



CERTIFICATE OF PARTICIPATION



National University of Water
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Engineering

This certificate is presented to
VU TRUNG TIEN

HANOI UNIVERSITY OF MINING AND GEOLOGY, VIETNAM

for attending

the VI International Scientific and Technical Conference "Innovative Development
of Resource-Saving Technologies and Sustainable use of Natural Resources"

Petroșani, Romania on November 16, 2023

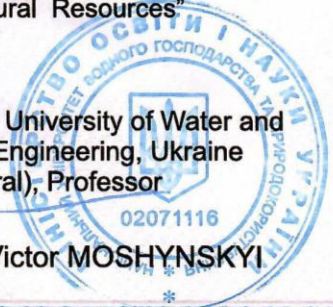
Rector University of Petroșani,
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Ph.D., Professor


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6rd INTERNATIONAL SCIENTIFIC AND TECHNICAL
CONFERENCE

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SAVING TECHNOLOGIES AND SUSTAINABLE USE
OF NATURAL RESOURCES”**

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Table of contents

Scientific committee composition.....	3
Table of contents.....	16
Greetings from the Scientific committee co-chairmen:	
<i>Sorin Mihai RADU</i> , Rector of the University of Petrosani, Romania	18
<i>Viktor MOSHYNSKYI</i> , Rector of National University of Water and Environmental Engineering, Ukraine	19
Section “Sustainable use of natural resources”	
<i>Florin FAUR, Maria LAZĂR, Izabela-Maria APOSTU</i> General considerations regarding the use of fossil fuel based energy	20
<i>Yuriy VYNNYKOV, Maksym KHARCHENKO, Marina RYBALKO</i> Geotechnical properties of overburden low-cohesion rocks formed during the development of iron quartzite deposits	23
<i>Wiktoria SOBCZYK, Martyna WŁOCH</i> Bacteria and enzymes in the fight against plastics	26
<i>Ahmed JEDID</i> Harnessing the power of artificial intelligence for sustainable resource conservation	28
<i>Mykola KHARYTONOV, Iryna KLIMKINA, Olha SUMIATINA</i> The biochar application as amendments in technosols	29
<i>Zenfira AGAYEVA, Sevinj BAYRAMOVA, Leila ABDULLAEVA</i> Study of toxicants impact on the ecosphere	31
<i>Mykhailo PETLOVANYI, Vasyl POPOVYCH, Kateryna SAI</i> Development of an approach to the effective restoration of the earth’s surface disturbed by mining operations	33
<i>Oleksandr KUCHIN, Hanna BRUI, Yuliia ZABOLOTNA</i> Geodetic monitoring of degraded lands due to coal mining	35
<i>Martyna WŁOCH, Wiktoria SOBCZYK</i> Disposal of plastic waste in the legal aspect	37
<i>Dmytro ONOPRIENKO</i> Resource-saving technologies of maize grain production on irrigated lands	40
<i>Oleksii KOSHLYAKOV, Oksana DYNIAK, Iryna KOSHLYAKOVA</i> Current issues of water supply optimization in Ukraine at the account of groundwater	43
<i>Olena FEDOSKINA, Mikola YERISOV, Valeriy FEDOSKIN</i> Prospects for recycling triplex in a vibratory jaw crusher with an inclined working chamber	46
<i>Mohamed Tafsir DIALLO, Mamadou Diouhaya BALDE, Cheick Mohamed DIAWARA</i> Impact of technological change on the economy and resource management in least developed countries (LDCS), possible solutions: the experiences of the cira-uganc-bocej project – republic of Guinea	48
<i>Yevhenii CHUHAI, Ilona PANASUYK, Pavlo VOLK</i> Improvement of the design of the hydro-pumping unit of the polder drainage system in accordance with current changing conditions and requirement	49
<i>Viktor BREDUN, Liudmyla CHAIDAK, Andrii BREDUN</i> Features of the use of garbage trucks in the conditions of rural and urban villages communities	52
<i>Pavlo TSYHAN, Olha ZAMKOVA, Sofiia PINCHUK</i> The influence of complex building renovation on minimization of heat losses and reduction of greenhouse gas emissions	55
<i>Ihor CHOBOTKO, Serhii TYNINA</i> Development of a classification system for coal mining waste utilisation methods	56
<i>Yevheniia SHERSTIUK, Vasyl TYMOSHCHUK, Iryna CHUSHKINA</i> Study of the current hydrodynamic state of the territory of the Novotroitsk deposit of the Volnovask district of the Donetsk region	59
<i>Igor BAHRII, Iaroslav KRYL, Olena REMEZOVA</i> Justification of global environmental and energy decarbonization projects in Ukraine and Romania	61
<i>Nataliia PRYKHODKO, Anatolii ROKOCHYNSKYI</i> Substantiation of necessity of resource optimization in irrigation in the context of modern changing conditions and requirements	64
<i>Oleksandr KOMLIEV, Oleksandr BEIDYK, Olena REMEZOVA</i> Forecasting and search system for amber in Ukraine: purpose, structure, implementation	67
<i>Olha BOHOMAZ, Maryna TAVREL</i> Compact technical mean of regulating the concentration of water oxygen in the shallow water bodies	70
Section “Mining and processing of useful minerals”	
<i>Victor MOSHYNSKYI, Myroslava KUCHERUK</i> Using peat for obtaining alternative energy carriers	72
<i>Zinovii MALANCHUK, Vitalii ZAIETS, Vasyl SEMENIUK</i> Actual problems of disturbed lands reclamation during amber mining in polissia	74
<i>Valerii KORNIYENKO, Oleksandr VASYLCHUK, Oleh PROSHCHARUK</i> Research of the amber mining machines automation complex	76
<i>Olexandr KRUKOVSKYI, Viktoriia KRUKOVSKA</i> Supporting of the roadways to be preserved after the stope drivage	78
<i>Victor MUTAMBO</i> Assessment of the effectivity of the current de-watering boreholes draw-down on the final bench at nchanga open pit mine, Zambia	80
<i>Volodymyr BONDARENKO, Ildar SALIEIEV, Iryna KOVALEVSKA</i> Associated mining of mineral and raw material resources from coal mines in the western Donbas (Ukraine)	81
<i>Ruslan ZHOMYRUK, Andriy KHRYSTYUK, Yevhenii MALANCHUK</i> Control system of the hydromonitor washing process	83
<i>Serhii CHUKHAREV, Serhii PYSMENNYI, Andrii PEREMETCHYK</i> Using a floating ceiling to improve ore extraction ...	86
VU TRUNG TIEN, DO ANH SON, NGUYEN HONG CUONG The control solution for weak roof in the fully mechanized mining longwalls in quangninh coalfield, Vietnam	88
<i>Yevhenii KOROVIAKA, Andrii IHNATOV, Mykyta MEKSHUN</i> Some functional features of the use drilling fluids during the construction of wells	91
<i>Viacheslav KAMENETS, Vitalii PILIUHYN, Mykhailo NOVIKOV</i> New technologies for sectional entries driving and maintaining at “Krasnolimanska” coal mine	93
<i>Tatyana OLIYNYK, Vitalii NEVZOROV</i> Technological feasibility of using fine screening in processing flowsheet	96
<i>Vasyl KONDRATETS, Anatolii MATSUI, Mykola KHLEBNIKOV</i> Optimisation of drum mill ball loading in the first stage of ore preparation at beneficiation plants	98

<i>Yulian HRYHORIEV, Sergey LUTSENKO, Ihor BARANOV</i> Optimization of final contours of pjsc ArcelorMittal Kryvyi Rih pits as parametric adaptation of the mining complex to dynamic business conditions	101
<i>VU TRUNG TIEN</i> Solutions to improve mining efficiency for the longwall in thick, sloping seams of Mao Khe coal mine, Vietnam	103
<i>Vitaliy RIASNYI, Ihor YEVSTRATENKO, Ivan KUSHNEROV</i> Improving the safety of Kryvbas miners by improving the equipment of the mining rescue service	107
<i>Tatyana OLIYNYK, Maryna VILHELM</i> Evaluation of the possibility of application in processing flowsheet of hydraulic screening by near-mesh grain	110
<i>Yury KURIS, Yana VIDLOHA</i> Research on bioconversion and improvement of technological opportunities for biogas furnishing	112
<i>Viktoriia DMYTRENKO, Taras PODOLIAK</i> Analysis of the efficiency of using methanol to prevent hydrate formation in gas gathering and processing systems	115
<i>Artem PAVLYCHENKO, Andrii IHNATOV, Islam ASKEROV</i> Drilling and environmental aspects when constructing water wells	117
<i>Oleksandr MAMAIKIN, Roman SYDORENKO, Ivan SHEKA</i> Preconditions for the use of composite materials in mine support elements	120
<i>Iryna PERKUN, Volodymyr SHYMANSKYI, Volodymyr POGREBANYAK</i> Calculation of different hydrojet water-polymer perforation models for oil and gas wells	123
<i>Ivan ZEZEKALO, Mykola PODOLIAK</i> In-reservoir catalysis as a method to improve the development of hard-to-extract hydrocarbon reserves	125
<i>Sergiy STETS, Andriy STETS</i> Development of technical proposals for the design of the site for industrial development of the zeolite-smectite tuff deposit	128
<i>Mykhailo PEDCHENKO, Larysa PEDCHENKO, Nazar PEDCHENKO</i> Features of regeneration of low-dose hydrate formation inhibitors	131
<i>Vladimir PANTELEENKO, Serhii KARPUSHYN, Andrii CHERVONOSHTAN</i> Method of manufacturing of drum mill lining plate	133
<i>Valentyn OSINNII, Natalia OSINNIA</i> , Combined technology for developing quartzites using plasmatrons	136
<i>Volodymyr BARANOV, Yana ANTIPOVYCH, Serhii STEFANKO</i> Methods for prediction of disturbed zones and dynamic processes in sedimentary rocks	138
<i>Svitlana MOSHCHYCH</i> Strategic directions of innovative development of the coal industry on the example of the Lviv-Volyn coal basin	141
<i>Olena MYKHAILOVSKA</i> Technological solutions of drilling waste disposal	144
<i>Victor KHILOV, Artem RUKHLOV, Nataliia RUKHLOVA</i> The energy efficiency increasing of the system «rock excavator - power line» in conditions of the Ukrainian mining and ore enterprises	146
<i>R. (STEPANEK) CUJBA, Maria LAZAR</i> Sustainable copper mining: balancing resource extraction with environmental and social responsibility. case study	148
<i>Maksym DZOBA, Ilya LYTVYNCHUK, Oleksandr FROLOV</i> Study of the stability of the working bench of quartz sands	151
<i>Mykyta BELTEK, Artem OSTAPCHUK, Oleksandr FROLOV</i> Research of the influence of rock mass fracture on its strength	154
<i>Oleksandr DRESHPAK, Oleksandr BEREZNIAK, Olena BEREZNIAK</i> Wet high gradient magnetic separation of kaolin clay	157
<i>NHU THI KIM DUNG</i> Development trends of the mining industry in Vietnam	160

Section "Machine building and automobile transport"

<i>Mykola MARCHUK, Roman MARCHUK, Nazar MARCHUK</i> Research the movement of lorry convoy on curved trajectory by braking wheels on one axle	161
<i>Stanislav FELONENKO, Viktoriia HUBKINA, Olena TROFYMOVA</i> Piston liquid sloshing in a vertical vibrating conveyor	163
<i>Mykola PIKULA, Taras PANAI</i> Finishing and cleaning processing of details in the vibration center installation	164
<i>Dmytro RADCHUK, Oleg DERYUGIN, Serhii CHEBERIACHKO</i> Logistics risks of truck transportation	167
<i>Stanislav BARTASHEVSKYI, Valery BORODAI, Olha NESTEROVA</i> Compensation of dynamic loads of chain traction mechanisms by means of electric drive	170
<i>Oksana BANZAK, Hennadii BANZAK, Oleg LESHCHENKO</i> Optimization of strategy parameters "in condition" maintenance with constant monitoring frequency in mechanical engineering and road transport	172
<i>Anastasiia SHKUT</i> Virtual reality illustration of dynamic system mechanics using a screen example	174
<i>Anastasia KASHKANOVA, Andrii KASHKANOV, Viktor BILICHENKO</i> Conceptual principles of ensuring transport safety of cities	176
<i>Oleksandr STADNYK, Oleksandr KOZULIOV, Vladyslav KHOLODENKO</i> Research of the used electric vehicles price dependence on the technical and operational indicators	179
<i>Viktoriia NYKONCHUK, Igor KHITROV</i> Designing of the intersection for traffic safety	182

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THE CONTROL SOLUTION FOR WEAK ROOF IN THE FULLY MECHANIZED MINING LONGWALLS IN QUANGNINH COALFIELD, VIETNAM

The phenomenon of roof falling of the weak roof rock in the fully mechanized longwall is one of the main reasons affecting on the safety and efficiency of longwall mining process. Therefore, the analysis of causes for the phenomenon of roof falling in order to find out the proper preventive solutions, strengthen the roof control, reduce the falling roof accidents is very essential.

Regarding to the real issues in the work of coal mining and work of roof control, the authors researched and analyzed the main reasons leading to collapse of the roof rock near the face in the fully mechanized longwall and proposed solutions to prevent roof, contribute to the management and control of the weak roof rock reasonably.

The basic of controlling roof rock in the fully mechanized longwall is to control and protect the roof rock near a longwall face, because the roof rock near the longwall face above shield, basically it is not supporting area and the roof rock area are cracked, soft rock which belongs to the roof rock which are controlled in the mining longwall. At the area, combining just has moved past to mining in the immediate the roof rock are exposed and strain state also changed dramatically. However the shield has not moved forward promptly to support the roof rock here. If the roof rock in the area is type of soft and loose rock, it will tend to fall in space of the longwall, there will have the roof convergence. This issue causes the failures in the longwall and many difficulties of support works even though it may cause of the accident to the work.

During the coal mining process at the longwall faces, the roof rock is exposed immediately, at the same time the stress state here also changes drastically. But now, the shield still has not timely moved forward to hold roof rock near to the face. If it is weak and loose rock, it tends to fall to

space in the face, this problem can cause accidents in the face, besides it causes difficult to the holding work and unsafe for people working in mine.

Factors affecting the roof falling phenomenon in the longwall

+ *Factors of geology*

The geological factors such as folds, faults, fissures, cracks of coal and rock, strength of coal and rock etc. They are the factors affecting the stability of the roof rock. During the coal mining process at the longwall faces, structural dynamics of initial stability rock and coal are destroyed, the strain of the roof rock through coal seam to the floor rock. If coal is soft and breakable, the strain will fully transfer to the floor rock, leading to the roof rocks crumbling. The crevices and density of crack are the main factors determining the strength of the block rock. the crevices and cracks are more increasable, character of rock is more weakly and the strength of the rock is decreased, which makes the rock easily collapse. The geological fractures such as folds, faults, are easily formed. The rocks which are crumbled, easily to collapse. The angle between a longwall and the crumble of rock area issmaller, exposure area of the crumble of rock is larger that may result on the increase of the roof falling phenomenon to the longwall mining. The crevices and cracks are similar characters of rock swelling. The roof rock is weaker, the roof falling phenomenon is more sharply [1-3].

+ *The width exposure of the roof rock* [4]

After the shearer has cut coal, the roof is exposed. If the shield does not move in time to support the roof or during the move, the shield does not lower to the required level but still makes certain contact with the roof, reducing the support quality of the shield. The distance from the shield to the longwall face exceeds the specified value, which causes the exposed distance of the roof to be large, and then leads to the hanging time exceeding the specified time limit. The working load and initial holding force of the shield do not reach the specified value, or the mining height is greater than the maximum support height of the shield, resulting in pressure on a large area concentrated on the roof, which causes the roof to bend and creates problems with the phenomenon of face spall and roof falling.

During the coal mining process at the longwall faces, the roof rock is exposed. The width of exposure of the roof rock is larger, degree of collapse is higher.

In fact, the mining process shows that in case of distance exposure of the roof rock is zero (beam was closer to the longwall face) but the roof falling phenomenon still happened. The demonstration shows that the distance exposure of the roof rock is not the only the factor affecting the roof falling phenomenon which also involves many other factors.

+ *Initial support load of shield* [5]

During the operation of the shield, it is necessary to adjust the average working load of the shield to a reasonable level, which can reduce the problem of roof falling of the roof. In order to ensure the supporting load of the shield, it is necessary to first determine the initial support load of

the shield, but in fact, it is shown that the reasonable ratio of the initial supporting load of the shield is to be determined only about 70% on average, due to the following main reasons:

- the time to supply lubricant to the shield is short, the initial support load has not been achieved but the lubricant has stopped pumping;

- the pressure of the pump station is not enough, the valve and the pipeline are leaking;

- the floor is soft and weak.

The control methods for the weak and loose roof [6-8].

+ *Selection of reasonable shield*

The roof rock is instable, we selected beam of shield with the function of telescopic. During the coal mining process, we need to move shield closer to the longwall face following movement of the coal cutting shearer, support the roof rock after that it is exposed concurrently to pull beam forward, ensuring the smallest distance from the face to the beam. If the face is failed, it can be moved the beams to location of the face failures, immediately support before. This is also effective in the management of the weak and loose roof.

+ *Spread out steel grating under roof rock*

The weak and loose roof above the beam of the shield are crumble. Therefore, forming unstable rock layers with different thickness above the beam. So, when pulling the shield, this rock layers can fall down the gap between beam and the face which lead to the roof convergence phenomena on the increase. When spreading out the steel grating under roof rock, this makes the weak and loose roof from rock layer stable. Improving the support of the roof rock. Normally, spreading out the steel grating, two layers for managing roof rock have the advantages:

- Effective prevention on the roof rocks falling on among distance from the shield to the face.

While improving the state's exposed roof rock and beams of shield.

- Effective improving the average load of the shield and rock hardness

- Effective for the prevention of the roof convergence phenomena, reducing the depth of the roof convergence phenomena.

+ *Adjusting and moving the shield closer with roof rock*

With the weak, loose and unstable roof lowering and moving the shield is normally very difficult. This time is necessary to apply the method to move the shield closed to the face. (when moving the shield, firstly starting the hydraulic jack, then gradually unloading to make loads of beams and roof rock certain ensure, then moving the shield). Thus, the roof rock can't appear the phenomenon of sudden instability. it will not only be effective roof control but also the shield move fast, reducing time of the hollow roof.

+ *Build up valve to ensure the initial load of the shield*

When workers perform movements of the shield, to improve movement speed, normally, the time to feed liquid for the shield must be short. Strength of initial shield is not enough so it is re-

quired to build valve to ensure the shield to continue the pressurization until achieving the strength of initial shield.

Conclusion

In the fully mechanized longwall with the weak roof rock, the roof control is fine, which lead to the decrease on effective work of equipment in the longwall and even threaten the safety conditions of workers. The authors summarize some of the actual production methods to handle the problem. This may be effective in the longwall mining with the weak roof rock.

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SOME FUNCTIONAL FEATURES OF THE USE DRILLING FLUIDS DURING THE CONSTRUCTION OF WELLS

If we do not take into account some exceptions, we can say the following. The process of drilling wells cannot be carried out without circulation of drilling fluids [1]. The purpose of drilling fluids is varied. Drilling fluids help reduce the hardness of rocks at the bottom of the well. They cool the rock cutting tool and bring the destroyed rock to the surface. Drilling fluids are the hydraulic power source for downhole motors. The presence of special substances in drilling fluids helps reduce power costs, which is associated with overcoming friction forces in the well. Further development of drilling technology requires the development and implementation of the latest well flushing techniques and drilling fluids formulations. In most cases, they allow you to avoid serious compli-