

Application analysis of high mining face installation technology

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Abstract: In recent years, with the continuous development of coal industry in our country, the high mining technology has become more and more mature, it plays a vital role in the coal mining. This is of great help to further improve the overall mining efficiency of China's coal industry. However, there are many matters worth noting in the installation and use of this technology, because there are still certain restrictive factors in this technology, such as: support mode and hydraulic support selection and other problems. Before and after construction, it is necessary to do a good job of field research, and make a reasonable installation and construction plan. This paper discusses the application of large mining height working face installation technology, and puts forward a reasonable installation scheme according to the different needs of working face installation, which provides some countermeasures for the higher installation of technicians in the future.

1. Introduction

With the rapid development of our country's society, the population demand for the coal increasing, the scale of the coal mining is becoming increasing, the use of large high mining technologies to mining, not only can improve the coal mining efficiency, but also can improve the importance of the coal mining. At present, the research on the exploitation of ultra-thick and ultra-thin coal seams has attracted the attention of many technical researchers, and has been actively discussed and analyzed. The general mining methods include the use of stratified mining, or the use of top coal mining, or the use of full height mining. However, for the thick coal seam with a thickness of 9m, 6-7m mining height is usually adopted for mining. This mining method will lead to a large amount of waste of 8-9m coal seams, and can not improve the efficiency of coal mining. Therefore, the use of 8 meters high mining height fully mechanized mining can improve the efficiency of coal mining. The first production surface of 10101 was commissioned by Tianlong Installation Company of Shendong Group to start installation on August 2, 2023, and all the equipment was connected to the well on August 20. In order to ensure the rapid and safe installation of the continuous working face, the following optimization strategies are planned for the continuous working face after site investigation by the mining side, Huatai Project Department and Shendong Tianlong Installation Company.

2. Large mining high coal mining method

The large-height full-thickness mining method is referred to as the large-height mining method. Compared with the traditional mining seam, this mining method is thicker and can complete the mining method of more than 3.5 meters. Affected by the working face and limited, it is applied to the coal seam with relatively small inclination Angle. Generally speaking, the large mining height mining method is usually placed on the thickness of the coal seam and is suitable for the overall thin range [1]. Therefore, this mining method has broad technical application prospects in China's coal mining industry, and is an important direction of our future research. In the field of fully mechanized mining technology, large mining technology also needs to be applied to different technical equipment, such as: high-power shearer, scraper conveyor, transfer machine and so on. Among them, high-power coal mining machine in China's technical application has made great

promotion, many technical researchers have optimized the design of this kind of coal mining machine, so that the mining efficiency of this kind of coal mining machine has been greatly improved, at present, this kind of coal mining machine has achieved large-scale production, export, exported to Europe and the United States, South Asian countries.

3. Relevant construction processes shall be reasonably arranged

3.1 The construction technical process should be reasonably arranged

In the process of actual installation, there are always many construction technical problems, so it is necessary to reasonably arrange the relevant construction procedures before equipment installation, and make arrangements according to the different needs of installation. In the process of fully mechanized mining face installation, due to the long total length of installation, the complexity of underground operation and the length of line and other characteristics, it is necessary to formulate a reasonable plan to improve the rationality of installation construction, especially to prevent the occurrence of construction rework, or slow work, to avoid the obstruction of installation construction progress, affecting the overall construction. Therefore, in the process of construction, in order to make the construction work more efficient, it is necessary to make full preparations and strive to complete the construction task as soon as possible [2].

3.2 Reasonable selection of the specific location of the chamber

The location of the chamber is set in the return air roadway, and the reason for this design is that the transportation distance of the whole frame should be controlled within a reasonable distance range and should be shortened as far as possible; Because this is the primary condition for the installation of the chamber position. Relevant studies have shown that the second type of assembly chamber location method is more advantageous for the effective control of the roof and the reasonable installation of the support. Of course, if the slope of the cutting eye is not very large, then you can choose to cancel the winch chamber layout. Of course, in order to facilitate the shovel car to turn around in the cutting eye, it is necessary to arrange a 5m deep reversing chamber in the middle of the cutting eye (about 120m), with a section width of 6.2* height of 5.7m. The reverse chamber of the return air groove is arranged 40m away from the cutting eye, 12m deep, 6.2*5.2m cross section, and 5*5m wipe Angle is constructed on both sides to facilitate the wrong vehicle. When withdrawing the support, in order to facilitate the shovel and material vehicles to turn around and miss the vehicle, a reversing chamber should be arranged at a distance of 40m from the withdrawal channel, with a depth of 12m, a section of 6.2*5.2m, and a construction Angle of 5*5m on both sides.

4. Installation of 8 meters high full mechanized mining face before construction preparation

4.1 Acceptance of coal mine projects

Before the installation, according to the turning size and shape size of the vehicle and the Angle is different, the working face should focus on meeting all aspects of the technical requirements of the installation, which includes the relevant mobilization of the vehicle, the water point laying or pipeline hanging of the driving route, the specific water and electricity supply situation of the temporary pumping station and the location of the pumping station. Other roadway angles are generally constructed according to 4*4m.

4.2 Disclosure of installation and construction technology

Before the installation, the construction personnel should be combined with the size and technical characteristics of the equipment to determine the specific location of the installation, as well as the equipment mobilization situation, and organize the relevant technical personnel to prepare for the construction.

5. The selection and application of trackless rubber wheels and the transportation of large equipment

5.1 The selection and application of trackless rubber wheel vehicles

Compared with the traditional rail transportation system, it can be seen that the fully mechanized mining face is greatly improved, which is conducive to coal mining, improving efficiency and quality. At the same time, because the foreign explosion-proof diesel locomotive has strong working performance and is more reliable, the use efficiency of these large equipment in the transportation fully mechanized mining face is relatively high, and the use of manpower can be reduced. At the same time, due to the diverse functions and strong climbing ability of trackless rubber wheel vehicles, they can meet the needs of fully mechanized mining production and installation. In addition to improving installation efficiency, installation costs can also be reduced [3].

5.2 Transportation of large equipment

In the installation of transport MG1100/3030-GWD shearer, the overall handling scheme can be adopted, that is, the removal of the rocker arm on both sides of the shearer, including the top protection plate or crusher, etc., and then the shearer is installed on the middle groove of the six-section scraper, the use of small chain and chute pin to fix, and the shearer pit is arranged in the flat section as far as possible. Generally about 25m in the head; Of course, in addition to the construction of four rows of lifting cables above the two rollers of the shearer, the cable is fully anchored, and the layout is two and two, the spacing between the rows is 1*1m, and the cable is as close to the side of the machine as possible; 4 rows of lifting anchor cables need to be constructed above the transmission part of the head of the transfer machine, the anchor cables are fully anchored, and the layout is two and two, and the spacing between the rows is 1*1m, which is convenient for lifting and installation.

Secondly, in the process of transportation, due to the high transport requirements of the scraper conveyor, so in the transport, it should be reasonable arrangement of the mode of transport, such as: in the transport, you can use 40T to fix. Then, use the shovel plate of the battery car to lift the self-moving tail upward, and then send it to the working face for installation. In addition, the belt self-shifting tail of the equipment can also take this installation method. But the difference is to develop different transportation and installation methods based on the actual situation.

6. Analysis of 8m installation process

From the current point of view, the application of 8m high mining technology is very difficult, and it is relatively rare in the world. Therefore, strengthening the 8m installation process analysis is of great significance and discussion value. The large mining height of 8m is more efficient than 7m and can create greater mining benefits. In the application of technology, as our country's research in this field becomes more and more thorough, the application of technology is highly innovative and valuable. This has created opportunities for the development of China's coal mine equipment. For the analysis of 8m installation process, a reasonable installation scheme combining safety, parameters and specifications is proposed, which is conducive to improving the installation success rate and ensuring the orderly and safe installation [4].

6.1 Equipment installation line

In the process of preliminary installation, then, different equipment can be released according to the installation sequence, such as: belt self-shifting tail, transfer head line and so on. The purpose is to facilitate the subsequent installation work.

6.2 Equipment installation process analysis

6.2.1 The operation process should be optimized

The installation process will be combined with the actual needs and conditions, and make full use of the powerful transportation capacity of the vehicle to carry out the operation, in order to

achieve efficient transportation and function, especially for projects with a short construction period. On the one hand, it can greatly shorten the construction period; On the one hand, it helps to improve the efficiency of installation and construction work, which can be described as killing two birds with one stone [5].

6.2.2 Transfer machine, crusher installation

According to the size of the self-moving tail is different from the actual working conditions in the coal mine, and then in determining the placement place of the self-moving tail, two small transport vehicles can be used to place the equipment firmly in the designated position, and then the transfer head frame is placed on the ladder; In addition, the transfer head can shovel the plate battery car, transported to the mine, and after reaching the designated place, the shovel car can be lifted, and then it can be installed on the stairs. This operation is also relatively safe and reliable. After the installation is completed, the chain wire rope can be passed into the chain from the bottom chain path. In addition, after the bridge groove is transported in place, the test shovel bracket car can be lifted and the transfer head can be on, and then the bolt is good, tightened, fixed, followed by the installation of the convex groove, the middle groove of the suspension section, the twisted groove, the groove, and the process of installing each section must use the wire rope. Of course, in order to facilitate the installation of the head and tail of the eye-cutting scraper conveyor by the shovel truck, it is necessary to construct a chamber beyond 5m of the eyelet at the tail of the two longitudinal grooves, and the section width of the construction section is 6.2* 5.2m. In the process of installing the crusher, it can be installed after the battery car is transported in place, and then, according to the 1m adjustment groove, 1.5m adjustment groove, through the aqueduct, you can use the dumbbell pin to install and connect correctly, and then the adjustment groove connecting plate is installed at a time. In addition, the scraper chain of the transfer machine enters the groove from the bottom chain path of the tail, and then the battery car can be used to turn the machine head into the chain and return to the tail part of the machine. After the installation of the scraper head on the working surface, the bottom chain can be completely connected to the top chain by bypassing the tail sprocket, but professional chain connecting rings must be used for installation [6].

6.2.3 Installation method of scraper conveyer

To install the actual installation situation and different needs of the scraper conveyer, transport the tail to the specified installation position, and then install the tail chassis and transmission parts, and then fix the bolts and insert them into the wire rope; Use multifunctional forklift truck to move the tail of the first section of the line slot and the tail of the installation, and the dumbbell pin is well, cable groove cleats, pin rows and screws and pins, but in the installation process after each section of the chute installation must be the bottom chain of the wire rope can be pulled out; Then shovel the second cable trough and the first section to be installed in alignment, and then install the working face general groove after the installation of 5 cable trough. During the installation of the middle groove, the calculation can be made from the first general groove at the tail to the working side. After every 7 general grooves are installed, the first skylight observation groove is installed. In the process of ground operation, 50 large chains are loaded into the large chain bucket by tram, which can be transported to the tail part of the machine by forklift, and then the large chain is pulled into the machine track; During the installation of the middle groove, attention should be paid to whether the connection is tight, such as: when installed to the machine socket, the rocker arm on both sides of the shearer can be installed with the crusher; Then, the installation of the middle slot, the five section of the machine head, and the over-slot of the machine head is carried out [7]. In the process of installation, part of the head orientation of the bottom chain of the transporter can be pulled out eight meters in length, and then penetrated into the inner part of the head frame. The battery truck and the forklift truck can be used to fit the head frame into place, the bottom chain of the transfer machine and the transport machine is connected with the top chain through the sprocket, then the Transport Machine Head is installed vertically, the transmission part and the shield and the chassis are installed.

6.2.4 Installation of equipment train

In the process of installation combined with the "Fully mechanized mining face power supply system diagram", you can determine where the specific location of the first train is, and then lay the track at the designated location, and then do a good number, according to different numbers into the well; After the first equipment train is transported to the mine, the train is picked up by the shovel, and then placed on the road, and the vehicle stopper is installed in time. Then the connecting plate test pins carried by each car are fixed one by one, and then the last car is fixed and installed on the train and the track and the car stopper [8].

6.2.5 Installation method of hydraulic support

The installation of the hydraulic support can be installed from the head to the tail direction until the installation is complete. Transport the support to the designated location, unload it on the special track for installation, and then use the support to push the glide to the designated location.

7. Basic requirements of 8m high mining face installation technology

In the process of installation of 8m large mining height working face, in order to ensure that the technical work can proceed smoothly, then mining and through the way can be adopted for construction, so that the hydraulic support or shearer and other large equipment can run smoothly, can complete the construction work, and complete the different requirements of moving. In particular, we should optimize the width of the open cut and the transportation trough according to the actual conditions, such as: for the scraper conveyor and transfer machine head installation of accessories used in an orderly storage and use, a storage chamber with 5m deep accessories is arranged on the outer side of the transport channel (cut hole) . The section width is 6.2 * and the height is 5.2 m.

When the working face is increased to 8m, the pressure of the working face will increase, and the situation of "large pressure" is likely to appear when the mining is done, because the installation and construction should be done in each different part of the installation work. In order to make the installation work can proceed smoothly, and the rapid installation of a fully mechanized mining face will not only directly affect the production efficiency of the mine, but also affect the work safety, so in the installation process should do a good job in all aspects of the installation design and investigation, reasonable development of the corresponding installation countermeasures, while in accordance with the relevant technical standards for installation.

8. Conclusion

To sum up, the installation of 8m large mining height fully mechanized mining face is a very complex and systematic work, its equipment involves a very wide range, and the relevant participants are more and more strict technical requirements, so the installation process must be strictly in accordance with the relevant conditions, equipment specifications, technical parameters and other installation. Through scientific planning and arrangement, the installation efficiency of equipment can be improved, while the safety of personnel installation can be improved, the installation difficulty can be reduced, and the installation quality and level can be improved. Therefore, it is very necessary and valuable to strengthen the research on this aspect.

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