effectiveness criteria, aerodynamic configuration, radial vorticity fan.

Technology

Altuhov A.A., Mitenkin A.V., Teplova T.B., Doronin M.A. Processing of Diamond Preparations by Thermochemical Method with Receiving a Surface of a Nanometer Roughness

Diamond application in microelectronics sets technological tasks of formation of a surface of diamond preparation of a nanometer roughness. For production of products of scientific and technical, research and medical appointment it is necessary to use new ways. One of such ways is thermochemical which allows to reach Ra roughness to 5 nanometers.

In article the problem of achievement of a nanometer relief of a surface of diamond reveals at its application in hi-tech products of microelectronics and medicine. The description of a thermochemical way, design of thermochemical installation is provided, the scope is specified. In article there is a description of a pilot study with the subsequent scheduling and a conclusion of a formula of dependence of quality of processing of a surface from temperature of a processing disk. At the end of article conclusions are drawn on need of further researches.

Key words: microelectronics, thermochemical way of processing of diamond, roughness of a surface of nanometer level, temperature mode.

Desyatov A.M., Malinsky R.A., Mantsevich M.I., Shcherbakova G.V., Kozlov P.A., Panshin A.M. Resource-Saving Clinker Processing Technology at Chelyabinsk Zinc Plant

Energy-saving technology has been developed for processing of Waelz slag from zinc plants incorporating production of coal concentrate for re-use in the Waelz process and intermediate products containing other valuable components for further processing.

Key words: Waelz slag, coke fines, mineral processing, concentrates, environmental performance, sulfides.

Kasatkin V.V., Ilchev V.A., Kamnev E.N., Kasatkin A.V. Expert Assessment of Radiation Risk of Objects of Peaceful Nuclear Explosions (PNE) on the Basis Selected Empirical Criteria

Based on the generalized analysis of characteristics of peaceful nuclear explosions, the authors offer a matrix of empirical criteria of radiation conditions and expert appraisal of radiation hazard and advisable rehabilitative measures. Judging from the analysis, all peaceful nuclear explosion objects are grouped into 3 classes. This classification is used as the basis for package plan on nuclear safety of population, environmental and mineral wealth protection, considering specificity of nuclear explosion technology branches.

Key words: peaceful nuclear explosions, radiation hazard, expert appraisal, empirical criteria, rehabilitative measures.
Blasting operations

Klishin, I.V., Shcheptev, E.N., and Koltyshov, V.N. DEVELOPMENT AND JUSTIFICATION OF CONCENTRATED GREATER-DIAMETER EXPLOSIVE CHARGE PATTERNS IN BLOCK MINING

The authors propose the multiblasting patterns of concentrated greater-diameter explosive charges. The specific explosive consumption in the secondary crushing circuit is found.

Key words: charges, explosive, block, breaking, deposit.

Rakhmanov R.A. VARIABLE DIAMETER BLASTHOLE CHARGE DESIGN FOR TOP PORTIONS OF BENCHES

Aimed to raise energy efficiency of blast fragmentation of hard inclusions at the top of a various strength rock mass, it is proposed to design a combined blasthole charge with variable diameter up/down blasthole. The author has developed procedure for determination of parameters of such charges, taking into account their position height-wise a bench.

Key words: rock, blasting energy, fragmentation, bench, charge, parameter, height, diameter.

Rakhmanov R.A. BASIS FOR PARAMETERS OF COMBINED BLASTHOLE CHARGE DESIGN FOR DIFFERENT-STRENGTH ROCK MASS

The article presents a combined blasthole charge design to shatter different-strength rock mass with hard inclusion at the top of bench. It is found that characteristics of the combined blasthole charge relate with the parameters of controllable fragmentation zones in different-strength rocks.

Key words: rock, hard inclusion, layer, blast, charge, fragmentation.

Rakhmanov R.A. BLASTHOLE CHARGE ENERGY CONTROL BY SHORT-DELAY EFFECT ON DIFFERENT-STRENGTH ROCK MASS LAYERS

The author reviews the experience gained in high-efficient utilization of blasthole charge energy in the different-strength rock mass of Zheroi-Sardara deposit due to modified blasthole charge design. The proposed approach to changing the blast energy transfer to different-strength rock mass layers is based on the short-delay blasting theory.

Key words: rock, rock mass, hard inclusion, blast, charge, energy, bench.

Chan Kuang hieu, Belin V.A. EFFECT OF THE WIND AND AIR TEMPERATURE ON THE DEGREE OF SHOCK AIR WILLS IN THE EXPLOSION ROCKS ON VIETNAM’S COAL PITS

Consider engineering-geological and technique conditions of the existing and planned Vietnam’s coal mines; improving management of energy explosions for no increase in energy consumption to achieve the required degree of crushing rocks while reducing Peripherals and seismic waves on the environment, to reduce the danger zone of the explosion, is very relevant scientific and practical task in Vietnam.

Key words: open mining, coal mines, drilling and blasting operations, the parameters of blasting operations, hole charges, Vietnam.

Shemetov P.A., Umarov F.Ya. SEISMICALLY SAFE METHOD OF DRILLING-AND-BLASTING IN PITWALL ROCKS AND AT ENGINEERING STRUCTURES

The developed seismically safe drilling-and-blasting technique and nomographic methods of drilling-and-blasting parameters calculation ensure safety of benches, walls and engineering structures in open pit mines.

Key words: open pit mines, engineering structures, seismically safe blasting.

Economy, management and planning

Garmanov V.V., Badenko V.D., Trushnikov V.E. EVALUATION OF RENT LAND PROJECT

The reclaimed land rent serves as an economic tool for land management, which takes into account the interests of land owner and land tenant. The approach proposed makes it possible to objectively justify the rental rate for the reclaimed land including the cost of the owner of land on its development and the size of the potential tenant’s income, providing the required level of profitability.

Key words: land rent, cadastral value of land, land value assessment, method for determination of the land rent.
**Kondratsky A.A., Popov P.V.** IMPLEMENTATION OF RISK LEVEL EVALUATION IN FINANCING OF INVESTMENT PROGRAMS

The article considers key aspects of the procedure for evaluating risk levels of investment and describes the developed economical forecast model of a project choice.

Key words: economical forecast model, investments, crisis, investment project, risk, program.

**Kondratsky A.A., Popov P.V.** MODELING INVESTMENT RISKS OF INDUSTRIAL COMPANIES IN RUSSIA IN THE FINANCIAL CRISIS CONDITIONS

In focus are key aspects of modeling risks of investment projects in industrial companies.

Key words: modeling, investments, finance, management, ranging.

**Kondratsky A.A., Kornyushkin G.A., Popov P.V.** STRUCTURE OF INVESTMENTS IN METALLURGY INDUSTRY IN THE FINANCIAL CRISIS CONDITIONS

The authors describe the strategy details one faces in calculating payback of investment projects in the conditions of the global economic crisis.

Key words: metallurgy industry, investments, crisis, investment project.

**Plotnikov V.P.** CALCULATING ECONOMIC EFFICIENCY OF COAL SHEARERS BY BROKEN COAL SIZE

Effectivity of coal shearsers is evaluated based on broken coal size, the related research trends and ways to solving the problem are determined. The article introduces definitions of theoretical, technical and operating cost, as well as absolute and relative cost of lost quality of coal. The author presents formulas for calculating the listed costs and, using these formulas, evaluates economic waste of coal overgrinding by modern shearers, as well as the potential benefit of higher quality coal mining by shearers and cutters with hydraulic drives.

Key words: broken coal size, effectivity of coal shearers, cost, economic waste.

**Rznichenko S.S., Lozinskaya M.A.** METHODOLOGICAL PRINCIPLES OF JUSTIFICATION ORGANIZATIONAL AND TECHNOLOGICAL SCHEMES SURFACE MINING OF COAL DEPOSITS

The principles of substantiation organizational and technological schemes have been presented. Economical and mathematical models of formation and evaluation of organizational and technological schemes have been developed.

Key words: organizational and technological scheme, production process organization, a coal quality, criterion of optimality.

**Electrification mining enterprise**

**Fashchilenko V.N., Varfolomeev S.V.** ELECTRIC VENTILATION CONTROL IN TERMS OF INDOOR CLIMATE ON SHOPFLOORS IN TECHNOLOGICAL COMPLEXES: STATE-OF-THE-ART

The author discusses currentness of utilizing fuzzy logic to control electric operation of ventilation systems, terms and demands placed on industrial ventilation systems, ways of solving the problem and the related optional systems.

Key words: indoor climate, working area, ventilation, electric drive.

**Mathematical modeling**

**Isaev A.B., Kovalchukov N.N., Saveliev I.A.** ANALYSIS AND SYNTHESIS OF THE CHEBYSHEV POLYNOMIALS IN THE REGRESSION ANALYSIS PROBLEMS

The article presents the strict mathematical analysis of synthesis of the multidimensional orthogonal polynomials, or the Chebyshev polynomials, aimed to improve stability of approximated regression relationships. The authors prove the theories of linear span properties, polynomial regression space and the stability of orthogonal basic sets of the Chebyshev polynomials constructed using the Gram-Schmidt algorithm.

Key words: approximation, interpolation, Chebyshev’s multidimensional orthogonal polynomials, polynomial regression, isomorphic spaces.

**Oil and gas**

**Beketov S.B., Karapetov R.V., Akopov A.S.** DRILLABLE PACKER FOR REPAIR AND INSULATION WORKS IN THE OIL AND GAS WELLS

The paper describes the design and function of drillable packer, used in the repair of oil and gas wells, treatments of the reservoir with the objective of increasing the productivity of wells.

Key words: Well, packer, oil, gas.
Sadovenko I.A., Inkin A.V. GROUNDING PHYSICAL AND CHEMICAL PARAMETERS OF FORMING AND CONTROLLING THE AREAS OF HYDROCARBONS DURING UNDERGROUND GASIFICATION OF COAL

By physical simulation of underground coal gasification, the author defines shapes and sizes of hydrocarbon areas in roof rocks. The author substantiates technology of coal gasification to allow gasification products to be split into liquid and gas phases and to level anomalous hydrocarbon concentrations.

Key words: coal, underground gasification, gas generator, gas leakage, overburden rock, gas-dynamic processes, gasification product, hydrocarbon areas.

The higher mining education

Petrov V.L., Rachutin M.G., Shagarova O.N., Goncharenko S.N., Makeeva D.V. ASSESSMENT EDUCATIONAL PROCESS QUALITY INFORMATION SUPPORT IN THE CONDITIONS OF INTRODUCTION STATE EDUCATIONAL STANDARDS SYSTEM

A survey was conducted among the students of the Moscow State Mining University, in order to identify the level of student satisfaction with the quality of educational services. The main objectives of the survey were students: evaluation of social - democratic characteristics of respondents rating the reasons for choosing the university, evaluation moral - psychological climate in high school.

Key words: Quality of education, questioning, educational services, problem zones, educational process.

Works of young scientists

Aleksandrov A.N. FEASIBILITY STUDIES OF THE RICH ORE MINING PROCESSES AT A ROCKBURST-HAZARDOUS DEPOSIT

The feasibility studies of the available rich ore mining flowsheets are performed at new areas of the mining field. The capital investment of the venture and the net present values are computed for the proposed process flowsheets. The high-efficient project for the deposit exploitation up to 2033 implies the involvement of new objects into the exploitation and the net income since 2018.

Key words: deposit, flowsheets, capital investment, net income.

Voloukov A.Yu. PILOT TEST EQUIPMENT FOR INVESTIGATIONS OF IRON ORE DEWATERING WITH USING OF VACUUM DISC FILTERS

Pilot test equipment for iron ore dewatering investigations is described in a current article. The high resembling to the industry process is defined as the main advantage of developed equipment.

Key words: iron ore concentrate, dewatering, disc filters.

Voloukov A.Yu. THE TECHNIQUE OF EXPERIMENTS WITHIN THE FRAME OF IRON ORE FILTRATION BY VACUUM DISC FILTERS

The main definitions and principles using in iron ore concentrate dewatering are described in this article. The technique of dewatering related investigations was developed during long-term tests and experiments with application of vacuum disc filters.

Key words: iron ore concentrate, dewatering, disc filters.

Grishin E.L., Trushkova N.A. DETERMINATION OF AUXILIARY FAN SYSTEM PARAMETERS AND ITS LOCATION IN MINING

This paper provides recommendation for selection auxiliary fan systems parameters intended for hard-ventilated areas.

Key words: hard-ventilated area, the auxiliary underground fan system, the fan-ejector, potash mine.

Zavirkina T.V. PREVENTION ENDOGENOUS FIRE OF MINING FIELDS BASED ON THE STUDY OF HEAT AND MASS TRANSFER PROCESSES IN THE GOB AREA

The article is devoted to mines endogenous fires protection. Mathematical model is developed about distribution of the filtration rate of air leakage and heat and mass transfer process in the gob area. To solve this task the author encourage to use 3D-computer modeling of gas-flow filtration with heat and mass transfer over the gob area for determination of coal self-heating and ignition process parameters.

Key words: Fire hazard, the endogenous, spontaneous combustion, 3D modeling.
The article considers the problems of prevention of crisis situations at the industrial enterprises. It reveals a mechanism for warning of crisis situations at the industrial enterprises with the help of information tools, the complex approach to their selection and use.

Key words: crisis, the industrial enterprise, warning of crisis situations, information, information-based tools.

The investigations of loading elements of rotating turret tunneling machine in the interaction with the rock slaughter. It was conducted the analysis of the dependence of loading elements of metal structures from a variety of operational and strength characteristics of the rock face.

Key words: tunneling machine, metal structures, loads, durability of breed.

We propose a method for the analysis of linear and quasi-linear model systems of ordinary differential equations (ODE) with polynomials periodic matrix in the presence of $A_0$ defining different stable Jordan structure. With the help of non-traditional study new algorithm specified above ODE system that summarizes or clarifies the previously known results [1 - 6], allowing to formulate sufficient conditions for stability of the solution of such systems.

Key words: Model systems of ordinary differential equations with periodic matrix polynomial, splitting method, stability, theorems on reducibility.

In this paper presents the experimental studies results of features of the thermoacoustic emission memory effect on the example of granite samples as a function of their thermal loading and cooling. The detected differences in the nature of this effect for low- and high-temperature ranges were analyzed and explained.

Key words: thermally stimulated acoustic emission, geomaterial rock, sample, acoustic emission memory effect.

As a result of analysis of the optimization problem for non-isothermal transport of oil and oil products, subject to the conditions of real industrial process, an algorithm for finding an optimal heating temperature is suggested. The resulting algorithm is general, because it allows to find the optimum heating temperature for different optimal criteria. In the solution obtained corrected the shortcomings of existing techniques, including a major drawback as the search for solutions at a fixed flow rate. The criterion of maximum benefit, which allows to get the maximum benefit of transporting crude oil and petroleum products is suggested.

Key words: “hot” oil pipeline, optimal temperature of preheating, nonisothermal flow, energy saving.

As a result of analysis Mihnev’s correlation equations for Nusselt number calculation in case of forced convection in pipes, with the help of multiply linear and non-linear re-
gression and statistical analysis, new correlations are suggested. Using new correlations in heat transfer calculation, there is no need in iteration solver. The equations for transition flow regime were formulated. This makes it possible to take account of transition flow regime in heat transfer and hydraulic calculations.

Key words: pipelines heat transfer calculation, dimensionless equations, heat transfer, Nusselt number, forced convection in pipes.

Tantsov P.N. THE NEW APPROACH URGENCY TO CALCULATION OF MINE VENTILATION NETWORKS

The problem of the new mine ventilation nets calculation elaboration approach. The basic disadvantages of existing methods of mine ventilation calculation are given. The conclusion of necessity of the new approach to calculating of mine ventilation networks paradigm is made.

Key words: Hardy Cross balancing methods, ventilation networks, dynamical calculation of ventilation.

Trepalina E.A. ALGORITHM OF RECOGNITION DRAGLAYN’S PRODUCTION CYCLE

In this article possibility of creation of algorithm of recognition of stages of performance of a production cycle of the excavator-dragline for further application as a part of the control system software dragline is considered.

Key words: automated control system, imitating model, algorithm of recognition, production cycle dragline.

Journal in journal

Androsov A.D., Sorokin V.S. TECHNOLOGICAL SPECIFICITY OF MINING SMALL-SIZE KIMBERLITE PIPES AND FEASIBILITY STUDY OF THEIR EXPLOITATION

During mining of small kimberlite pipes it is proposed a vertical scheme of lifting of minerals from deep horizons of the open pit with new complex of loading and transport equipment. It is also recommended to develop mini-metallurgical industry on the base of mineral raw materials of small pipes, which contain fine but valuable minerals.

Key words: small kimberlite pipes, technological peculiarities, non-standard equipment, scheme without transport, special vessels, specific expenses of explosives, cage hoist, traditional technology, ecological situation, mini-metallurgical production.

Bureina O.N., Andreeva A.V., Egorov G.V., Sokolova M.D., Zarounaev B.N., Hristoforov A.A. EVALUATION OF APPLICABILITY OF REINFORCED MINING WASTE MATERIAL TO CONSTRUCTION OF BASES OF SEMI-STEEP PIT ROADS

Possibility of uses of technogenic soil of the Nakynsky kimberlitox field of Respublika Sakha (Yakutia), received as a result of pit deepening, for construction of the bases of career roads of krutonaklonny congresses is shown. Thus as the stabilizer use of a surface-active preparation of “ANT” which action is directed on creation of a strong mineral skeleton from elements available in soil is recommended. It is established that application of “ANT” allows to receive constructive materials with high mechanical properties.

Key words: open-cast mines bottom horizons, technological career roads, the strengthened soil, rocks, portlandseement, clay soil of the Turannakhsky field of RS (I), mechanical properties.


This article explores the numerical research of dynamic and hydrodynamic processes, generated during the operation of centrifugal pumps.

Key words: centrifugal pump, forces, moments, equation, loadings.

Koulekov I.I., Dmitriev A.A. CHOICE AND ESTIMATION THE HEAT-INSULATION'S PARAMETERS FOR MINING OF OVERBURDEN ON THE PLACER GOLD DEPOSIT

The choice of method of preparation of the frozen overburden for stripping is proved on the placer gold mining in severe northern climatic conditions. The
technique of thermal protection of a layer, which had thawed for a summer, by heat-insulated plates from foam polystyrene is offered. Calculation of an optimum thickness of a thermal protection, taking into account the snow thermore sistance, is made.

Key words: mining, open pit mining, placer gold deposit, overburden, frozen rock, heat-insulation.

Markov V.S., Pavlov A.A., Petrova L.V., Skryabin E.P. DEVELOPMENT OF AIKHAL MINE WITH SLICING METHOD AND SCALED-UP DRIVAGES............ 373

In this work the extraction of picking belt with the increased parameters is offered: 15 m high with a width of 8 m, at an arrangement of picking belt on strike of an ore body by the combined way (combined drilling-and-blasting works).

Key words: the underground mining, the increased parameters, exposure, technology.

Petrov D.N., Petrov A.N. NATURE OF INFLUENCE PARTICLE SHAPE BACK-FILL MATERIAL OF STRENGTH THE ICE-ROCK FILLING…………………………… 379

The character of the influence of filler particle shape on the strength characteristics frozen water rock mixtures. The content of particles of different shapes in the exploded rocks of the mine Badran, used as a placeholder frozen backfill. Results of tests frozen backfill samples with different contents of lamellar particles (flakiness) and needle forms on the compressive strength. Found that the tensile strength of the material on frozen backfill uniaxial compression with increasing content of lamellar particles (flakiness) and needle forms filler with 15% to 30% decreased by 1.5 times.

Key words: ice-rock filling, particle shape, strength uniaxial compression.

Petrov A.N., Akimov D.D. STUDIES OF SLICING METHOD IMPROVEMENT IN KIMBERLITE MINING……………………………………………………………………… 384

The results of research on perfection of layer system of kimberlite deposits working out in Yakutia are presented. Optimal parameters of breakage heading are identified. The estimation of intense-deformed condition of massive around the headings with increased cross-section at different depths of working out is done.

Key words: Kimberlite, ore body, continuous mining system, layer system working, drilling and blasting operations, filling massive, the combined scheme working out, self-propelled machines, intense-deformed condition.

Sokolova M.D., Portnyagina V.V., Shadrinov N.V., Hristoforova A.A., Davideva M.L. STAND AND PILOT TESTS OF SEALS FOR MINING TECHNICS OF THE NORTH....................................................................................... 393

There are the results of stand and pilot testing of elastomeric seals composites. Found that the seals of the developed materials have distinct advantages when operating in the hydraulic systems in comparison with the standard seals. Seal introduced in the enterprises of the Republic of Sakha (Yakutia).

Key words: mining equipment, operational properties, tribology, sealing materials, frost resistance, wear resistance, oil resistance.

Shubin G.V., Zarouzyaev B.N., Sorokin V.S. MONITORING OF FORMING OF CREST OF A BENCH IN THE EXPERIMENTAL SECTIONS OF THE “UDACHNY” OPEN PIT................................................................................................... 402

There are the results of observations of the demolishing speed of the crest of a bench in the southern flank of the “Udachny” open pit in two experimental sections, situated in the safety benches of horizons of 35 m and 125 m.

Key words: open pit, experimental section, rocks, technological factors, annual fluctuations of temperature, weathering, crest of a bench, safety bench, schedule, period of observations.

Open-cast

Fomin D.S. THE CHARACTERISTIC OF PROCESS OF DISPERGATING OF PEAT IN MULTISTAGE MECHANICAL DEVICES................................................................. 407

Article is dedicated to the refinement of dependence between the conditional specific surface area, which characterizes the quality of processing peat, and the index of the working apparatus processing actions. The proposed expression for evaluating the
process of dispersion in the multistage processing devices of the machines of the molded peat makes it possible in the process of design to select the design and kinematic parameters of the separate steps of processing from the condition of obtaining the production of the assigned quality.

Key words: lump peat, processing of peat, dispersing, the design of multi-stage processing devices.

Anniversaries

Dmitry G. Antoniadi’s 65th Anniversary

Preprints

Lisenko P.Yu. METHOD OF ANISOTROPY AND IMPERFECTION INVESTIGATION OF ROCKS BY LASER ULTRASOUND SPECTROSCOPY USING “GEOSKAN-02MU”

Krivitskiy V.O. EFFECTIVENESS OF RUSSIAN ECONOMIC SUPPORT TO SOUTH OSETIA

Romanov S.M., Khelaya I.T., Diachkova A.Yu., Ilina V.A. ECONOMIC AND INFRASTRUCTURE PROBLEMS OF MINING INDUSTRY IN RUSSIA


Gorbanov V.A. COLDBACH CONJECTURE

Deposited manuscripts

Popov S.M., Savin K.S. ECOLOGICAL AND ECONOMIC VALIDATION OF EXPEDIENCY OF USING PEAT BOGS FOR PRODUCTION OF A USE VALUE, CONSIDERING THE PEAT BOG EFFECT ON REDUCTION OF FOREST-AND-PEAT FIRE RISK

Voloshinovskiy K.I. TEMPERATURE AS FREQUENCY FUNCTION

Safonova E.G. THEORETICAL AND METHODOLOGICAL PRINCIPLES OF CREATION AND DISCLOSURE OF ACCOUNTING POLICY

Rakhmanov R.A. BLASTHOLE CHARGE ENERGY CONTROL BY SHORT-DELAY EFFECT ON DIFFERENT-STRENGTH ROCK MASS LAYERS

Safonova E.G. GENERAL PROVISIONS AND SPHERE OF APPLICATION OF THE CONSOLIDATED FINANCIAL ACCOUNTING

Voloshinovskiy K.I. INDUSTRIAL GAS ACCOUNTING SYSTEM DEVELOPING BASED ON REQUEST SCHEME METHOD FOR DATABASE SYSTEMATIZATION AND EXCHANGE PROTOCOL RESEARCH