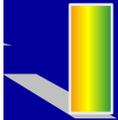




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Underground mining of steep seams in India



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■ Introduction

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Facts and figures about coal reserve and its exploitation trend in India reveals that the future of the industry lies with

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underground mining of coal. However, parameters like: depth cover,

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surface/sub-surface constraints, multi seam mining, **steepness**, contiguity and

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thickness of the seam are becoming more important with changing geo-mining conditions of the mines.





■ Geo-mining conditions

Steep coal seams of the country are thick and thin and are stuck below hard and massive formations of Jharia coalfield to highly folded, soft and fragile formations of Makum coalfield. Majority of the steep seams consist good quality of coal and susceptible to spontaneous heating and fire during working.





■ Mining technology

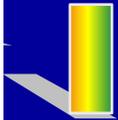
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Steep coal seams with competent rock mass formations adopted different Mining methods like inclined slicing, horizontal slicing, cross slicing by lonwall mining method in single/multi-lift working with stowing experienced limited success.

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Special methods like descending shield, artificial roofing based sub-level caving, Bhaska, Tipong etc. were practiced for underground extraction of steep seams with weak and fragile rock mass formations of NEC





■ Problems



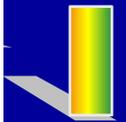
• Working of thick and steep seams encountered instability problems mainly due to sliding movement.



• Steeply dipping coal mass is observed to be fragile due to their close vicinity of the faults and under the influence of folds.



- Poor mechanisation and automation
- Complex rock mass behaviour
- Problem of gas accumulation





Technical considerations



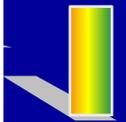
Technology should match the geo-mining conditions of the site.



In situ performance evaluation for iterative improvement of the design.



Requirement of a mining technology for steep seam working under competent rock-mass without stowing





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Thank You