Case study: Drained CMM to power

Background information:

As a part of long term sustainability and environment improvement program AMT committed to reducing the emission and release of greenhouse gases into the environment. As a heavy-duty industrial enterprise the company is a subject to inventory and penalties for extra emissions that may happen at different stages of the vertically integrated coal-and-metallurgical process. At the same time AMT mines emitted up to 400 mln.m3/a in terms of pure CH4 from the 8 mines of the Coal Division of AMT. Insignificant part of the drained gas has been used at the mined for heating purposed (12-17 mln.m3/a) for a long time but no any other scale options were tested until very recently.

At the same time coal mines of AMT group in Karaganda typically use between 5MW and 15MW of Power per mine. The electricity used by the mines is generated by both the local government heat-and-power company and by own power stations of AMT. Both sources are predominantly based on coal fired boilers and steam-electric power generators. The external regional high voltage grid is owned by the local government. AMT owns and operates an internal electric distribution system that serves mines as well as other facilities of the industrial group.

Solution:

Thus, being suffered from environmental issues with local authorities the company made a decision to test industrial option of emission mitigation and came up with a local mine methane power generation project that would provide direct mitigation of GHG emission and also may help to reduce load from the national electricity grid up to some extent.

In order to maximize the value of generated power and to minimize grid network connection cost, it was recommended that any power produced by such a project is supplied into the internal mine electrical system. In this case the value of power to the project does not seem to be the price of electricity sold but the cost of electricity supplied from the grid.

Since AMT has long term plans to continue coal production in the region, at least, to support the metallurgical activities of the group the CMM will be produced as a byproduct of mining activities and electricity will be required to power the coal mines as long as they are in operation.


The pilot CHP installation in Karaganda area - *Courtesy of Coal Division of AMT*

Implementation results:

Thus a 1.4 MW GE Jenbacher 420 series containerised CHP has been in operation (initially at Lenina mine) since late 2011 as a pilot project using gas between 25% and 50% CH4 from surface gob wells. The generated electricity is fed to the group substation of Lenina mine and covers up to 20% of its power load. The unit is operated in automatic mode.

Practical experience of the CHP operation revealed that at a certain point it is also possible to use most of the waste heat (from exhaust system, etc,) for the purpose of heating water for the mine needs even in summer period and thus to provide additional mitigation of emission and coal consumption by the boiler house of the mine.

As noted above over the pilot project phase the electric power generation by the CHP project with CMM is supplied to the internal grid of the mines. It is noted by the CMM experts that most likely during certain shutdowns/slowdowns or longwall shifts where production slows there will certainly still be a need to import power from the external grid. The frequency and value of these cases will be studied further on over the operational stage of the project but there is a strong expectation that the volume of this export would be minimal. At the same time as the CMM power generation would increase there is a likelihood of export of the poser to external consumers. Thus, as a part of commercial development phase the company plans corresponding discussions on establishment of a separate local CMM-based power generation/distribution company.