

## ***Case study: CBM as a pre-drainage solution***

### ***Background information:***

Coal methane reserves of Karaganda coal basin up to the depth of 1500 m comprise 490.47 billion m<sup>3</sup> (KazTransGas JSC). High gas content of coal seams and coal-bearing strata cause significant problems for underground coalmining activities. At the same time methane content in the gas of Karaganda coal varies from 80 to 98% that makes it a viable potential alternative to natural gas.

Experience of CBM extraction in Karaganda basin for mine safety purpose traces back to 1960-ies. Specialists of "Karagandaugol" IE (main coal mining enterprise in the region for that time) jointly with scientists of Moscow Mining Institute (university) held scientific studies and pilot activities on steered hydraulic fracturing of coal seams at mines of Karaganda coal basin. The key purpose of these activities was reduction of natural (inherent) gas content and outburst probability of thick coal seams K12 and D6. Coal Division of Arcelor Mittal Temirtau maintain some of these activities until present time. The most significant input in elaboration and implementation of these studies was made by Professors N.A. Dizhd, S.K. Baimukhametov, N.H. Sharipov, Doctors I.A. Shvets, K.D. Li, F.A. Mullagaleyev and others.

Historically the pre-drainage activities were secured by drilling of vertical wells from the surface into virgin coal strata followed by hydraulic stimulation of the most outburst-dangerous seams to drain gas by formation pressure or with vacuum-pumping stations. Due to very low permeability of Karaganda coal seams application of this technology resulted in well yield of 0.2-0.7 m<sup>3</sup>/min at best. However, long-term draining through these wells over 5 to 7 years was able to provide reduction of inherent gas content of the coal for 6-9 m<sup>3</sup> per ton of reserves or up to 25-35% at methane concentration in the drained gas reaching up to 85-95%. Since the subsurface gas drainage system of the coal mines is connected with vacuum-pumping stations as well leakages in the pipes reduce quality of the gas and complicate its utilization. Besides, coalmining operations go deeper these days that makes traditionally applied drainage techniques insufficient to secure safe working environment. However, application of expensive modern technologies to pre-drain gas from the surface may have negatively affect cost of the coal production.

### ***Solution:***

In light of the above, JSC "KazTransGas", the national operator in the field of gas and gas supply, pursuant to the President's instructions, starts in 2015 to conduct exploration CBM in the framework of a cooperation agreement with a subsoil user of JSC "National Company" Socio- Entrepreneurial Corporation "Sary-Arka" in the Karaganda coal basin.

After carrying out exploration work results will be obtained about the prospects of gas-bearing Karaganda coal basin and made recommendations for future phased transition to the implementation of industrial mining operations. Stage of development of the project JSC "KazTransGas" for the

extraction of coal-bed methane involves three stages. Industrial extraction of methane is planned in 2017.



**Pilot CBM drilling at Sherubainurinskiy site - Courtesy of KazTransGas JSC**

"KazTransGas conducts unique tests, which will allow the expansion of pilot projects run large state task - to get industrial gas", - a well-known in the industry expert, Professor of Karaganda State Technical University Nikolai Drizhd. - In the process of drilling obtained sufficiently high gas content of coal seams, which demonstrates once again the prospect of work done. This gas is essential for solving energy problems, not only of the Karaganda region, and Astana, and its production will have a fundamental impact on the further development of social and environmental concerns.

Further study of core will hold in the leading services in the field of international certified laboratories in the US, China and Poland. They already signed the relevant treaties. Completion of the 1st stage is planned in 2016, then the results will be elaborated into a feasibility study of the prospects of development of this area of gas production and corresponding methane reserve calculations will be made.

***Contribution to mine safety precautions and emission reduction:***

The pilot CBM project is creating a precedent for economical drainage of gas from coal seams from the surface. In term of safety and improvement of operational practice in Karaganda coal mines AMT may potentially gain the following benefits from such practice:

- get gas removed in advance of mining and secure high-quality gas available for utilization;
- reduce inherent gas content prior to coal mining operations;
- opportunity to reduce emissions of methane to the atmosphere (reduction of GHG emission) from the mines, and potentially benefit form the National GHG emission trading system (potential opportunity to substitute coal and heavy oil in power and heat generation by the drained conditioned methane).

At the same time, there are still some economic and technical obstacles to overcome, such as absence of tax incentives (discussion of a "renewable" incentive is in progress), high design, implementation and operation cost of surface drainage program, very low permeability of most of the coal seams of Karaganda basin.