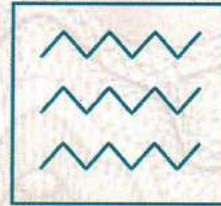




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AND SUSTAINABLE USE
OF NATURAL RESOURCES”**

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RESEARCH AND APPLICATION OF SEMI-MECHANIZED MINING TECHNOLOGY FOR A FEW MINES OF DONG BAC CORPORATION IN QUANG NINH COALFIELD, VIETNAM

Semi-mechanized mining technology is a type of technology that uses shearer or plow with non-mechanized supports to extract raw coal block [1]. This type of technology has been used in many different countries, especially China [2;3], where semi-mechanized mining technology applied to thin coal seams with gently sloping angle is also relatively effective. Currently, semi-mechanized mining technology for thin coal seams is still very new for underground mines in Quang Ninh coal basin, Vietnam.

At present, coal mines owned by Dong Bac Corporation are managing and exploiting mainly by underground method. With a small mining area, the annual mining output at the mines is not high. Excluding the Nam Khe Tam mine which is exploited by Company 86, Dong Bac Corporation also has underground sites such as: Bac Quang Loi, Tay Bac Khe Cham (790 Company); Tay Bac Nga Hai, Tay Nam Khe Tam (35 Company); Dong Ri (45 Company); Nam Khe Tam (86 Company); Khe Chuoi (91 Company); Ho Thien (618 Company); Dong Quang La and Tay Quang La (Thang Long Company) with a total geological reserves of about 66.9 million tons.

Depending on different geological conditions, Dong Bac Corporation has commanded and applied different mining systems as well as supporting and mining technologies. Up to now, the Corporation has researched and applied many different types of supports for each geological condition, such as hydraulic prop, moveable hydraulic support, moveable frame support, support “ZRY” and recently, a flexible mechanized support is being deployed at 35 Company, 618 Company and 790 Company. However, most faces in the Corporation are using mining technology of drilling and blasting method, which proves that coal mining technology has not been innovated and invested in this Corporation. The advantage of drilling and blasting technology is mobility and flexibility, which can be applied to all geological conditions. However, the disadvantages of this technology are low safety, interruption in technological chain, release of many harmful gases, as well as low labor productivity and mining output.

In order to eliminate the disadvantages of drilling and blasting mining method, along with the determination to modernize technology in underground mining, Dong Bac Corporation has cooperated with 86 Company to find suitable areas for the application of mechanized mining technology. The first problem is choosing the type of mechanization technology (semi-mechanized or fully mechanized), and the second is human resources to operate the equipment because the Corporation has no experience in applying such technology. Based on research results and consultation, as well as a practical study on application of semi-mechanized mining technology at some Chinese longwall faces for thin and gently sloping coal seams, the efficiency has been realized. Therefore, the Corporation decided to apply for the same conditions at Nam Khe Tam site of 86 Company [4].

From the above practical issues, the author also has researched and proposed a design for support plan and operation scheme for longwall face in a few mines of Dong Bac Corporation. On the basis of those documents, longwall face can apply and deploy in actual production to improve supporting and working efficiency of synchronous equipment in the longwall face, thereby increasing mining efficiency and worker productivity.

The selection of coal mining technology depends on many factors in which the geological conditions of mine are the decisive factors. According to preliminary assessment of geological conditions, the seam is relatively stable, and it is possible to use semi-mechanized mining technology. Currently, this technology is used in many different underground mines and has shown relatively good results. The application of mechanized technology at underground coal mines of Dong Bac Corporation has been approved by the Corporation's leaders based on geological conditions assessment of a few mines having suitable conditions. The application of semi-mechanized mining technology is to ensure the requirements of output as well as labor productivity and increase the level of safety [5].

+ Main synchronised equipment at the longwall face

The selection of synchronous equipment at the longwall face is influenced by many different factors and regulations. This selection is not only a problem of the technological system but also a problem of the most optimal combination. In order to ensure that the synchronous selection of equipment achieves the most suitable results for overall longwall face design, the equipment synchronization must be consistent with geological conditions of designed area, technical and economic factors of mines.

- *Shearer*

To extract coal in the longwall face, Dong Bac Corporation has chosen a China shearer MG125/150-WD. Cutting drum web: 1m; Number of cutting drum: 1 drum; Cutting drum diameter: 0,8m; Total weight: 8 tons; Outer Dimensions (Length x Width x Height): 6500 x 1600 x 700 mm

- Roof support

From analysis and comparison of different types of roof supports, the support selected for apply at the longwall face is a combination of single hydraulic prop DW22-300/100 and steel box bar DFB 2800/300. Max and min height of single hydraulic prop DW22-300/100 is 2240 and 1440 mm, the length of steel bar DFB 2800/300 is 2800 mm.

- Transport equipment

The transport equipment used in the the longwall face is a conveyor coded SGZ 630/2*90, which is synchronized with the shearer MG125/150-WD. Transport capacity: 250 ton/h; Conveyor length: 150 m; Rated power: 90×2 Kw; Dimensions of a plate (Length×Width×Height): 1500×630×190.

Support plan and operation scheme are two closely related technical documents. They must fit together in both time and space. These documents are prepared by professionals and are used to direct the production and management of the mine.

The support plan is a document that shows necessary information for viewer to use as a basis to build and install the roof supports, ensuring the safety of workers and equipment. On this plan, it shows the status of longwall face according to each extraction cycle, type of mining technology used, distance between supports, number of support, movement of shearer and support, as well as pressure control method in the face. In addition, the support plan also shows the progress of moving face in one day and the method for creating a room placing shearer.

+ Design basis of the support plan [6; 7; 8]

- Documents on the mine geology of design area; parameters on properties of roof and floor rock;

- Mining technology in the longwall face, technical parameters of equipment;

- Hypothesis to determine mine pressure (console beam hypothesis);

- Method of creating a room for placing shearer (head or tail);

- Method of controlling mine pressure in the longwall face;

- Skill level of workers;

- Requirements of actual production;

- Technical, safety and efficiency requirements.

The operation scheme in longwall face shows how to arrange the work to be done in a certain space and time relationship, and it also shows the number of people needed to complete each work to ensure that the longwall face moves on schedule to reach the designed capacity. It is extremely important to establish a suitable operation scheme for each different condition. This is what any manager wants because it determines the working efficiency of the selected synchronous equipment and ensures the safety for workers. Detailed research and calculation based on initial geological

data to establish a close relationship between technological stages is essential. This aims to maximize the working efficiency of shearer as well as other equipment at the longwall face. The operating efficiency of shearer is one of the factors affecting the economic efficiency in the mining process. In order to achieve high productivity in longwall face, it is necessary to arrange a reasonable operation scheme so that shearer can promote its advantages.

+ Design basis of the operation scheme [9; 10; 11; 12]

- Factors regarding characteristics of geological conditions of the design area;

- Technical and technological factors;

- The parameters directly affect the productivity of shearer;

- Movement speed of shearer;

- Tasks need to be completed in one mining cycle: cutting face, strengthening face, repairing face, operating face supports and conveyors...)

- Norms to complete each task;

Conclusions: This mining technology diagram which has been applied at Nam Khe Tam mine step by step shows the efficiency in exploiting thin and gently sloping seams. Thereby, it is recommended that Nam Khe Tam mine, 86 Company continues to report and evaluate so that this technology can be applied to other areas with similar geological conditions. At the same time, this is also a premise for Dong Bac Corporation to comprehensively evaluate other mines with thin, gently sloping seams in the corporation to put this technology into application

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