NUMERICAL MODELLING STUDY OF THE EFFECT OF SOFTCOVER ON THE CAVING BEHAVIOUR OF STRATA AND SUPPORT REQUIREMENT IN DEPILLARING WORKINGS

Thesis submitted in partial fulfillment for the
Award of Degree

Doctor of Philosophy

By

Sandeep Kumar Sahoo

DEPARTMENT OF MINING ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY
(BANARAS HINDU UNIVERSITY)
VARANASI- 221005
INDIA

Roll No. 15151009

December 2021

CHAPTER 9

LIMITATIONS AND SCOPE FOR FUTURE WORK

The main aim of this study was to study the influence of softcover on the caving behaviour of strata in a depillaring working and develop an approach for delineation of the safe thickness of the parting strata, and assessment of the goaf edge support requirement for a safer depillaring in such geo-mining conditions.

The parametric study conducted in this work provided confidence in the numerical model for simulating the strata mechanics of Bord and Pillar depillaring working and developing an approach for estimating the safe thickness of parting strata for a given thickness of softcover and the optimal capacity of the goaf edge support for safer depillaring under such condition.

The approach, so developed, was used for the proposed working at one of the mine sites for which the rock properties and other geo-mining data were readily available. However, as the actual depillaring could not be taken up by the mine due to lesser reserve and financial non-viability of the project, the outcome of the modelling study could not be compared with the field observation.

The present work has been carried out under a set of limitations as stated below:

(i) This research work started with only two known cases where the Bord and Pillar extraction was proposed under softcover of the OB dump. During the course of study, seven more cases from different coalfields came to our knowledge. However, the site-specific data pertaining to physico-mechanical properties of the strata were not

available in most of the cases. The in situ stress data, including the direction of the major horizontal stress, were also unknown.

(ii) The study considered a generic set of physico-mechanical properties compiled from twenty-five different coal seams in India to formulate the experiments for the parametric study considering different cover depth, PS/SC ratio and goaf edge support capacity. In absence of field measured data, the mean horizontal stress field estimated from the thermo-elastic model (Sheorey 1994) was incorporated in this study.

(iii) As the simulation of progressive caving, filling of caved goaf and its compaction was a tedious task, an exhaustive parametric study covering different strengths of hardcover could not be undertaken.

Amid the above-mentioned limitations, the outcome of the present work provides a ready to use approach for safe planning and design of secondary extraction workings after due assessment of the prevailing conditions.

In light of the above, the Scope for future work are as follows:

(i) The database of geo-technical properties of the hardcover for all the mines could be developed by drilling of boreholes over a few designated panels and recovering the core samples of hardcover for each of the mine sites, logging them onsite and conducting different laboratory tests for physico-mechanical properties.

(ii) The insitu stress measurement may be conducted in a few mines, particularly in those cases where a significant anomaly in the stress field is anticipated.

(iii) A detailed numerical modelling work considering variation in strength properties of the hardcover, particularly the strata within the caving zone, the parting strata and the initial

properties of the goaf material could be taken up for different cover depth and PS/SC ratio to develop an empirical solution for estimation of the safe parting thickness.

(iv) As the solution for the safe design of secondary extraction becomes available, the mine plans can be implemented in the field, and the data obtained from field experience can be used for further validation and refinement of the model.