CASE STUDY 3: Mine gas utilization for heating purpose

Background information:

Karaganda coal basin is one of the gassiest in the world. Forecast resources of methane in the basin, by different experts, are estimated at the level from 850 billion m3 to 4 trillion m3. Due to high gas content of coal seams and coal-bearing strata of Karaganda coal basin coal mines have been employing gas drainage practices for over the last four decades to provide safety for underground mining operations. Thanks to application of different gas drainage techniques the mines have reached high level of gas extraction through the extensive CMM drainage system (over 70mln.m3 of conditioned gas in 2015).

At the same time Karaganda is located in the area of sharp continental climate where the ambient temperature usually reach over +30C^0 in summer time and gets down to -40C^0 in winter and the cold period of the year usually lasts for over 6 months.

CMM fueled boiler house of AMT - *Courtesy of "Industrial Karaganda" and Methane Center PA*

Solution:

Specialists of AMT maintenance facilities elaborated special upgrade equipment to install at several mines of the group in order to utilize CMM with concentration exceeding 30% drained from coal seams and coal-bearing strata while mining operations for the purpose of heating ventilation air for the mines over cold seasons and, at a few mines, to generate heat and hot water for the mine facilities. By these means the company managed to replace earlier used coal with coalmine gas that was traditionally considered as a waste resource at the mines and was mainly vented to the atmosphere uncontrollably.

CMM-fueled boilers are to the most extent conventional natural gas based industrial heating devices with some specific adjustments that allow controlling the combustion process based on conditions of the used air-gas mixture (chemical composition, concentration, moisture content, etc.). As a fact coal mine methane extracted from subsurface in Karaganda coal basin

is represented by CH_4 up to 98%. That certainly simplifies the process of utilization and extends lifetime of the applied equipment.

Implementation results:

Over 17 mln.m3 of CMM were used in boiler of five AMT coal mines in 2015 to supply heat and hot water for mining facilities. Since cold season of 2016-2017 is going to be longer and colder (about 6 months) by weather forecasts the level of CMM consumption for heating purposes is expected to increase. The scaled relatively “low-cost” solution helps not only reduce emission, use an alternative environmental-friendly energy resource available at hand, but also create significant opportunities for the coalmining operator to safe on coal itself that would otherwise be used to cover the noted heating needs of the mines.

Although being a good tool for utilization of waste gas and mitigation of emissions methane-fueled boilers do not provide a stable solution for beneficial use of this resource. While this method represents the least cost option for CMM utilization, the lack of demand for heat during the summer months would mean a poor overall utilization rate. Thus, it makes more sense to consider it as one of the elements of CMM utilization program to support more efficient elements that may be potentially implemented into the mine infrastructure, such as, for instance, CMM-based power generation with waste heat recovery whenever required. Considering oxidation of vast VAM resources along with beneficial heat recovery would potentially add some value to the program as well, especially when emission reduction trading scheme will be officially enforced in the country.