

MINE CLOSURE PLANNING ISSUES AND STRATEGIES IN THE INDIAN CONTEXT

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Abstract

This paper comprehensively discusses the legal framework for mine closure in Indian context besides highlighting the environmental and safety issues resulting from unplanned mine closure.

INTRODUCTION

Mine closure occurs as a result of the total extraction of the mineral reserves within the physical limits of a deposit or unworkability of the deposit due to technical/economic reasons. The legacy of abandoned mines and their associated adverse environmental and safety problems have led to an increased emphasis on mine closure planning in recent years. Both in the developed and developing countries, mine closure issue has been a challenging and herculean task and requires good planning, monitoring and execution as well financial commitments and hence to be exercised correctly (Tripathy, 2004).

TECHNICAL, ENVIRONMENTAL AND SAFETY ISSUES ASSOCIATED WITH MINE CLOSURE

The technical aspects of mine closure planning deals with management of pit slopes, hydrology and hydro-geology, closure of entries, decommissioning of infrastructure etc. The social impacts of mine closure involve: redeployment of workforce, PAPs, minimize community and socio-economic risk. The mine closure costs normally takes into account: cost of closure activities, cost of organization for execution of closure related activities, cost of post-project monitoring and bond/insurance.

GUIDELINES FOR PREPARATION OF MINE CLOSURE PLAN IN INDIA

The Central Government vide Notification No. GSR 329 (E) dated 10.04.2003 and No. GSR 330 (E) dated 10.04.2003 amended the Mineral Concession Rules, 1960 and Mineral Conservation and Development Rules, 1988 respectively. As per these amendments all the existing mining lessees are required to submit the "Progressive Mine Closure Plan" along with prescribed financial sureties within 180 days from date of notification. Further, the mining lessee is required to submit "Final Mines Closure Plan" one year prior to the proposed Closure of the mine. In the notification it has been enumerated that the "Progressive Closure Plan" and "Final Closure Plan" should be in the format and as per the guidelines issued by the Indian Bureau of Mines (**Appendix-1**).

CLOSURE RISK FACTOR

Closure risk model was developed by Laurence for assisting decision makers in the area of mine closure. It has been a unique concept and was demonstrated successfully in many Australian mines to estimate the closure risk rating. Closure risk factor (C_{RF}) rating is a qualitative and quantitative measure that captures various significant risk components in mine closure. These risks can be broadly divided into environmental risk (R_E), safety and health risks (R_{SH}), community and social risks (R_C), final land use risks (R_{LU}), legal and financial risk (R_{LF}) and technical risks (R_T). The closure risk factor is the sum total of each of these risks and can be expressed by the equation:

$$C_{RF} = \Sigma R_E + R_{SH} + R_C + R_{LU} + R_{LF} + R_T$$

Mine closure risk matrix was used and concept was applied for determination of closure risk factor for mines finally. Laurence classified mines into five possible categories based on C_{RF} and closure risk rating as: $C_{RF} > 2000$ – extreme; C_{RF} : 1500-2000-very high; C_{RF} : 1000-1500- high; C_{RF} : 500-1000- moderate and $C_{RF} < 500$ -minor. This type of concept has not been applied in Indian mines yet nor was any indigenous effort made scientifically to develop similar risk evaluation approach for mine closure. Both the authors are planning to develop and fine tune/modify the closure risk factor approach and initiating efforts to develop software in this direction for Indian situation (Laurence, 2005).

STATUS OF MINE CLOSURE IN INDIAN COAL MINES

Coal mines in India have no statutory requirement to prepare mine closure plans or to furnish financial assurance to ensure decommissioning and reclamation of the mined out areas. The coal industry on its own has started preparing mine closure plans and incorporating it in EIA/EMPs prepared these days. The coal companies also have started earmarking contribution based on per tonnes coal produced to cover closure cost.

DESIRABLE CLOSURE OBJECTIVES, POLICIES AND STRATEGIES FOR INDIAN MINING COMPANIES

Mine closure objectives may be to (i) prevent access to former underground openings, (ii) remove unwanted infrastructure, (iii) develop final land forms that are safe and compatible with subsequent land use as determined through consultation with the stake holders (iv) ensure mine closure in accordance with statute, (v) enable progressive relinquishment of leases and release of financial sureties. The objectives of closure include minimizing long term environmental liability, attaining regulatory compliance and maintaining geotechnical stability, while closing as quickly and cost effectively as possible and to return land to a safe and stable condition for post-mining uses.

Post closure planning

Post mining site restoration and rehabilitation are the final and crucial stage requiring proper planning and is site specific. It includes adequate steps to be taken during active and passive care stages. Rule-34 of MCDR, 1988 gives details guidelines on reclamation and rehabilitation of mining land.

CONCLUSIONS

Comprehensive mine closure for abandoned mines, operating mines and the future mines remain a major challenge for every mining nation in the world. Planned decommissioning, closure and reclamation planning have in recent years become a legal necessity in India since 2003 as pragmatic business approach and an environmental responsibility are viewed as an integrated part of mining cycle. There is still lack of expertise in this field. Closure and rehabilitation costs must be directly or indirectly borne by the state. Studies on environmental impacts of mining post closure are very rare. Hence considerable efforts are needed to be directed towards environment and safety risk assessment of mines after mine closure.

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