

Practice of Gas Drainage Technology in High Pressure Seam and Outburst Seam by Pressure - Relief of Ground

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ABSTRACT: In this paper, through the Xinji a mine surface drilling borehole pressure relief gas for practical investigation and study, analysis of the layout of the ground drilling, the influence scope of ground drilling drainage is investigated , and analyzes the drainage effect and the economic benefit brought by the ground drilling. Practice has proved: ground drilling of the mining area of influence, drainage effect is good, the economic benefit is better than the bottom plate roadway extraction and so on.

General Situation of Ground Hole Construction Area

13-1 coal seam in the third mining area of Xinji No.1 Mine has the risk of coal and gas outburst, the coal seam 11-2 under 13-1 coal is selected as the protective layer of 13-1 coal seam. Respectively. 1311 mining area, 2811 mining area 13-1 coal and the underlying coal seam 11-2 distance of 65.71 ~ 80.5m, the average spacing of 66.7m. The coal seam in this working face tends to 355° ~ 30°, coal seam dip 10° ~ 26°, with an average of 20°. 11-2 coal pure coal thickness of 2.35 ~ 3.85m, the average thickness of pure coal is 3.05m, full thickness of 3.65m.

13-1 basic parameters of coal and gas: Coal gas pressure 3.6MPa, gas content of 13.1m³/t, the average permeability coefficient is $6.67 \times 10^{-4} \text{m}^2 / \text{MPa} \cdot \text{d}$, the attenuation coefficient of borehole gas flow is 0.159d⁻¹ on average.

Ground group hole layout

131103,131105,281108 face a total of 12 ground drilling layout, to the spacing of 200m, according to the law of gently inclined falling roof displacement law, under fully exploited conditions, the surface subsidence in the middle of the coal face is the largest, the swelling of the overlying strata and the permeability of the coal seams are the largest in the middle of the working face, And the inclination position is the middle portion of the depressurized area to be protected. Take 131105 ground drilling layout as an example, see Figure 1, Figure 2.

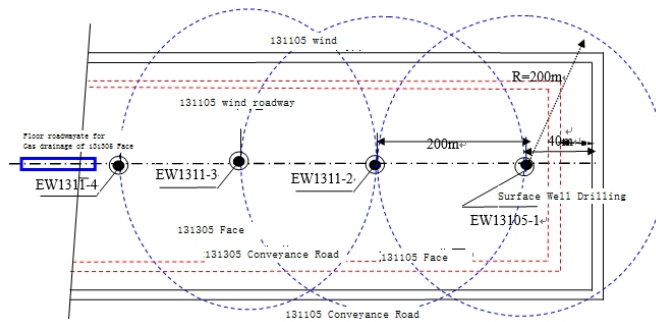


Figure 1 plan layout schematic diagram of ground drilling

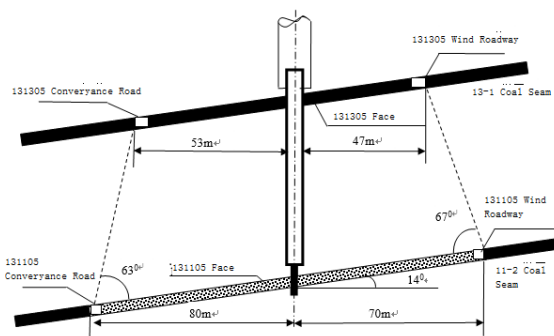


Figure 2 schematic diagram of drilling position along the inclined profile

Study on the Effect of Drainage of Ground Group Hole

Study on effective diameter of extraction

The extraction radius of pressure relief coal along the coal seam and the direction of the coal seam is studied, and the influence range of ground drilling drainage is detected, this paper provides a basis for the layout of the boreholes for the industrial drilling of the boreholes with pressure relief and gas drainage for geological structures and similar mining areas where coal seams are located, promote the safe and efficient mine exploitation.

This experiment uses pulse release, a total of 5 tracer gases are released, In the first two times, the single extraction gas SF₆ was used to investigate the extraction radius of the coalbed methane released from the ground borehole., the extraction radius of the pressure relief coal seam along the coal seam was investigated by the double tracer gas SF₆ and 1211 (CBrClF₂) in the last three times. The test site used by the tracer gas SF₆ gas and 1211 (CBrClF₂) gas, they are through a large number of laboratory experiments and field test study, thermophysical properties are stable, colorless, odorless, non-toxic and no coal mine air, are electronegative substances, can be detected by the same detector (electron capture detector ECD), has a simple operation, high precision. The experimental results are shown in Figure.3 .

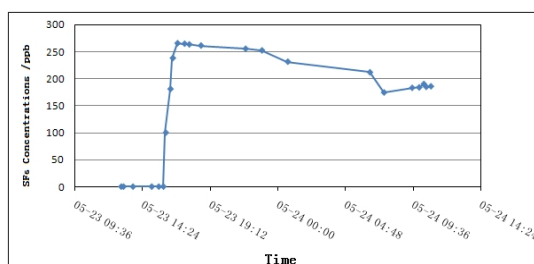


Figure 3 SF6 concentration and time relationship

A total of 5 times from the front and rear tracking technology test results, the following conclusions can be drawn: with 131105 mining face under the protective layer, 131105 Mining surface of coal mining face drilled pressure relief gas along the coal seam inclined extraction radius of not less than 160m and the direction of the extraction radius of not less than 240m.

Evaluation of extraction effect

July 2006 to March 2011, in the 1311 mining area, 2811 mining area of 12 ground drilling drainage network extraction of a total of 13.164 million m³, the average single-well gas extraction capacity of 1.097 million m³. Single well gas drainage capacity can reach 100 million m³; The average extraction rate of gas can reach more than 30%; Tendency of the extraction radius of not less than 160m and the direction of the extraction radius of not less than 240m.

July 2011 the successful mining of ground drilling after pre-pumping 131303 surface, 13-1 coal original gas pressure 3.6MPa, the original gas content of 13.11m³/t, the surface to take a cumulative pre-drainage of ground drilling 2,106,800 m³ of gas. After testing the residual gas pressure 0.15MPa, residual gas content of 3.65m³/t, 131303 Face outburst prevention measures are effective, for no prominent danger zone.

Economic Benefit of Ground Drilling Extraction

(1) Comparison of gas extraction

Using statistical comparison method, take 131303 ground drilling as an example, 131103 normal mining face during working face, 131303 drilling floor drilling and ground drilling gas drainage contrast in Table 1.

Table 1 Comparison of Ground Drilling and Floor Pumping Quantity

Month of the year 2006	Monthly advance(m)	Ground Drilling Gas Drainage(m ³)	Ground Drilling Drainage Time(h/d)	Gas Drainage in Floor(m ³)	Remarks
7	109.3	105364.8	12.0	391510.0	Only 9 days.
8	112.3	368532.0	15.4	0	Bottom plate Lane stop pumping
9	113.9	158817.0	16.4	156931.0	Floor lane began to drain from the 6th
10	121.8	265789.0	16.6	473589.0	Ground wells and stop pumping for 11 days
11	113.0	404606.0	23.0	288216.0	
		1303108.8		1310246	

Can be seen from the table, July-August ground drilling or floor lane has not been able to normal drainage time, no comparison was made, October ground drilling drainage gas 265789m³, the average drainage time was 16.6h, if an increase of 11 days of pumping capacity, drainage every day 21h, then the pumping capacity of 536237m³. Calculated in October, November two gas drainage: ground drilling gas drainage can be 940843m³, floor lane is 761805m³; Ground wells than pumping more pumping 23.5%.

(2) Direct engineering cost comparison

Through 131103 ground drilling implementation of the inspection mine to master the core technology of ground drilling, in 2008~2010 in 131105,281108 has adopted the ground drilling

network group hole pumping, alternative downhole floor lane, high abstraction and perforation construction, a total of 1358.3m of underground pumping tunnel were reduced, downhole perforation 31942m, ground drilling the total cost of 9,956,000 yuan, the total cost of the project is 11.4466 million yuan, direct savings of 1.4930 million yuan, see Table 2.

Table 2 Ground Drilling and Alternative Cost Comparison Table

Ground drilling			Alternative Engineering				
Drilling engineering quantity(m)	Integrated unit price per meter(yuan)	Total cost(million yuan)	Bottom roadway and high abstract roadway engineering quantity(m)	Integrated unit price per meter(yuan)	Drilling drilling project volume(m)	Integrated unit price per meter(yuan)	Total cost(million yuan)
5531.3	1800	995.63	1358.3	4900	31942	150	1144.66

(3) Compare plan

①Floor roadway: underground engineering volume, drainage of the mine gas drainage tunnel 1470m (including drill fields), to occupy the mining area ,a rock drilling team and drill team long drilling, need to construction more than one year, project costs more, drainage lane needs long-distance long-distance main fan ventilation.

②Ground drilling: advantages do not need a special drainage tunnel, ground drilling construction and production do not affect each other, more than a well, can be 13-1 coal seam and the upper and lower adjacent layer of gas and 11-2 coal goaf gas, do not need to take up mine on the rock lane team and drill team strength.

(4) Ground Drilling Drainage Safety Social Benefit: ground drilling gas extraction with high security, overcome underground gas, roof natural disasters, is conducive to coal, social and harmonious development.

Conclusion

(1) 131105 Mining surface of coal mining face drilled pressure relief gas along the coal seam inclined extraction radius of not less than 160m and the direction of the extraction radius of not less than 240m. The pre - drainage coal seam pressure relief gas in the ground borehole has a large extraction range.

(2) Borehole ground coal seam gas drainage effect and economic benefits superior to Bottom Road Drainage; Simultaneously, ground drilling can also be a multi-purpose well, While pre-pumping 13-1 coal seam gas and the next adjacent layer 11-2 of the goaf of coal seam gas.

References

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