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CORNER GAS ACCUMULATION CONTROL TECHNOLOGY OF FULLY MECHANIZED COAL FACE

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Abstract: In connection with the corner gas abnormal emission phenomenon in the process of VI16,17-12041 fully mechanized coal face mining in Shoushan No.1 mine, the causes of gas accumulation were analyzed with the method of engineering survey, which included the underground temperature and fault structure zone effect. On these basis, put forward the comprehensive drainage measure which was assembled by Y-ventilation drainage and seam drainage in the return air roadway, with the traditional U-type ventilation. It effectively solves the problem of working corner gas anomaly and implements the safety production of coal mine.

Key words: Fully mechanized, Gas, Upper corner, Comprehensive drainage.

1. GENERAL INSTRUCTIONS

With the increase of mining depth, the management of the upper corner gas in the working face become an important segment of safety production in our mine. The problem of the upper corner gas overrun has become increasingly prominent. It seriously threatens the safety and the production of the working face. We always think the management of the upper corner gas is the priority among priorities in the job of one ventilation and three. We insist on the principle that management, equipment and training are equal importance. It makes the gas control equipment and management levels have been improved year by year. In the process of backstopping in *VI16,17-12041* fully mechanized working face, the gas was accumulated in the upper corner of working face by various reasons and the gas density increases in the return air. In view of this situation, we analyse the causes of accidents and find out the corresponding measures. So, in specific work, we must strengthen the comprehensive control and management of coal mine gas and take effective measures to control gas to provide forceful security for the safety production of coal mine.

2. ENGINEERING SITUATION

VI16,17-12041 fully mechanized working face of Shoushan No.1 mine is the second section on the west of VI_2 mining area. And it is also the first working face in the west mining area. The working face is near to the central air shaft in the east, it is west to F6 normal fault, it spaces a section with the anticline axis of Mount Baishi in the north, it is the no-dig $VI_{16,17}$-12061 coal face in the south. Its corresponding ground position is the Jianshan village. Its advancing length is 1427m, its width is 160m, the dip angle of coal seam is 3°÷19°, its thickness is 6m, its top slice mining height is 3.8m, it backstopings the $VI_{16,17}$ coal seam, its workable reserves is 1.279Mt. The wind-road elevation of this working face is -569.6m ÷-597.9m, the conveyor roadway elevation is -595.2m÷-628.9m, the depth of coal seam is 710.7m ÷751.9m. The immediate roof of this working face is mudstone and its thickness is 4.5÷7.2m. The immediate roof is dense, brittle, with slide face and bed separation and falling. The immediate floor is sand-mud interbed and its thickness is 3.5÷5.5m. The workable reserves of this working face is 1.279Mt, the gas content is 12.06m³/t, the gas pressure in coal seam is 2.4MPa, this coal seam has spontaneous combustion tendency and its spontaneous combustion period is 38 days.

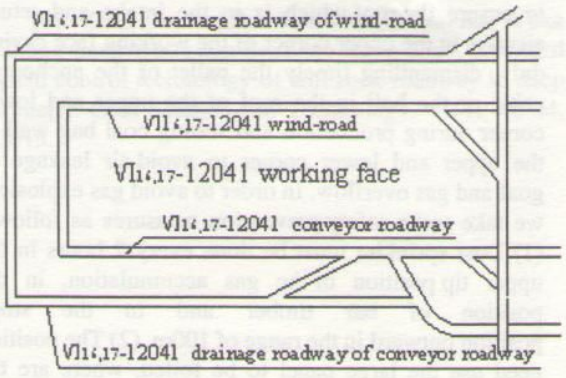

Fig. 1. Schematic diagram of working face

3. ANALYSIS OF THE CAUSES FOR GAS ACCUMULATION AND PREVENTIVE MEASURES

3.1 Causes for Upper Corner Gas Accumulation of Fully Mechanized Working Face

3.1.1 Temperature Influence

In the summer The temperature rises. The day's temperature rises greatly and the temperature difference is large between day and night. When

the temperature rises in the pit, the gas diffusion velocity and the gas emission of the working face increase. In the same time, the gas emission also increases in the goaf.

3.1.2 Influence of the Fault in Tail Frame

VI16,17-12041 fully mechanized working face adopts the U type ventilation. First, the flows turned suddenly in the upper corner and it well engender vortex at the lateral of the air flow. Secondly, when the working face backstopings the fault, the roof at the 110 and 109 frames of the working face is crushed. Because of the fault, it forms some local high cavity area in the wind-road and it leads to gas accumulation. In order to avoid gas in goaf releasing to the coal face, it need plug the goaf with plastic sacks. But it causes the roof of the upper corner in goaf not to be caving and gas accumulation. When the gas content reaches a certain level, the gathering gas froms a pressure differences between the air return-side and the goaf. The gas continues to overflow to the return air along the wind-road and the broken roof in the two frames, it increases gas content in the return-air current.

3.2 Preventive Measures of Gas Accumulation Management and Control

According to the gas increasing in the return-air current of VI16,17-12041 working face and the situation, we take some prevention measures as follows: (1) Reasonably setting up the position of the wind screen in the upper corner, (2) Using the drainage system in the wind-road and the coal seam drainage to draining out gas in the upper corner, (3) Adding a plurality of drainage tubes and ventilation tubes to draining out or dispel the gas accumulation, (4) In order to ensure the roof which is in the intake and return airways in the upper corner of the working face caving duly, dismantling timely the pallet of the anchorage cable or the bolt in the roof of the upper and lower corner during production and setting coal bag wall at the upper and lower corner to avoid air leakage of goaf and gas overflow. In order to avoid gas explosion, we take some safety prevention measures as follows: (1) Dust sprinkler must be done every 2 hours in the upper tip position of the gas accumulation, in the position of bar timber and in the stope position outward in the range of 100m, (2) The position need use the large panel to be foiled, where are the upper T-junction supporting of the end bracket in the coal face and the advance support of the wind-road and so on, in order to prevent sparks between iron and iron, so we take some specific measures as follows:

3.2.1 Reasonably Setting up the Wind Screen

It occurs vortex when the air flows around the upper corner, at the same time, the gas in the upper corner is difficult to enter the main airflow, because the wind speed is low. Therefore, setting up the temporary wind screen in the upper T-junction supporting of the coal to change the airflow direction, it makes a part of the airflow through the vortex and turbulent region in the upper corner to dilute the gas in there.

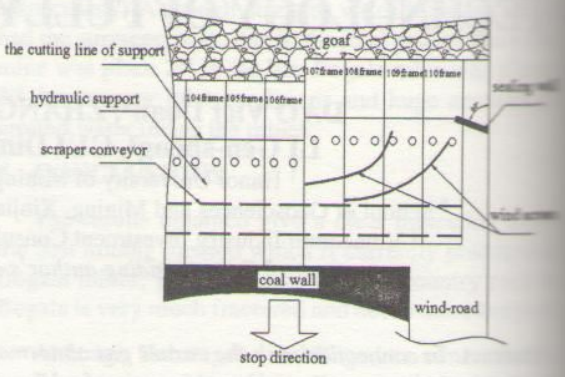

Fig. 2. Schematic diagram of wind screen

This method is only a temporary measure, it is only suitable for a small amount of gas accumulation in the upper corner and the triangular area. Practice has proved that: even with the drilling drainage and drainage pipe, the vortex motion is still existence in the upper corner when the absolute gas emission is large in a working face. Sometimes there is gas overrun phenomenon in upper corner. Setting up the wind screen can change the airflow direction in the upper corner and let the fresh air into the upper corner to change the state of vortex and turbulent. This can dilute the gas and prevent the accident of gas overrun.

3.2.2 Gas Drainage Network in the Working Face

When the working face is backstopinged, a large number of gas accumulates in the upper corner of goaf side, because the upper corner of stope roof falling is not sufficient. At this time, the bag filled with coal can be used to plug a double bag wall in the upper corner. Using the low level drainage roadway wear layers drill and coal seam drainage to drain gas in return airway, it can reduce the gas pressure and the gas accumulation in upper corner and reduce the amount of the gas overflow in return airway. Setting up a independent movable pump station system of gas drainage to drain the gas in the upper corner. The gas should be drained incessantly to suit the situation of the gas accumulation in the side of goaf, so as to achieve the purpose controlling gas from the source. VI16,17-12041 working face mines the upper-level seam, its mining height is 3.8m (coal thickness 6m), the mining method is strike, longwall and back, the method of roof control is natural caving. With the working face advance outwards continuously, the gas concentration is between 0.2% and 0.6% in the air of return airway, the gas concentration in upper corner is even as high as 1%.The gas drainage volume can reach 7m³/min using the movable pump station system of gas drainage, the low level drainage roadway wear layers drill and coal seam drainage. After draining, the gas concentration in the upper corner and in the return airway are separately from 0.3%÷1% to 0.2%÷0.5%

and from 0.2%÷0.6% to 0.1%÷0.3%, and it tends to stable.

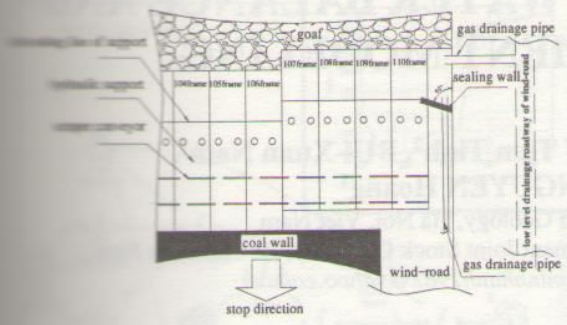

Fig.3. Schematic diagram of network drainage

Dust Fall and the Iron Control

In order to avoid the gas concentration in goaf reaching the explosion range, we adopt two safety protection measures in the production process. First, the dust sprinkle is done in the upper corner and timely of support every two hours to avoid the dust accumulating. Secondly, in order to avoid the iron and iron tuching each other to produce spark during production and supporting, it need lay plank above the support, use copper or wooden hammers near the upper corner and other material hammers are prohibited to use, so as to prevent sparking.

4. CONCLUSIONS

Based on the field application in the typical fully mechanized coal face in Shoushan No.1 mine, we analyze the causes and proposed series solutions to solve this problem and get the conclusions which can be introduced to ensure the safety in working face corner in mines as follows:

1) Among some ventilation methods such as reduced air, blowing-in and exhaust in the upper corner, the wind screen is adequate ventilation for the upper corner in the right conditions. But it will lead to the gas overrun in the return airway to influence the safety production, if the gas volume is large.

2) Setting up wind screen in the upper T-junction supporting, using a double bag wall in the upper and lower corner and gas drainage in the upper corner all can effectively prevent the gas accumulation in the upper corner. These provide forceful security for the safety production of coal mine.

3) The drainage pipe in the upper corner should be fixed, and ensure that the suction always in high gas concentration area when manage the gas in the upper corner by network drainage. The gas concentration in every drill hole should be checked to guide the modification of design parameters of boreholes and improve the gas drainage rate when use the low level drainage roadway to drain gas.

5. ACKNOWLEDGMENTS

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