

Report
on the Workshop “Geomechanical and Geodynamic Aspects of High-Efficiency Extraction of Coalmine and Coalbed Methane”, held on 20-22 September 2006 in St. Petersburg on the basis of Research Institute of Mining Geomechanics and Mine Surveying (OAO “VNIMI”)

The Workshop was organized by UN ECE Working Party on Gas and Ad Hoc Group of Experts on Coal Mine Methane together with OAO “Promgas”, OAO “VNIMI” and in close cooperation with the Ministry of Education and Science of Russian Federation, Ministry of Industry and Energy of RF, Federal Agency on Science and Innovations (Rosnauka), Federal Agency on Energy (Rosenergo), Federal Service on Ecological and Nuclear Supervision (RosTechnadzor), the Siberian Coal Energy Company (SUEK), ZAO “Severstalresurs” and others.

The purpose of the Workshop was to define the most appropriate technologies and practices for the development of more efficient and effective production of methane from coal seams (coalbed methane or CBM) and methane degasification of coal mines (coal mine methane or CMM) for the purposes of developing unconventional energy resources, ensuring safe mining operations and improving the investment climate for such projects.

Main topics of the Workshop.

Topic 1. Improving the recovery efficiency of coalbed methane production from unmined coal seams:

- Technologies for the exploration of methane-bearing coal deposits for the purpose of selecting the most promising production areas;
- Identification of methane-bearing coal seams with high production potential;
- Optimal technologies used for the enhanced gas production from coal seams under certain geological and mining conditions.

Topic 2. Improving the efficiency of methane extraction from active and abandoned coal mines:

- Technologies for the control of rock and gas pressure and assessing the permeability of the coal seams and subsurface strata;
- Technologies for the degassing of coal seams;
- Methods for enhanced gas production of the methane.

Topic 3. Utilisation of high-quality and low-quality mine methane.

82 specialists from 8 countries (Germany, Kazakhstan, China, Russia, Roumania, USA, Ukraine, Japan) have participated in the Workshop. 29 papers and reports were heard.

Topic 1. Improving the recovery efficiency of coalbed methane production from unmined coal seams.

Discussion on this topic concerned all stages of coalbed and coal-mine production:

- at the areas of unmined coal seams;
- within the mine field with the purpose of advance degassing and providing the safe following mining operations;
- in the process of mining works for providing their safety;
- from the mined-out spaces including the abandoned coal mines.

The papers presented mainly concerned the aspects of scientific and practical substantiation for the choice of promising areas of methane-bearing coal deposits for industrial methane extraction. The important place in discussions was given to the consideration of new geologo-geophysical and geodynamic methods for identification of promising areas for carrying out prospecting and assessment work at the methane-bearing coal deposits.

A brief discussion ended in the acceptance of the concept about the existing nonconventional methane traps in coalbearing deposits, having a closed mode (type) with the developed local tectonic disturbance, flexure or dome-shaped folds with the presence of low-permeable overlapping sediments.

This scientific agreement is of great importance in the definition of a wise complex of search and prospecting works for the purpose of selection of promising areas for methane production.

The authors considered in their papers the matters concerning the connection between the gaseous, hydrochemical and hydrodynamic zonations of coal deposits for the revealing of diagnostic features of presence of the gas traps.

An essential part of the authors' investigations was devoted to the study of geomechanical and geodynamic specific features of the formation of methane-bearing coal deposits and the methods for control of coal strata state for the enhanced gas output of coal seams.

Consideration was given also to the identification of methane-bearing zones of coal deposits with the use of methods of deformation monitoring during wet treatment of coal seams.

Main conclusions of the first session of the Workshop are as follows:

1. Selection of promising areas of industrial methane production of coal seams should rely on the proper analysis of geologo-

- structural, geodynamic and geomechanical specific features of the geological medium;
2. Presence of serious motivation of coal-winning plants in an advance degassing of mine fields and producing sections of mines to ensure the safe mining operations.
 3. Absence of reliable economic stimulation for the utilization of captured gas in local energetics at mining plants of Russia and CIS-countries.

Topic 2. Improving the efficiency of methane extraction from active and abandoned coal mines.

An important part of discussion on Topic 2 was devoted to the underground degassing of coal seams and utilization of the captured methane.

It was noted that as a result of considerably increased loads on working faces of coal mines (increased rate of their advance) the gas factor becomes a decisive one in the economic efficiency and safety of mining works.

The participants have heard the circumstantial reports concerning the forecasts of methane abundance in the mined-out spaces, optimization of technological schemes of degassing, control of geomechanical state of rock mass in order to increase its permeability, gas dynamics and deformation processes in the flooded massif.

A great interest was shown to the reports on practical application of different methods for enhanced discharge of degassing and producing wells, such as barogradient, hydroimpulsing, thermochemical, seismic, forced replacement of methane by CO₂, etc.

Main conclusions in the 2-nd session of the Workshop:

1. Increased rate of the working face advance of coal mines has lead to the necessity of changing normative methodological basis in the determination of the value of spacing of main roof landing, zones of bearing pressure, protective zones, gas release into mine working that required to revise the technological schemes of degassing;
2. Degassing operations are profitable, because they allow to increase the loads on the working face and thereby to increase essentially the coal production volumes. At the same time, the practical utilization of degassed methane only for mine's own needs and the absence of developed business strategy in the sale of this energy-carrier reduce the investing attractiveness on its utilization in Russia and CIS-countries. The positive experience gained in the USA, Germany and other countries will facilitate the solution of this problem;
3. The unique experience of study of the development of gas-dynamic and deformation processes in the flooded rock mass

with the abandoned coal mines did not find yet its application in projects of coal plants liquidation.

Topic 3. Utilisation of high-quality and low-quality mine methane (Round Table).

The particular interest was expressed to the reports of Peet Mati Soot (Canest LLS, USA), Erwin Kunz (DMT, Germany) and of N. Storonsky (Promgas, Russia).

Consideration was given to the designing and exploration of mine units for the methane utilization. A wide range of methods and techniques for utilization of high-quality and low-quality methane was discussed. Among them the independent modular boiler-rooms, recuperative mixing air-heaters, radiant systems of heating, etc. were mentioned.

The speakers refer in their reports to the economic assessments of profitability of the utilization projects within a wide range of the methane concentrations in the methane-air mixture and yield of producing wells.

At the end of the Workshop third session the Round Table was carried out, at which the Workshop Resume was accepted.

The main conclusions and recommendations being involved in the Workshop Resume are as follows:

1. To take note the research activities being conducted by the Russian organizations and foreign companies, i.e. Promgas, VNIMI, Moscow State Mining University, Schlumberger, Canest LLC, DMT, University of Tokyo and others, aimed at the high-efficiency degassing and the enhanced coalbed and coalmine methane production.
2. To consider the major priority direction in the creation of effective technologies for the coalmine and coalbed methane production, the arrangement of international research polygons in Kuzbass (Russia), Donbass (Ukraine) and Karaganda coal basin (Kazakhstan) for the purpose of testing the research and designing works aimed at the improvement of methods and techniques for the enhanced degassing and coalbed methane production and its utilization with involvement of consolidated invested funds of the participating countries, owners of coalwinning plants, governing bodies as well as with the use of development aid mechanisms of the UN Economic Commission for Europe.
3. To consider it necessary during 2006-2007 to carry out the development of the normative legal base for the prospecting, degassing and utilization of coalbed methane within the CIS-countries being harmonized with the mining rules and regulations of the EC countries, in particular:

- In development of “The Manual on prospecting of the methane-bearing coal deposits for production of methane as an accompanying or self-dependent useful mineral, therefore to include the methane of coal deposits into the industrial classifier”;
 - In development of the special technical regulations for the safe degassing and utilization of coalmine methane to enhance the mining safety in coal mines;
 - In licensing of coal production and methane extraction within one mining diversion;
 - In creation of economical mechanisms for stimulation of methane production at coal deposits;
 - In development of requirements to coalwinning plants on the accounting order of extraction and utilization of methane as an accompanying useful mineral.
4. By suggestion of Gasprom Co. to organize the II Workshop on the coalmine and coalbed methane production at the Kuzbass in 2007.