OVERVIEW OF BLASTING GALLERY METHOD IN AN INDIAN MINE
- CASE STUDY

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ABSTRACT

In the mining industry, the challenging task of mining professionals comprises the extraction of maximum natural resources along with the protection of the miners. Application of conventional Bord and Pillar mining in thick seams is yielding an extremely low percentage of extraction rate (around 30%) even under favorable conditions. Almost 50% of coal reserves in India are found to possess a seam thickness of about over 4.5 meters which is considered and called thick seams. The exploitation of thick seams by underground methods arises certain difficulties and problems. Blasting Gallery (BG) method can be applied for extracting thick seams. A comprehensive study of the blasting gallery method of mining within the technical and technological analysis is will allow for its effective application.

Keyword; Mine, Blasting gallery method, Thick seam rise to dip and loading the blasted coal from these levels. From level galleries/splits ring pattern long holes are drilled as shown in Figure 1 and blasted from bottom section and the blasted coal from (Sawmliana, 2005). Goaf is loaded through level galleries/splits on the bottom section by means of remote controlled Load Haul Dumpers (LHD) with a bucket capacity of 3 m³. In turn LHD discharges coal on to armoured chain conveyors for onward transport of coal at the outbye by other means. Jumbo drills are used which drill 3 to 6 rings of holes/day/jumbo with an average number and length of holes 12 to 20 numbers and 5m respectively. Cogs are erected in the top galleries at the intervals of 3m and steel girders (200mm x 100mm) with 2 rows of 40 tonne open circuit hydraulic props are erected in the bottom galleries. Distance between two props is 0.7m. Special type of cartridge-GE-8 explosive (quantity of explosive/ring=16 to 30 kg) and spacer with fuse cord (special type ring cord) are used which produce coal/ring (for a burden of 1.4 m) 125 tonne. Maximum charge per hole is 2 kg and the powder factor achieved 3.9 to 6.29 tone/kg. Out of 125 tonne of coal produced per blast, 100 tonne of coal is loaded by the LHD whereas remaining 25 tonne of coal is left in the goaf.

Figure 1. Ring drilling pattern

2. OVERVIEW OF BG METHOD

The method is already introduced in Mine -A in Jharia Coalfield, India, in a 7.5m thick seam dipping around 1 in 8 which was developed in long back in 2 section--one along the floor (2.83m) and another along the roof (2.11m) in the bord and pillar pattern (size of the pillars 23m x 23m centre to centre) (Samanta, 1997). In this method all the pillars (3 pillars along dip-rise) are divided into two halves by 4.2m wide, 3m high (by roof heightening) level splits. Then full thickness of coal in successive slabs is taken by retreating on level galleries from
greater strata control problems than longwall mining and in thick seam mining, this problem becomes very high. Further heavy coal loss takes place in bord and pillar mining. Therefore, longwall mining (with multi slicing) is the preferred method of mining for extraction of coal from thick seams. This is also suitable for mining thick as well as steep seams. However, BG method was tried in many mines for getting better extraction rate than other mining methods. The comparison of BG method with other methods is presented in Table 1 (Singh, 1997; Deshmukh, 1990).

Table 1. Comparison of BG method with other methods

<table>
<thead>
<tr>
<th></th>
<th>Blasting Gallery Method</th>
<th>Bord &amp; pillar Method</th>
<th>Longwall Mining Method</th>
<th>Inclined slicing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage recovery is high.(75-85).</td>
<td>Percentage recovery (30-45)</td>
<td>Percentage recovery (65-80)</td>
<td>Percentage recovery 50</td>
<td></td>
</tr>
<tr>
<td>Thickness of seam more than 7m.</td>
<td>A seam thick than 1.5m.</td>
<td>Thickness of seam is 0.6 to 5.5m</td>
<td>Thickness of seam in More than 5m</td>
<td></td>
</tr>
<tr>
<td>Capital investment is less</td>
<td>Capital investment is less</td>
<td>Capital investment is more.(shearer and power support.</td>
<td>Capital investment more because heavier supports are used.</td>
<td></td>
</tr>
<tr>
<td>The full thickness of the seam can be extracted in one lift.</td>
<td>The full thickness of the seam can be extracted in Multiple lift.</td>
<td>The full thickness of the seam can be extracted in Multiple lift.</td>
<td>The full thickness of the seam can be extracted in Multiple lift.</td>
<td></td>
</tr>
<tr>
<td>Easy to train the required manpower and easy maintained of the equipment.</td>
<td>Difficult to maintained the equipment.</td>
<td>Difficult to train the required manpower and easy maintained of the equipment.</td>
<td>Difficult to train the required manpower and easy maintained of the equipment.</td>
<td></td>
</tr>
<tr>
<td>Less manpower</td>
<td>More manpower</td>
<td>Less manpower</td>
<td>More manpower</td>
<td></td>
</tr>
<tr>
<td>Subsidence chances are less</td>
<td>Subsidence chances are more.</td>
<td>Subsidence chances are more</td>
<td>Subsidence chances are very. High.</td>
<td></td>
</tr>
<tr>
<td>Spontaneous Heating is less.</td>
<td>Spontaneous Heating is more.</td>
<td>Spontaneous Heating is less.</td>
<td>Spontaneous Heating is very high. Since high amount of coal left in the goaf.</td>
<td></td>
</tr>
<tr>
<td>Loss of coal is less</td>
<td>Loss of coal is more because left rib pillar</td>
<td>Loss of coal is less.</td>
<td>Loss of coal is more.</td>
<td></td>
</tr>
</tbody>
</table>

From the Table 1, it is clear that the recovery rate of coal is higher in BG method.

Conclusion

Application of conventional mining methods like Bord and Pillar, longwall mining in thick seams is yielding low percentage of extraction rate. CDFI have come out with the technology of "Blasting gallery (BG) method", by this method about 80% of coal can be extracted for thick seams. BG method was applied in few Indian mines for extracting coal from thick seams. The method was successful in extracting up to 85% of coal from thick seams. The comparison of BG method with other mining methods indicated that the

- Extraction rate is very high
- Capital investment is less compared to longwall mining
- Loss of coal is less compared to bord and pillar
- Spontaneous heating is less compared to inclined slicing method
- The full thickness of the seam can be extracted in one lift.
- Subsidence chances are less compared to inclined slicing method

References


