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STABILITY AND PERFORMANCE OF CONTINUOUS MINER

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ABSTRACT:

In India, the use of coal for power generation and other purposes is becoming increasingly important. Using continuous miners is one way to boost both production. In India, continuous mining is seen as an appropriate form of technology. In dark, dusty, and claustrophobic mines, they are significantly hindered, and output declines. Even a small increase in productivity can generate several hundred thousand rupees in extra income per machine every hour. For typical coal mines looking to increase production output while at the same time lowering relative production costs, the contemporary continuous miner and associated trackless equipment like shuttle cars, roof bolting rigs, and scoops have made the room and pillar approach particularly appealing from an economic standpoint. This project outlines every facet of a continuous mining system's applicability, enabling it to operate in extremely limited areas and generate coal in an efficient and economical manner.

Keywords: Shuttle car, Roof Bolting Rigs, Productivity, Continuous miner.

I INTRODUCTION

Open cast mining, which proved to be more efficient and cost-effective to meet the rising demand for coal, is fully responsible for the amazing rise of the Indian mining industry. India can no longer rely only on open cast mining as a result of economic liberalisation and the subsequent fall in the import duty of coal. To increase the overall quantity of coal and bridge the gap between the demand for coal and supply, widespread mechanisation of the underground coal sector's previously stagnating production is now necessary. Currently, technology needs to be implemented in Indian coal mines to increase underground production while taking cost of production, productivity, profitability, and safety into consideration. The coal industry has reached an understanding regarding the necessity of increasing

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production from underground coal mines, from the current share of 15% to a total coal production of 30% from underground coal mines by 2030. This is due to the rise in coal demand and growing awareness towards sustainable development. India has the third-largest production of coal in the world and the fourth-largest reserves of coal. The production of electricity accounts for about 70% of the entire output, with the balance going to heavy sectors like steel and cement. Despite possessing one of the largest deposits, the Indian coal sector does not have a position in the league of global energy suppliers; coal is used as a fuel for domestic purposes.The reason for this is the enormous domestic demand. Nearly 20% of the nation's total coat production in India is produced underground. This is true even though around 70% of the country's coal reserves may be exploited using underground techniques. This demonstrates how slowly technology is being introduced in underground coal mines and demonstrates how much room there is for improvement. Immediate attention is needed for the improvement in underground mine production in order to meet the nation's continued demand for coal.

To achieve the needed coal output levels, mechanisation must be incorporated into underground mining. The best choice in this regard is board and pillar mining, which does not require virgin regions and may be used anywhere development has already been completed. since the invention of the board and pillar in India. This method facilitates high extraction rates and production levels while maintaining safety.

II SURVEY OF RESEARCH

High automation is needed in underground coal mines to achieve higher production and safe mining conditions. Continuous mining is increasingly used in underground mines, which leads to improved production and secure working conditions. Improving underground mine productivity must get rapid attention in order to satisfy the nation's continuous demand for coal. In order to satisfy rising energy demand, India's coal ministry seeks to make better use of land. By putting an emphasis on underground mining, the goal would be to fully utilise underground resources. According to the Powered Support expert committee's recommendations There is a need to popularise and establish longwall and

continuous miner technology as the de facto subterranean standard, especially for mass production. These technologies are now being used successfully in numerous mines.

Permanent Miner The best option for attaining mass production in underground mines that doesn't require virgin regions is the continuous miner technique in board and pillar mining; it can even be used where development has previously been done. Technology for continuous mining aids in obtaining high productivity and a faster rate of extraction while maintaining safety. The coal is transported by shuttle cars and continuous miners from the coal face to the transfer point (feeder breaker). The underground conveyor system is primarily used to tip coal from the transfer point to the surface where it is supplied to customers. One potential area for increasing productivity is the cycle of cutting, loading, transportation, and tipping.

Using a Continuous Miner to Depillar Large coal pillars are left exposed in underground coal mines to support the enormous weight of the stratum above and maintain safe mining conditions. India has coal pillars that contain more than 3 billion tonnes of coal reserves. The Bord-and-pillar method, which is once again the most widely used method used in India, finds it extremely difficult to recover more than 30% of the total coal reserve due to varying geo-mining conditions. In actuality, these factors contribute to a significant loss of coal, their spontaneous heating, the buildup of dangerous fumes, and the development of hazardous working conditions. The apparent remedy appears to be to reduce the size of these pillars and move the coal backward by additional de-pillaring or by adopting an artificial support system in place of these pillars, such as a truss system, cable bolts, or roof bolting system. Different pillar dimensions can be extracted using the fundamental pillar extraction pattern, which includes modified Navid system, split and fender, double split and fender, and 1/3 split and fender.

Requirements for Supports in Depillaring Areas Support is defined as the application of a reactive force to an excavation's surface, and it includes methods and tools like steel or concrete sets or liners, lumber, fill, shotcrete, wire mesh, and shotcrete. By using methods like rock bolts, cable bolts, and ground anchors, reinforcement, or supporting, preserves or enhances the

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general qualities of the rock mass from within the rock mass. The immediate roof's Rock Mass Rating (RMR) is calculated for this purpose in order to identify the system of support to be used, and typically the following factors are taken into account: Featured structures Rock strength, rock weathering capacity, layer thickness, and underground water

II WORKING METHODOLOGY

Extraction of pillars using "Split and slices " method of mining in the previous seven panels CMP-5A,CMP-5B,CMP-6A1,CMP-6A2,CMP-6B,CMP-7A,CMP-7B/2 were found successful as per expectation from strata control point of view with an average percentage of coal recovery around 72% except subpanel CMP-7B/1 where strata control problems were faced and the subpanel was prematurely closed which has been analysed. It was found that problems was arisen due to heavy loading from thick L/W barrier of earlier top seam working just above the CMP-7B/1 subpanel workings . The CMP-8 panel was extracted with the same method of mining but diagonal line of extraction adopted instead of straight line of extraction for better strata control.

The same method of mining can be implemented here also because most of the geo mining parameters of proposed panel are almost identical to the previous ones those are successfully extracted .diagonal line of extraction should be adopted in the panel similar to CMP-8. This problem which refers to much smaller volume of material and these type of failure effect one or two benches at a time due to shear plane jointing, slope erosion due to surface drainage.

EXTRACTION PATTERN FOLLOWEDE IN EARLIER EXTRACTION CM PANELS

In the previous worked out CM panels "Split and Slice " method of mining using CM Technology with straight line of extraction was followed .First each panel was prepared with proper size of road ways for smoother movement of CM and shuttle cars. For this purpose, all the road ways were widened to 6.5 m from either side with 3 m height along roof. The pattern of extraction of pillar along with breaker line support.

THE SEQUENCE OF EXTRACTION PATTERN FROM A PILLAR FOR EXTRACTED CM PANELS IS DETAILED BELOW:

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Two dip rise pillars were spitted simultaneously by driving level split galleries of 3.0m Height along the roof and 6.5m wide ,from stages 1 to 6 forming two stocks in such a way that it creates two stooks of 1/3 rd and 2/3 rd size pillars (1/3rd ,dip side fender- A) and (2/3rd ,rise side fender B). Roof bolting with resin grouted rock bolts, side supports with plastic meshing and GRP bolts were completed in splits along with installation of breaker line A ramp of 1 in 7 gradient was made along dip gallery from the rise side junction of same pillars as shown in (Fig 1) Stage 7D and deepened to 4.6 height by floor dinting.

Slicing operation frame No 9 to 11 by slicing 5 m in upper side (upper stock) and 13.5 m in lower stock (Fender A) (Fig 1) :up to 4.6 m height was completed .the last stook in Fender-A OF dimension 7m x13.5 m was left for its judicious extraction . The final size of snook left in the goaf after judicious extraction was used to be decided based on Audio Warning Tell tale blinking (installed near to the snook at the height of about 10 m and having warning level 5mm and withdrawal level of 8mm deformation and pressure coming over surrounding pillars ,fenders and snook which can be judged by their side spalling. Lastly, level gallery shown as 12D IS TO be dinted and slicing stages from number 13 to 15 were completed with full height of 4.6m, so that a snook of size 7 m x 13.5 (fig 1) can be left against four way junction. If the caving in the goaf delayed ,induced blasting of the level junction was done .Before going for induced blasting over the junction of splits and level galleries after extraction of each fender ,the snooks/ribs were further reduced or knocked down to facilitate the roof caving in extracted area

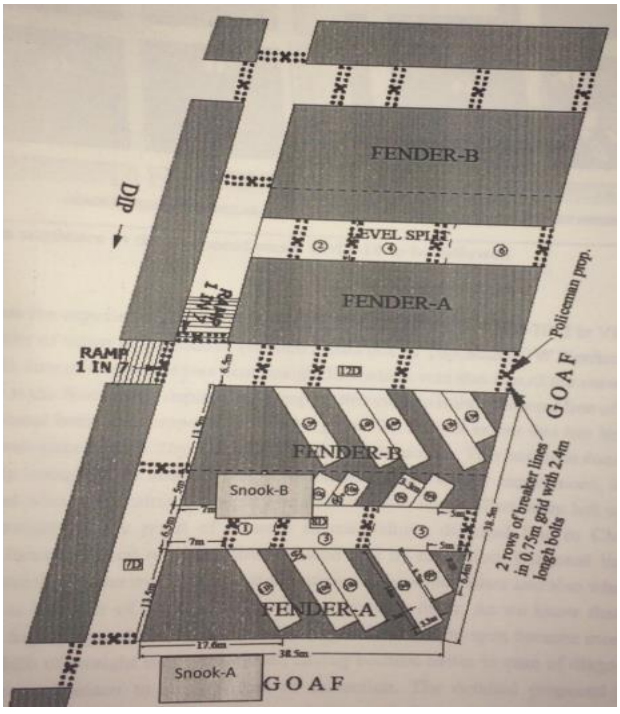

Fig.1. Extraction pattern during splitting ,slicing and dinting along with goaf edge supports.

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From the experiences of last seven panels from CMP-5A to CMP-7B/2 in VK-7 incline mine, number of times strata control problem araised due to Top seam L/W Barrier pillars. In those panels line of extraction was kept straight line which was also one of the reasons to give higher load at the face during depillaring. Keeping this view in mind diagonal line extraction on experimental basis was proposed in CMP-8 panel. To limited extent this has been tried in CMP-7B/2 Sub panel below top seam L/W barrier with success. This has been done for better roof stability compared to straight line of extraction. From earlier experiences it has been observed that while maintaining straight line of extraction some pillars were left unextracted for better stability. Only point of concern in maintaining diagonal line in CM panel is operational inconvenience resulting into reduced rate of extraction. Diagonal line of face provides protection as working places are supported by solid pillars and also when the roof caves there is a less risk of goaf flushing into the working faces. As we know that line of extraction was kept diagonal during extraction, diagonal extraction span become more than the extraction width of straight line. As a result caving became easier in case of diagonal line of extraction in comparison to straight line of extraction. The detailed proposed pattern of extraction in CMP-10 panel with splitting, slicing, and floor dinting including goaf edge supports are shown in Fig 18 (a and b) and Fig 19 .therefore the sequence of pillar extraction as given in plan Fig 20 may be triesd on CMP-10 panel like CMP-9 where extraction was safely done by the following diagonal line of extraction .

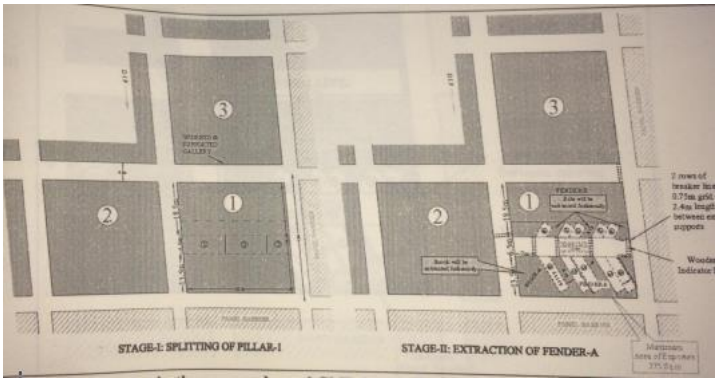

Fig.2. Extacted sequence in the proposed panel CMP-10.

IV RESULTS EXPLANATION

- We observed that major part of breakdown in continuous miner is due to gathering problems i,e 50.14%. This includes gathering cylinder pin out, gathering head gear box prob, gathering spray nozzle jam.
- A part from gathering problem, there are other problems like

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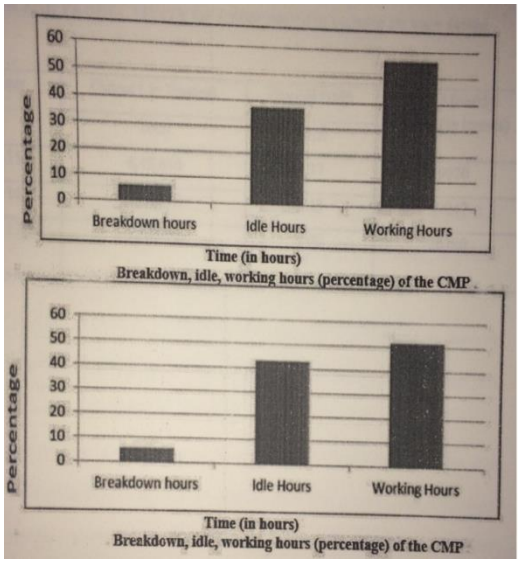
hydraulic and cutter problems which accounts for 24.32% and 11.32%of break down respectively.

- Here we observed electrical problems is main in shuttle car i,e 99.16%.
- We observed that major percentage of breakdown in continuous miner is due to gathering problem i,e 48.23%. This includes gathering cylinder pin out, gathering head gear box prob, gathering spray nozzle jam.
- Apart from gathering problems , there are other problems like traction and hydraulic problems which account 24.49% and 22.2% of breakdown respectively.



V CONCLUSION

Continuous miner technology will drastically increase the production productivity and safety in the underground mining. It is convenient for both caving as well as non caving method of mining. Using continuous miner technology high production can be achieved. It can be utilized for development as well as depillaring of developed pillars. it can give an average of 74.75% of extraction. The machine has worked for an average of only 54.78% .the machine can give good production rates if we can increase the working hours. This technology promises greater safety. The proper utilization of the equipment can give greater production rate. The reliability analysis shows that the machine is reliable about 95.56% whereas probability of failure is only 4.45%this indicates it is more reliable.

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