

ORIGINAL RESEARCH ARTICLE

Analysis and Research on Control Technology of Large Mining Height Fully Mechanized Face and Roadway Surrounding Rock

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ABSTRACT

Coal is important basic energy and important raw materials, the development of coal industry to support the rapid development of the national economy. In the 1950s and 1960s, the proportion of coal in China's primary energy production and consumption structure accounted for 90% and 80% respectively, and the proportion of coal in 2004 was 75.6% and 67.7% respectively. In recent years, with the rapid development of fully mechanized mining equipment manufacturing technology, fully mechanized mining equipment to heavy, strong and automated, so that the reliability of the equipment is guaranteed, a strong impetus to the development of large mining technology, new round of coal mining technology revolution, the current in the East, Jincheng and other mining areas have been the first in the thick coal seam $f = 1.5-5$ use of large mining height fully mechanized mining equipment, to achieve the highest efficiency, the lowest cost of tons of coal. The main points of this paper are: in the production of coal enterprises to improve the competitiveness of the coal market. Conditions and conditions of coal storage conditions should be allowed to give priority to the use of large mining and mining methods.

KEYWORDS: large mining height; fully mechanized mining technology;

1. Introduction

1.1. The purpose and meaning of the study

1.1.1 Purpose of the study

Power, high reliability equipment, with a strong ability to adapt in the use of Wang Zhuang mine is feasible, will further accelerate the Wang Zhuang mine to reduce the side by side, increase production efficiency as the main content of the intensive development of the study The feasibility and necessity of high comprehensive mining technology are analyzed in detail, and the coal seam and the existing production technology of Wang Zhuang Mine are analyzed in detail. The site investigation of Shendong Shang wan, Jincheng temple river and Zhao Zhuang mine is carried out. The mining technology of mining and mining technology of Wang Zhuang and Lu'an is promoted by the development of the mining and mining technology of Wang Zhuang and Lu'an. construction.

1.1.2 Research significance

In order to study the feasibility of large mining height fully mechanized mining technology in the existing production conditions of Wang Zhuang coal mine, Wang Zhuang mine was established in November 2007 by electromechanical, production, geology, ventilation, transportation, automation, planning and fully mechanized mining the investigation team composed of the team and the team analyzed the coal seam and the existing production technology of Wang Zhuang mine in detail, and carried out on-site inspection of Shendong Shang wan, Jincheng Sihe and Zhao Zhuang mine. Mine with large mining height of fully mechanized mining equipment, the relevant technical data, after analysis and comparison that the current large mining height fully mechanized coal mining face with high power, high reliability equipment, with strong adaptability, the use of Wang Zhuang mine is feasible, will further accelerate the Wang Zhuang mine to reduce the side by side, increase production efficiency as the main content of the intensive pace of development, and promote Wang Zhuang and Lu'an coal mining technology development, and promote the construction of safe and efficient mine. In the coal mining mechanization is increasing today, the selection of advanced coal mining technology has become a safe and efficient production of coal mining enterprises the only way.

1.2. The structure of this paper

This article is divided into five chapters, the first chapter is the introduction, the content of the full text of the outline of the summary, play the role of general collar. The second chapter is an overview of the coal industry development status and the main challenges facing. The third chapter is the development of high-tech development. The fourth chapter is the application of mining technology in fully mechanized coal mining face. Chapter 5 is the conclusion and suggestion.

2. Development status and challenges of coal industry

2.1. Status of coal industry development

Coal is an important basic energy and important raw materials, the development of coal industry to support the rapid development of the national economy. In the 1950s and 1960s, the proportion of coal in China's primary energy production and consumption structure accounted for 90% and 80% respectively, and the proportion of coal in 2004 was 75.6% and 67.7% respectively.

2.1.1 Since the reform and opening up the coal industry has made remarkable achievements

(1). Coal production continues to grow

The national coal production increased from 600 million tons in the early stage of reform and opening up to 1.956 billion tons in 2004, an increase of more than 2 times, at the highest level in history, providing energy security for China's national economic development.

(2). Significant increase in production levels

Large and medium-sized coal mine mechanization level, yield, single entry, coal efficiency, are increasing year by year. Built a number of leading international, high production and efficient mine, initially built the technology, design, manufacture, training more complete technical support system.

(3). Significant progress in industrial restructuring

Government and enterprises have taken a major step by step, most large and medium-sized state-owned coal enterprises began to establish a modern enterprise system. Some enterprises began to cross-regional, cross-industry industry, coal, electricity, chemical, road, port, aviation industry chain began to form a group of inferior enterprises out of the market.

(4). The overall efficiency of the industry continues to increase

After three years of serious economic difficulties, the coal industry began to out of the trough in 2001, showing a resumption of growth. After 2002 into the rapid growth cycle, the quality of economic operation continues to increase. In 2004 the national scale coal enterprises after the subsidy to achieve profits of 41.8 billion yuan.

2.1.2 Main features of the industry

(1). Coal is a resource industry

Coal is a non-renewable resource. The life of the coal mine depends on the coal reserves it owns. Most coal mines in our country are far from urban and economically developed areas, with heavy social burden and poor economic base. Regional conditions are different, the development of coal enterprises in the industry is very prominent imbalance.

(2). Coal is a high-risk industry

Due to coal mine production conditions, historically, in the national industrial sector, coal mine accident mortality is the highest. 95% of our coal mine production capacity is well mining. High-gas and double-protruding mines account for 1/3,90% of the total coal mine in China. The mine has a coal dust explosion hazard. With the increase in mining depth, the impact of safety factors more and more, more and more complex conditions.

(3). Coal is investing in high-risk industries

Coal mining complex, large investment in mine construction, long cycle, slow effect, coal market uncertainties and more. Therefore, from the construction to the production and operation of large risk, the majority of coal enterprises on the industrial structure of the impact of the enterprise market adaptability and disaster resilience.

(4). Coal is an industry that contributes to the development of the national economy

Coal is a primary product, the benefits of coal mines to the subsequent processing industry transmission and radiation. A single product structure, the economic efficiency of enterprises is difficult to improve, the value and benefits of China's coal mining is reflected in the follow-up industry and the support of national economic development.

2.2. The coal industry is facing major challenges

2.2.1 Resource security issues

China's coal varieties are abundant and abundant resources, but the level of resource exploration is low, the recoverable reserves and the per capita occupies are less, the resources are destroyed and the waste is serious. The ecological environment and water resources are seriously restricting the development of coal resources.

China 's regional distribution of coal resources is not balanced. Qinling mountains, north of Dabie Mountain, coal reserves accounted for 90.7% of the total reserves, of which Shanxi, Shaanxi and Mongolia provinces (regions) accounted for 65% of the country.

Low level of resource assurance. As of the end of 2000, China has not yet used the fine storage reserves of about 60 billion tons, currently available for large and medium-sized mine use of fine reserves of only 30 billion tons. It is estimated that by 2020, coal reserves will increase by about 125 billion tons.

At present, China's resource destruction and waste are serious. Part of the coal enterprises there are 'mining thin', 'eat fat thin' and other waste of resources, the average recovery rate of coal mines in the country about 30% to 35%, resource-rich areas of small mine resource recovery rate of only 10% - 15%. China is suitable for the construction of large coal base of the whole coal field, free to be split dismemberment serious.

2.2.2 Coal mine production capacity and technical structure

(1). Low level of coal mine production technology

National coal mining mechanization is only 42%, in addition to some state-owned large mines, the majority of coal production technology is low, poor equipment, low efficiency. Especially township coal mines, are basically non-mechanized mining.

2004 township coal production still accounts for 39% of China's total coal production, resource consumption and casualties, has paid a great price.

(2). Part of the coal mine super capacity production

According to the survey, in 2001 the state-owned coal miner's 1.12 billion tons of production, are super-capacity and capacity of coal production is about 142 million tons of coal, accounting for 13% of state-owned coal production. Coal mine super power production to meet the national economic development of coal demand, but its negative impact, one is to shorten the coal mining years, the second is threatening coal mine safety production.

(3). Large and medium coal mine coal supply capacity is insufficient

It is predicted that China's existing production of coal mines and coal mines in the total production capacity to 2010 and 2020, respectively, 1.77 billion tons and 1.47 billion tons. To achieve coal production and demand balance, the need to build a number of new wells and expand the existing coal mine production capacity, is expected to 2010 and 2020, respectively, need to increase production capacity of 450 million tons and 1.11 billion tons.

2.2.3 Industry structure and enterprise development issues

(1). Low concentration of coal industry

In 2004 China's top 8 coal enterprises market concentration of 20.68%, far below the rest of the world's major coal-producing countries.

(2). Coal enterprises are overburdened

The tax burden of coal mine enterprises than in 1994 before the reform of the tax system increased by 6 percentage points; in 2003, the coal industry expenditure railway construction fund of about 100 billion yuan; state-owned key coal mine enterprises to do social problems, local government to receive difficulties, the original state-owned key coal mine Social net expenditure of 6 billion yuan.

At the end of 2004, the original state-owned key coal mine staff of 2.75 million people, due to the social capacity of the region is weak, it is difficult to reduce the efficiency.

Part of the coal mine depletion of resources, production capacity decline, rising production costs, surplus staff, work injury and more personnel, conversion difficulties.

(3). Poor efficiency of coal enterprises, low income workers

In 2004 the original central government subsidies for coal enterprises before the loss is still up to 48%, after subsidies are still 6% of the enterprise losses. In 2004 the original state-owned key coal mine workers in the average income of 16812 yuan, lower than the national average.

2.2.4 Coal mine safety and environmental management of mining area

(1). Environmental problems in mining areas

Mine production of coal gangue emissions accounted for about 8 to 10% of coal production, is now accumulated more than 30 billion tons of coal gangue, covering more than 15 million mu.

Mine ground subsidence, coal spontaneous combustion, some coal gangue spontaneous combustion, coal mine gas emissions on the ecological environment seriously affected.

Coal mining annual discharge of about 2.2 billion cubic meters of groundwater, the main coal producing areas in northwest China, coal mining has exacerbated the lack of water resources, the impact of mining ecological environment.

Underground coalbed methane extraction capacity of about 10 billion cubic meters, 90% directly discharged into the atmosphere.

2.2.5 Coal transportation and coal pollution

(1). Coal transport control

China's coal resources are mainly distributed in the northwest, while the coal consumption center of gravity in the southeast, the formation of the 'North Coal South, West coal east' pattern, long transport distance, high transport costs, affecting coal supply capacity and market competitiveness: The problem of insufficient rail capacity will exist for a long time; port throughput capacity cannot meet the needs; long-distance transport costs of roads is too high.

(2). Coal consumption and environmental protection

Coal in the use of the process will produce a large number of pollutants and greenhouse gases. Especially the irrational use of coal, emissions of a large number of soot and harmful gases, serious pollution of the environment. With the increase in coal consumption, environmental protection pressure will become increasingly large.

China's acid rain coverage area has been extended to about 30% of the total land area, more than 75% of SO₂ emissions from coal. In 2003, the total SO₂ emissions increased to 21.58 million tons, acid rain pollution increased. In 2003 the total amount of coal increased, the total dust emissions increased to 10.47 million tons. China's CO₂ emissions are currently ranked second in the world, about 80% of CO₂ emissions from coal combustion.

3. Development of high mining technology

China's state-owned key coal mine thick coal seam reserves accounted for 44%, while the thick coal seam production accounted for more than 45%, the vast majority of high yield and efficient mine is in the thick coal seam mining production conditions. At present, China's key coal mine thick coal mining methods are mainly fully mechanized top coal caving mining and mining high mining two. Although the development of caving coal has been developed in China as a thick coal seam high yield and efficient coal mining method, widely used in 5 - 15m thick coal seam once high, but there are still many difficult to solve technical problems. For 4 - 6m stable thick coal seam, large mining height fully mechanized mining has a better technical and economic advantages, the past decade, to Shendong mining area as the representative of the modern mine construction, relying on unique thick coal seam storage conditions and advanced management mode, the use of world-class equipment, 4 - 6m a full high, and constantly refresh the high yield and high efficiency record, the face with an annual output of more than 10 million t. Jincheng Sihe coal mine using domestic large mining high hydraulic support, the successful realization of 6 yuan 6.5m a mining high, to produce a breakthrough of 800,000 t, to create the world's largest mining high yield and high efficiency record of foreign major coal-producing countries thick coal mining is mainly used full-height long wall mining, the United States, Australia and other developed countries, coal mines generally use highly efficient production, the maximum mining height of 4.5m; South Africa and the Czech Republic, the largest mining height of 6m hydraulic support to high resistance to the development of two-pillar bracket, support the work resistance of 6 000 - 12 000 kN, support height of 3 to 6m, bracket column 320 - 440mm, bracket center distance of 1.75m and 2.0m, stent control for the ring for liquid and electro-hydraulic control, stent down, shift, 1 cycle time is less than 10s, stent life test up to 50 000 or more.

4. Application of large mining and high coal mining method in fully mechanized coal mining face

Since the exploration of fully mechanized top coal caving mining technology in 1988, after nearly two decades of development, this coal mining technology for thick coal seam has become more and more mature, and has become one of the main mining methods of thick coal seam in China. But in recent years, with the rapid development of fully mechanized mining equipment manufacturing technology, fully mechanized mining equipment to heavy, strong and automated, so that the reliability of equipment is guaranteed, a strong impetus to the development of large mining and mining technology, A new round of coal mining technology revolution, the current in the East, Jincheng and other mining areas have been the first in the thick coal seam $f = 1.5-5$ use of large mining height fully mechanized mining equipment, to achieve the highest efficiency, the lowest cost of tons of coal, greatly improving the competitiveness of the coal market.

In order to study the feasibility of large mining height fully mechanized mining technology in the existing production conditions of Wang Zhuang coal mine, Wang Zhuang mine was established in November 2007 by electromechanical, production, geology, ventilation, transportation, automation, planning and fully mechanized mining the investigation team composed of the team and the team analyzed the coal seam and the existing production technology of Wang Zhuang mine in detail, and carried out on-site inspection of Shendong Shang wan, Jincheng Sihe and Zhao Zhuang mine. Mine with large mining height of fully mechanized mining equipment, the relevant technical data, after analysis and comparison that the current large mining height fully mechanized coal mining face with high power, high reliability equipment, with strong adaptability, the use of Wang Zhuang mine is feasible, will further accelerate the Wang Zhuang mine to reduce the side by side, increase production efficiency as the main content of the intensive pace of development, and promote Wang Zhuang and Lu'an coal mining technology development, and promote the construction of safe and efficient mine.

4.1. Overview of Wang Zhuang coal mine

Wang Zhuang coal mine in December 1966 completed and put into production, the original design capacity of 900,000 tons/year, has two after the expansion and multiple system transformation, mine intensive, comprehensive production capacity and sustainable development capacity greatly improved, The current mine safety production license capacity of 7.1 million tons/year. Wang Zhuang mine field area of 79.68Km² (including the reserve area 28Km²), mining depth from +880 meters to +350 meters' elevation.

Mine development: mine development for the legislation, vertical wells comprehensive development, the existing +740 and +630 two production levels, up and down the level of communication through the dark inclined wells. At present, is preparing to develop the level of +540 extension. The existing 43,52,61,62 four production panels.

Main lift transport system: Wang Zhuang mine has two sets of main lift transport system, +740 level for the shaft skip (7.5t/bucket) to enhance the +630 level for the slope of the tape to enhance. The capacity of the main saddle belt is 5.37 million tons, the capacity of the main shaft is 1.75 million tons, and the main transportation promotion system is communicated through the main upgrading and transportation system. The two levels of lifting capacity are complemented, Mine comprehensive upgrade capacity of more than 7.1 million tons/year.

Auxiliary transport system: auxiliary transport for the rail transport, track gauge 900mm. Inclined shaft track lifting mode for inclined shaft. Horizontal alley is used to drive wire rod trailer material delivery of production materials, equipment and so on. Mining area and mining area track, the use of non-polar rope winch and small winch relay transport material delivery. Work surface wind, road and track travertine winches and small winch traction transport.

Geological profile: No. 3 coal seam, which is being exploited in Wang Zhuang coal mine, is located in the middle and lower part of the strata of the lower Triassic Xiaxian formation. The thickness of the coal seam is 3.16 - 7.87m, the average thickness is 6.62m, the hardness is $f = 1-3,62,43$ The area is slightly hard, $f = 2-3$, the structure is generally simple, the thickness coefficient of the coal seam $Y = 10.59\%$. Its recoverable index $K_m = 1$, is a stable coal seam. No. 3 coal seam directly for the top of the sandy mudstone, mudstone, local siltstone, thick 0 - 10.75m. The old roof for the medium sandstone, fine sandstone, thick 1.10 - 13.60m. Fissure development, was open-like, no filling. Coal seam overlying the rock, from the top to the top of the roof for the weak - hard, hard - hard type. The upper part of the overburden is weak to hard and parallel to the composite structure. The inclination of the rock is 3 - 11°. Direct floor for the carbonaceous mudstone, sandy mudstone, siltstone, thickness 0 - 5.33m. The lower part of the fine sandstone and medium sandstone.

Existing reserves: As of the end of December 2007, Wang Zhuang coal mine is the exploitation of No. 3 coal seam reserves/resources for the 3958.44 million tons, of which the production level +740 and +630 level of 162.371 million tons, +403,233,300 tons. Production level is the production of conquering reserves of 312.15 million tons, the

recoverable reserves of 280.94 million tons of face. +540 level to remove the village and high-speed road pressure coal, the river under the pressure of coal, available for mining design reserves of 74.464 million tons.

In summary, Wang Zhuang mine in the production scale, geological conditions and coal reserves and other aspects of the application of large mining and mining equipment with the ability and conditions.

4.2. Working face roadway layout and production system

4.2.1 Face position selection analysis

According to the present investigation of the large mining face in Shendong Shang wan, Jincheng temple river and Zhao Zhuang mine, the paper analyzes the characteristics of coal seam in the mining area of Wang Zhuang coal mine and the production conditions, Work surface layout at 6207 is more reasonable:

1,6207 where the 62 mining area for the 2006 new operation of the mining area, rich reserves, arrangements convergence easily; the other side 62 mining area into the wind 6450m³/min, 6207 face mining time, the air volume is also easy to meet.

The buried depth of the face is about 260 meters, the coal quality is $f = 2-3$, the structure is simple, similar to that of the Jincheng Sihe river. At the same time, according to the mining data of the adjacent 6205 mining face, mineral pressure is not obvious.

3,6207 face for the downhill mining, can be appropriate to ease the mining and mining to bring the coal wall to help the phenomenon, is conducive to coal wall and roof management.

4.2.2 Working face roadway layout

(1) The face of the road layout

6207 Working surface along the direction of the dip direction of the coal seam, inclined mining. Working face cut length of 230m, along the direction of the wind, the road long 970m.

(2) Roadway section and support form

Roadway section, support form and use

6207 face wind, transport two lanes and open cut eye are used anchor support,

Roadway is mainly used for coal, into the wind and the column, belt, transfer machine and other equipment layout.

Wind lane is mainly used for transport materials, return air.

Roadway section to determine

Determination of roadway width

Transport lane

According to mine equipment and belt conveyor intermediate part of the arrangement, sidewalks and equipment inspection road merger to consider, the required net width L should meet:

$$L \geq L_1 + K_1 + K_2 + K_3 + L_2$$

L -channel width;

L_1 - the maximum width of the electrical equipment, m; take 1.85m

K_1 -column to the coal wall gap, m; take 0.3m

K_2 -sidewalk and maintenance space width, m; take 0.7m to meet the requirements

K_3 belt to the coal wall gap, m; take 0.5m

L_2 -belt width, m; take 1.95m

Therefore, $L \geq 1.85 + 0.3 + 0.7 + 0.5 + 1.95 = 5.3\text{m}$

The width of the roadway is 5.3m.

Wind lane

Wind lane for the installation and recovery during the transport roadway, in order to meet the transport requirements, control Sihe mine design selection of the width of the roadway 5.0m.

Open the width of the cut

According to the bracket installation requirements, open cut the width should meet:

$$B \geq (L_2 + w_2) / 2 + S + K$$

B-cut-out width, m

L-carrier transport length, m; take 7.0m

W-bracket width, m; take 2.0m

S-safety gap, m; take 0.7m

K-auxiliary support of the pillars of the required space, m; take 0.4m

Therefore, $B \geq (72 + 22) / 2 + 0.7 + 0.4 = 8.38$ m

In summary, the opening width can take 8.5m.

Height of roadway

Large support height of the face of the support frame height of 3.0-5.5m, shearer drum diameter of 3.5 m, considering the height of the Lane selected 4.0m, open cut eye selected as 3.8m.

Wang Zhuang mine currently used 150 boring machine can dig the maximum section of 5.5×4.8 m, to meet its requirements, without additional tunneling equipment.

4.2.3 Production systems

(1), coal handling system

Coal mining machine → coal mining machine → conveyor belt conveyor → transfer machine → 6207 roadway belt → 630/3 # belt → 630/2 # belt → 630/1 # belt → 61 coal warehouse → 630 strong leather → 51 coal bunker 51 strong leather → main belt coal bunker → main belt → ground.

Coal handling system bottleneck 630/3 # belt, belt speed 4m/s, the ability of 3000t/h, do not load the start is feasible, to the large mining equipment on the 630/3 # belt expansion can be.

(2), auxiliary transport systems

Shipping:

Material auxiliary shaft → inclined shaft → 630 lane → 62 materials carpark → 630 south rail → 6207 wind farm → 6207 face

Shi:

Deputy shaft → deep inclined shaft → 630 alley → gunpowder channel → 630/3 # belt → 6207 Lane → 6207 working face

(3), ventilation system

West into the shaft --- 630/3 # belt --- 6207 Lane --- 6207 face --- 6207 face wind tunnel --- 62 dedicated return air lane --- 62 air shaft --- ground

(4), power supply system: 6207 working surface by the 62/1 # substation power supply, 62/1 # into a dual-loop power supply from 62 total change I, II loop, the ground power supply for the 62 wind shaft 35KV substation, Alternate to each other.

(5), communication system

In the 6207 roadway nose and work plane transfer machine head were installed a program-controlled telephone, for underground and downhole and the well of the call.

In the 6207 working face to install a set of work surface communication control system for the face of the communication control.

(6), drainage system: 6207 wind transport Lane low-lying through the pump to 630/3 # belt 2 # water tank -62 water warehouse - ground

(7), lighting system

Lane conveyor belt head, three fork design 127V explosion-proof fluorescent lamp, the face of every 5 to install a flameproof lamp.

4.3. Work surface equipment selection

4.3.1 Work surface equipment selection

According to the situation of Shendong coal mine, the Jincheng coal mine and the Zhao Zhuang coal mine, the Jindong coal mine uses the large mining height support and its supporting equipment, combined with the characteristics of mine coal seam, the surface pressure data and transportation conditions to meet the high yield and high efficiency, economic and safety requirements of the premise, as far as possible to consider the equipment of the detachability, but also to achieve a simple coal mining process, a substantial increase in coal recovery rate, the purpose of reliable operation of the equipment, Wang Zhuang coal mining workers face selection as follows:

(1), hydraulic support (Zheng coal group valuation of 1.5 million/frame)

I mine coal seam thickness of 6.65 meters on average, if you consider a full high, on the current status of China's stent production point of view, there is no most suitable for my mine seam thickness of the rack, for this problem, we and the coal group in-depth exchanges, Through the joint development, you can design for mine geological conditions in the mining height of 6.8 meters in the hydraulic support, design and manufacturing cycle is estimated in 8-10 months, the valuation of 1.5 million/frame.

Main technical characteristics of large mining height hydraulic support

Two - column shelves

Base width of about 1880mm

Support height of 3.0-6.8m

Minimum support strength: greater than 1.1MPa

Average ground to specific pressure: 2.48-2.74Mpa

Working resistance of about 15000kN

Push step by step 1000mm

(2), coal mining machine (Xi'an coal plant, 12 million/Taiwan)

In the present case, the largest picking machine produced by Germany's Eckford is 6.3 meters tall. The maximum mining height of the coal miner produced by Jianyi company is 6.5m, which is not suitable for the coal seam condition. According to mine for many years, coal machine factory production of coal mining experience, the production of this plant quality and use of coal are more satisfied, so we chose the Xi'an coal plant production MG900/2210-GWD type shearer.

Main technical characteristics of MG900/2210-GWD shearer

Height: 3.5-6.8m

Production capacity: 5500t/h

Drum diameter: 3500mm

Depth: 1000mm

Cutting power: 2×900 KW

Traction power: 2×110 KW

Maximum traction: 1000KN

Maximum traction speed: 23m/min

Crusher power: 150KW

Pump motor: 40KW

Installed total power: 2210KW

Main structural characteristics of MG900/2210-GWD Shearer

MG900/2210-GWD type AC traction shearer is a multi-motor drive, the motor horizontal arrangement, AC variable frequency speed control chainless double-drive heavy-duty ultra-high power electric shearer. The total installed capacity of 2210KW, and with a broken device, the machine surface height of 2710mm, suitable for mining height of 3.5 m -6.8 m, coal seam inclination $\leq 15^\circ$, you can cut hard coal seam and can be forced through the gangue fault.

(3), scraper conveyor (Shanxi coal mine machinery manufacturing Co., Ltd., 16 million/min)

For the MG900/2210-GWD shearer, we use the SGZ1200/2 \times 700 scraper conveyor

The main technical characteristics of SGZ1200/2 \times 700 scraper conveyor

Conveying capacity: 2200t/h

Chain speed: 1.31m/s

Power: 2 \times 700/3.3KV

Coupling form: torque limiting clutch

Chute width: 1200mm

Chain specifications: $\phi 42 \times 146$ mm

The main structural features of SGZ1200/2 \times 700 scraper conveyor

- 1) Made of high strength alloy steel, and quenched by forging scraper.
- 2) Compact planetary gear drive reducer, to meet any supporting surface design requirements.
- 3) With the telescopic function of the conveyor tail, to ensure that the scraper chain in a moderate tension state of work.
- 4) Conveyor configuration Hydraulic motor low speed transmission, can be used for scraper chain tight chain operation.

(4), along with other ancillary equipment

(Shanxi coal mine machinery manufacturing Co., Ltd., 2.6 million / min)

Selection of SZZ1200/400 double-chain transfer machine, the technical parameters are as follows:

Design Length: 60m

Conveying capacity: 2500t/h

Chain speed: 1.56m/s

Drive power: 400KW/3.3KV

Chute width: 1200mm

Chain diameter: $\phi 38 \times 137$ mm

Crusher (Shanxi coal mine machinery manufacturing Co., Ltd., 400,000/Taiwan)

Selection of PCM315 type crusher, the technical parameters are as follows:

Broken capacity: 2500t/h

Drive power: 315KW/3.3KV

Material size: 1200 \times 800mm

Material size: not more than 300mm

Coupling form: hydraulic coupling

Self-shifting device (Shanxi coal mine machinery manufacturing Co., Ltd., 750,000/set)

Choose ZY2700 belt machine from the tail, if I mine transport conditions cannot meet the conveyor belt from the end of the transport, I will not use the belt conveyor from the tail, the technical parameters are as follows:

Self-shifting maximum thrust: 2 \times 910KN

Stroke: 2700mm

Adapt to belt machine width: 1400mm

The main structural features: configuration ZY2700 belt machine from the tail can be realized during the work of the belt during the belt machine forward and belt movement posture adjustment, can achieve continuous production of continuous production, the tail wheel with spiral drum, can be achieved clean your own coal.

Belt machine (northwest plant, 15 million/min)

Taking into account the mine is the main transport and transport capacity, use SSJ140/3 × 400-type belt conveyor belt, the technical parameters are as follows:

Transport capacity: $Q = 2500\text{-}3000\text{t/h}$

Bandwidth: $B = 1400\text{mm}$

Rated speed: $V = 3.5\text{-}4\text{m/s}$

Tape Type: PVC flame retardant whole core belt, with strong 1800S

Motor power: $3 \times 400\text{KW}$

Reducer: CST

Emulsion pump station (Wuxi coal mine machinery factory, 450,000/sets)

Selection of BRW-400/31.5 type emulsion pump station, equipped with 4 pumps and 2 boxes.

4.3.2 Power supply design

(1), the total installed capacity of the face is:

Coal mining machine 2210KW, scraper conveyor 1400KW, transfer machine 400KW, crusher 315KW, emulsion pump station 4 * 250KW, spray pump 2 * 45KW, belt machine 3 * 400KW, wind transport Lane low pressure 34KW, tightening device 55KW, Tape and Reel Unit 45KW.

(2), according to the face of the equipment configuration: (12.68 million)

Configuration three 4000KVA load center, dual-use equipment, load center outlet: 3.3KV voltage five outlet, 1.14KV voltage five outlet, 127V voltage outlet two. 2 # load center outlet: 3.3KV voltage outlet five outlets, 1.14KV voltage outlet four outlets, 0.69KV voltage two outlet, 127V voltage two outlet.

The belt machine is equipped with a 1600KVA shift, wind transport Lane low pressure with 500KVA change one

Price: 4000KVA load center 3 11.85 million, 1600KVA change a Taiwan 650,000, 500KVA change a set of 180,000, a total of 12.68 million.

(3), the choice of cable cross-section:

Load center power cable with 150MM²/6KV high pressure rubber sheathed cable, shearer cable with 150MM²/3.3KV, carbon bulb cable with 50MM²/3.3KV, transfer machine cable with 50MM²/3.3KV, conveyor cable with 70MM²/3.3KV, Emulsion pump cable with 50MM²/1.14KV, spray pump cable with 25MM²/0.69KV. Low voltage cable with 70MM².

(4), the required cable and junction box: (11.4487 million)

6KV junction box 40 13 million, 3.3KV imported fast plug 10 30 million, 1.14KV junction box 10 0.62 million, 0.69KV junction box 30 0.6 million. A total of 442,200.

6KV high voltage/150MM² cable 6500 meters 442 million, 3.3KV/50MM² cable 1500 meters 487,500, 3.3KV/70MM² cable 1000m 435,000, 1.14KV/50MM² cable 1000m 210,000, 0.69KV/70MM² cable 4500m 1.287 million, Unit cable 3.3KV/150MM² cable 1000 meters 360.6 million, 1.14KV/120MM² cable 1000 meters 53 million, a total of 10,966,500.

4.4. Coal mining methods and mining technology

4.4.1 Coal mining methods:

The working face adopts the method of comprehensive mechanized coal mining in the long wall.

4.4.2 Mining technology

1, Feed mode

The face of the use of the end of the cut diagonal coal oblique cut into the knife.

2, Push slip, shift the way

The work surface push slip, shift all the adjacent frame (or group) electro-hydraulic control operation.

4.4.3 Process description

1, Cutting coal, loading coal, transport coal

The working surface adopts electric traction double drum shearer. Mining height of 6.5-6.6 m, cut deep 1 m, the normal cutting coal, the former drum cutting cave, after the drum cut coal. When the shearer drum rotates, the coal is broken down by the screw on the drum, and the spirals are loaded into the big slips. A small amount of coal is loaded into the slabs in the large slippery when pushed in a large slippage. Slip the floating coal, by the artificial into the big slippery.

2, Shift frame

The working surface using electro-hydraulic control bracket, can achieve three kinds of shift frame way:

(1) Two-way adjacent frame automatic sequence shift

(2) Group shift plan

(3) Manual shift

3, Push slip

The use of the stent can be used to achieve three kinds of push way:

(1) Two-way adjacent frame push slip

(2) Two-way group push

(3) Manual push slip

Push the hysteresis Shearer rear roller 15m.

4, Coal transport

The miners cut off the coal from the big run to the end of the unloading, by the transfer machine, shipped out of the belt.

4.5. Achievements of high mining height fully mechanized fully mechanized caving face

4.5.1, The surface yield, efficiency and a new high

6207 face to create Nissan 33186 tons, the face of the highest efficiency of 502 tons/workers of the new record, greatly improving the labor productivity. Workplace workers reduced from 36 to 21, greatly reducing the number of operations, improve production efficiency.

4.5.2, Improve the mining height, optimize the mining ratio, improve the resource recovery rate

The height of working face increased from 3m to 3.8m, the ratio of 1: 1.2 is adjusted to 1: 0.80, and the ventilation section of fully mechanized top coal caving face is increased to 16m², which can effectively dilute the working area gas concentration, Surface recovery rate of 92.1%, greatly improving the resource recovery rate.

4.5.3, The use of electro-hydraulic control system, optimize the production process, reduce the labor intensity, improve the operating environment

Through the bracket controller button can be a single action, such as the shelves of the shroud protection board, lift the front and rear columns and other actions; also can achieve a single frame automatic control and group operations, such as the temporary frame, automatic coal caving and other actions, the temporary set of temporary shift frame, group help group, group push before the slip, group pull and then slip group action. Operators standing on the air side with the controller key operation bracket, shift the falling coal dust will not fall in the operating area, reducing labor intensity and improve the operating environment.

5. Conclusions

Based on the extensive retrieval and reading of the relevant references, this paper makes an in-depth analysis and research on the application of large mining and high coal mining methods in coal production in fully mechanized coal mining face, and obtains some useful conclusions.

China's rapid development of coal industry, high-yield has made remarkable attention to rely on scientific and technological progress, to achieve efficient and intensive mining is high production and efficient mine construction of high efficiency mine model.

The application of mining technology in coal mining in the fully mechanized coal mining face is becoming more and more mature and more and more important.

In short, coal production in the coal seam thickness of 3 - 8m stable coal seam, the structure is generally simple, allowing the case should be given priority to the use of large mining and mining methods.

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