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New technologies of the low permeability seams degassing efficiency increasing and the sudden coal and gas outbursts prevention in "ArcelorMittal Temirtau" JSC Coal Division mines.

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2015



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The degassing efficiency increasing technology in low gas permeability seams

The gas permeability of the Karaganda coal field at depths more than 500m reduces to $2 \cdot 10^{-3}$ mDarcy, which does not allow providing the required level of degassing by the available degassing methods.

Some mines, where the interseam distance is more than 60m, the mostly used degassing technology is seam undermining. In this case, the drainage gas-collection heading is developed in interseam area or in soft rock, in which the gas is transferred from the undermined seam.

This technology allowed to reduce the gas saturation of the undermined seam up to 90%.



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In some days the gas release in production face working below achieved 150m³/min. (see the table below).

The further mining in upper seam had been realized without degassing (the gas saturation was lower than 4-6 m³/min).

The 10 years experience in terms of seams undermining showed no difficulties in roof control and the longwall capacity had been increased 4-5 times comparing to not-undermined seams and the development speed was also increased 4-5 times. (See pictures 1-2)



Pictures 1-2

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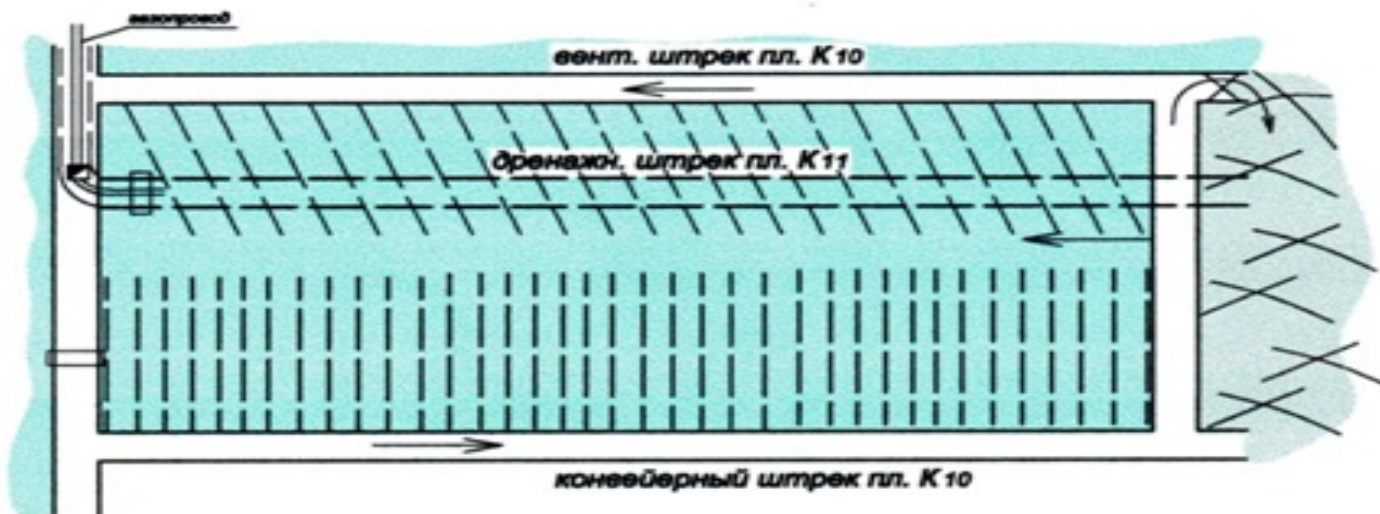
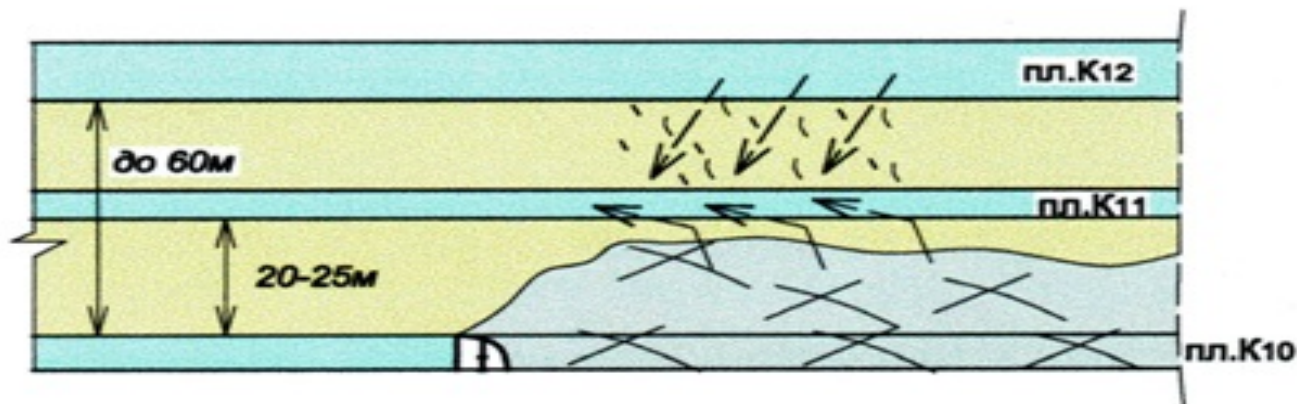




Table 1.

Longwall 331 K10-S

09.04.2014

The downtimes due to ventilation was: 0 min.

Production 4100 Tons/days

Place of measuring	Amount of air, m ³ /min	Methane concentration, %	Methane capturing m ³ /min
Ventilation			17,06
Longwall at distance of 15m far from ventilation gate	2587	0,6	15,52
Conveyor gate	2730		
Return air flow	2437	0,70	17,06
Upper "heel"		0,6/0,7	
Degassing efficiency			0,89
Degassing			133,98
Ventilation gate 331K10-S dead end			23,78
Vacuum-pump station No.1	118,9	10,2	12,13
Vacuum-pump station No.3	104,00	11,2	11,65
Third gate 331 K11-S			101,86
Vacuum-pump station No.10	149,80	68	101,86
Seam boreholes 331K10-S			8,34
Vacuum-pump station No.72	29,8	28	8,34
Total methane content of the section			151,04



Mine	Longwall daily capacity, t/day	Methane capturing by means of ventilation, m3/min	Methane capturing by means of degassing, m3/min		Absolute gas release of the section, m3/min	Complex degassing efficiency, %
			Goaf	Seam		
"Abayskaya" mine Northern wing of K10 seam	4000	33,3	102,7	3,3	139,3	73,7
"Abayskaya" mine Southern wing of K10 seam	3500	15,2	128,1	8,2	151,5	90



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The sudden coal and gas outbursts prevention technology in terms of mine headings development in high gas outburst hazardous D6 seam.

90% of all coal and gas outbursts in Karaganda coal field occurred during the mine headings development in high outburst hazardous D6 seam.

To prevent the sudden outbursts each 4m of the development 17-20 boreholes were drilled in advance with the length of 14m. Due to the time taking outburst prevention measures the monthly mine headings development speed was less than 25-40m, than was not allowing to prepare the production faces in time.



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The preliminary rock heading development technology is used for the production face preparation speed up at the distance of 8-12m from the seam (i.e. the seam distressing is made in the area of future development heading in coal). The degassing boreholes are drilled from the rock heading into seam and 2-4 months after the future heading area degassing the development is made in D6 seam with the speed of 100-150m/month.

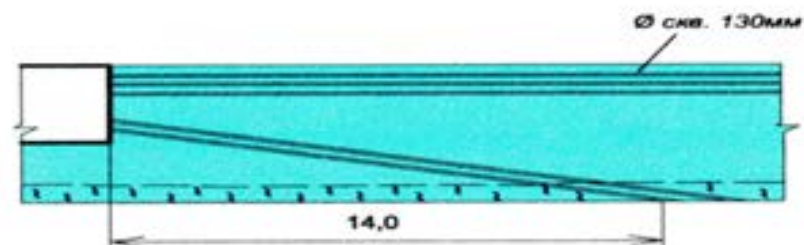
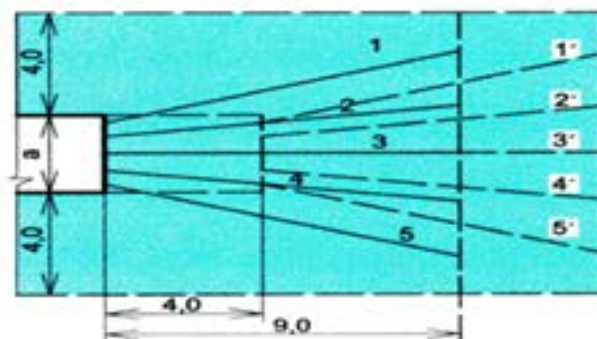
This technology allowed to reduce the production face preparation time by 6-8 months and excluded the probability of sudden coal and gas outbursts.

The additional expenses for the headings development are paying back by means of mine coal production.

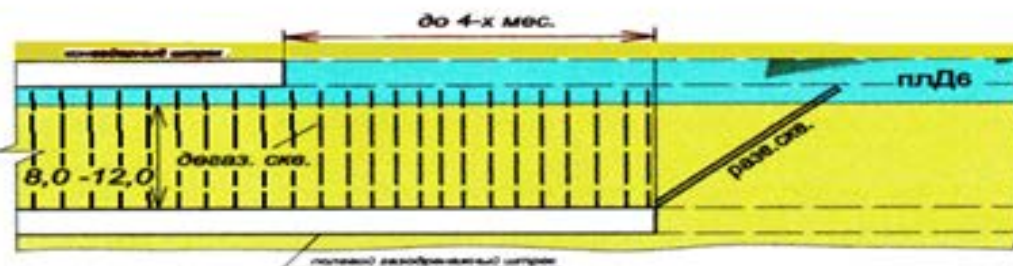
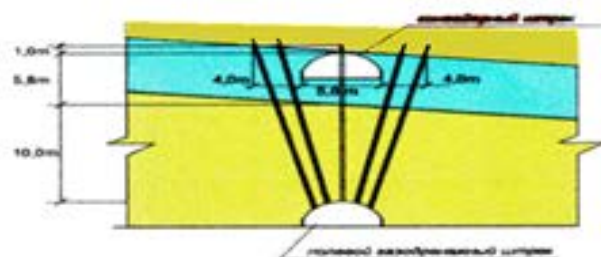


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Old Technology



New technology





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The early coal and gas outburst hazardous areas identification during mine headings development

The early coal and gas outburst hazardous areas identification during mine headings development

The last occurred coal and gas outbursts analysis showed that some hours before the sudden outburst (from 2 up to 24 hours) the abrupt jump of methane concentration happens of the return air flow in the developed headings (from some minutes to some hours).

Basing on this observation cooperatively with the "Davis Derby" company we have developed the further programs:

On the basis of the telemetric control data the background methane level content is identified during the development road header work (once a week) and the limits of methane concentration are adjusted (30% higher or lower than the background level).



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In case of concentration level achievement higher or lower than the adjusted one, the alarm is to be given, the power is to be switched off in the face and the people are to be evacuated for the safe distance.

After the alarm causes identification, in case if it did not happen due to the technological reasons (like the ventilation pipe leak, booster fan switch-off and etc.) the special committee along with the safety institute experts is invited to study the rock massive and to identify the required measures for the sudden coal and gas outburst prevention.

We consider it necessary to introduce into the "Guide ..." a new section Forecast and prevention of emissions of gas and outburst of coal , as the most dangerous process.



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Thanks for your attention