

### ***Case study: Gas drainage gallery (subsurface pre-drainage)***

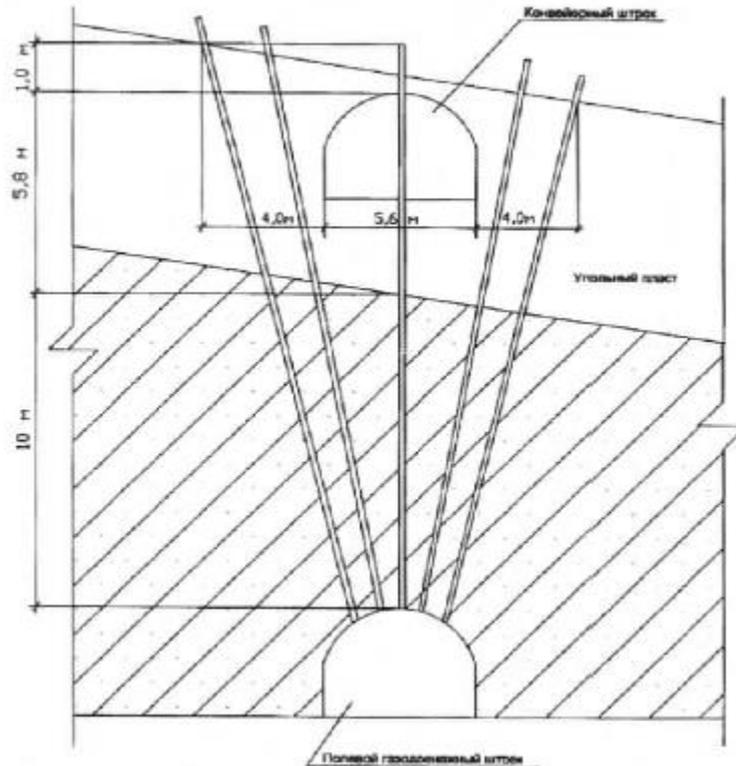
#### ***Background information:***

The coal seams mined by AMT mines are considered to be highly gassy with inherent methane contents of 8.5 – 27 m<sup>3</sup>/ton. Thus the mines have been active implementing advanced methane drainage techniques in order to improve and sustain drainage capture efficiency and mine safety. One of the most dangerous coal seams developed by Karaganda coal mines is D6. The seam is a thick high quality coking coal, with a very distinct shear zone (0.2-1.2 m) in the bottom section. The D6 seam has been found to be extremely outburst prone, particularly in the lower bank. The permeability of the seam is extremely low and wet drilling through the bottom section zone has to date been found to be most challenging, most probably because of the soft coal within the shear zone and swelling clays within the seam itself. The diffusion coefficient of the bottom section has also been found to be several orders of magnitude greater than the top section of the seam.

D6 is being developed by Lenina and Kazakhstanskaya mines known for series of accidents with fatalities caused by gas outbursts and explosions. After the accidents mining activities there became more careful and initially the roadways on coal advanced no more than 50 meters a month. That negatively affected operation efficiency of the available heavy-duty equipment and overall economics of the mine activities.

#### ***Solution:***

There was a decision made to implement a new drainage method: another roadway was built under the gassy seam and boreholes drilled from there towards D6 with a purpose to drain gas downwards from the coal face just before the front abutment, where the strata becomes de-stressed. Thus a certain efficiency of pre-drainage was reached. A headway (gallery, width of 5,7m) driven in the floor rocks 10 meters below the mined coal seam along the future longwall gate. The gallery is set up only for drilling of the fans of five up-holes (see the Figure 1 below). After the passage of the longwall face the roof is deformed, the support is left in place, the access is prohibited.



**Figure 1. Drainage gallery (pre-drainage) - Courtesy of Coal Division of AMT**

Borehole length is 17 – 19m, borehole diameter 93mm, standpipe diameter 80mm, standpipe length 12m. Standpipe is said to be sealed by synthetic resin. The final section of the borehole is cased with perforated pipe (dia. 80mm). The span of borehole fan is 4m. The boreholes are connected via 2" rubber hose to pipe manifold that is linked with a rubber hose to the reticulation system. There is no regulation valve at the borehole valve, at some boreholes simple „valve“ is stabbed in the hose for gas sampling. Flow rate is measured in the orifice meter installed in the pipeline for the whole gallery. Methane concentration is less than 20%. Boreholes must be ready for gas drainage more than 3 months before the start of the longwall face. The boreholes are disconnected just after the passage of the longwall face. The gallery is supported with steel arches and steel bolts.

**Results of implementation:**

As a result the company did not come up to any serious outbursts over the last five years. The applied technique above made it possible to drain enough gas to provide opportunity to mine this coal seam. Application of this technique allowed increased development rates in seams to be implemented from 25-40m per month to 120-150m in the outburst prone areas. The solution is not cheap for the mine operator. However, the extra costs were paid back since it increased the speed of drifting over the working seam up to five times.