Study on the effect of seasonal air temperature on high temperature environment in deep mines and its prevention technology

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A B S T R A C T

Seasonal air and surrounding rock temperature accounts for severe heat damage in deep mining, which seriously affected safety and efficient production of coal mine. Especially in summer, the high ground temperature intensifies heat damage at underground work sites. To study the effect of seasonal air and surrounding rock temperature on high temperature environment in deep mines, we thus measured the temperature variations of mine main ventilation circuit and surrounding rock as the normal production in coal mines. The results show that the underground airflow temperature is obviously affected by seasonal high temperature, the deeper the distance from the wellhead to the inlet, the smaller the time lag effect. Furthermore, from the data analyzed in each measuring point in the return route air temperature, we found that there is relatively little change and the air temperature in summer increases by 1~3°C. The heat damage in mines will show a significant seasonal change that affected by depth, strata heat release and seasonal high temperature. Therefore, the summer temperature at the roadways and working face are significantly higher than in other seasons. The distributed optical fiber temperature measurement system was used to measure the

distribution of temperature in deep mine working face, and the airflow temperature variation regularity from inlet to return of working face. The results show that the temperature field distribution of working face in deep mines gradually increases with the distance from the roadway ground and the highest temperature reaches up to 40.53°C. According to basic characteristics of the seasonal thermal disaster in deep mines, a mine cooling process with fully ventilation volume is put forward to eliminate the heat damage in the summer. A non-power air heat exchanger is designed for the cooling of the pithead. The heat resistance is 24 ~ 45 Pa , and the average leakage rate is 8 ~ 9%. As the wellhead is the transport channels and difficult to be closed, the method of the automatic door locking wellhead is proposed, which combined the main and auxiliary shaft mouth cooling air chamber and ensure a great cooling effect of the intake of airflow in the shafts. Through a practical operation in Zhaolou deep coal mine of Juye mining area, the cooling system can reduce the wind temperature of all the intake airflow to 10 ~ 15 ℃ both in main and auxiliary shafts. The air temperature is dropped on the inlet air route 4 ~ 5 ℃, the humidity is dropped 15%, the mining face supply air temperature is below 26 ℃. It can be concluded the technology of full ventilation volume cooling process has significantly improved the labor production environment and solved the problem of seasonal high temperature heat hazard in deep coal mines.