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Overburden A Major Environmental Issue of Open Cast Coal Mining - Overview

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ABSTRACT

Coal is the prime source of energy in India as well as Opencast mining of coal damage a large land surface area, displace people from their natural home and cause agricultural losses. This raises a number of environmental challenges, including soil erosion, dust, noise, and water pollution impacts on local biodiversity. During the past two decades the demand, as well as the production of the coal, grew very fast. The Opencast mine involves up-rooting of vegetation, scrapping of soil cover and drastic change in the topography. This process creates an ecological imbalance which is difficult to reverse.

Generation of dump waste from opencast mines in any coalfield threatens the social sustainability of land use pattern in many ways. The overburden dumps formed outside the open pits which occupying the lands alter the surface topography and contribute to the environmental degradation. In the present paper a attempt has been made to study the impact of physical properties of overburden of open cast coal mining, it's impact and their environment management.

INTRODUCTION

Over burden dumps are menace for the coalfields which is damaging the ecology. They are scattered here and there according to the availability of the land. They are sources of fires emitting obnoxious gases, rainwater carries fines into nearby fields rendering them uncultivable, dust gets airborne creating dust clouds. Dump fires raise temperature in the localities making life miserable, particularly in summer.

Every ton of coal produced by opencast method produces about 4-5 m^3 of waste stone (overburden), which has to be disposed off on the surface requiring large area for dumping near the mine to save the cost of transport. Mining area practicing opencast method has become full of such dumps.

Such dumps contain carbonaceous material, sandstones, alluvium, clays etc. with size range varying from fines to big chunks. Presence of carbonaceous materials has been the cause of so many dump fires, emitting noxious gases with resultant serious air pollution. Rainwater passing through the dumps carries fines to the nearby fields and drains rendering the fields non-cultivable and chocking the drains. Furthermore, such dumps have very shabby appearance and completely damage the ecology of the area. Overburden dumps are the greatest danger to the environment of Indian coalfields so much so that there is no parallel to devastation of our mother Earth by MAN as opencast mines. Jharia and Raniganj coalfields are the best examples of our misuse/exploitation of mines.

Opencast Mining and Overburden

Opencast mining involves excavating all materials consisting of inferior coal, shale and other carbonaceous materials, stones, alluvium, clays etc. lying over the coal bed termed as overburden. Such overburden can be used for filling back the quarry or filling the underground voids but, in practice, in Indian conditions, little overburden is consumed in such processes and it is mostly dumped on the surface in from of overburden dumps.

Compositing of Overburden

Nature of the overburden strata varies widely in different coalfields particularly in respect of thickness of alluvium and stone. In Jharia coalfield thickness of the alluvium is hardly 3-5 m of soft stone and than hard stone.

During the process of blasting, coal and overlying stone never get accurately separated such that some coal always gets mixed with overburden while some stone also gets mixed with coal. Furthermore, coal bed is useally overlain by inferior coal and shale having significant carbonaceous material and all these are thrown with the overburden.

During the process of excavation, handling and bulldozing while dumping, soft stone also gets curshed and mostly powdered such that fine content in the overburden sometimes becomes quite appreciable.

Problems Created by Overburden Dumps

Open cast mining drastically disturbs the physical, chemical, biological and socio – economical features of the area. For each million tones of coal production, about 0.24 sq. Km. of land gets degraded due to the use of Heavy Earth Moving Equipments for removal of top soil and overburden to get the Coal. Mine overburden is stacked in the form of large dumps. The entire soil profile during the process gets highly disturbed and may be all together inverted. The original fertile top soil layer may get buried deep inside

the dumps and sandy/shale erodible material consisting of boulders devoid of organic matter and generally lacking in mineral nutrients and moisture retentive capacity normally comes at the top. Not only land degradation, mining activities also create variety of pollution problems like dust pollution, water pollution and noise pollution etc..

Overburden dumps prove to be a nuisance in the coalfield and cause the following problems:

1. Local Villagers are tempted to pick coal from such dumps. Sliding of sides during such unauthorized operation has caused numerous accidents.
2. Dump fires are quite common due to presence of carbonaceous materials and their possibilities always exist if due care is not taken in time. Dump fire emits noxious gases causing serious air pollution in the area as well as increase the temperature in the vicinity rendering habitation extremely difficult, particularly during summer.
3. Dump fines get airborne and create dust nuisance in the area and the problem becomes serious with wind velocities going up. It is due to this reason that human faces always look black in coalfields and it is impossible to maintain cleanliness in the houses and offices. The whole atmosphere is filled with dust, with no escape whether inside or outside.
4. Rain Water carries fines from the dumps into nearby fields rendering them uncultivable. This is a serious problem in the coalfields creating unemployment and causing extreme hardship to the local people.
5. During monsoon, rainwater carries heavy load of fines and chokes drains and roads creating chaotic situation in the colliely area.
6. Black fines of the dumps get access into the river, also polluting river water, giving it a gloomy black look.
7. Drinking water is serious problem in coalfield with rivers and watercourses being heavily polluted. Even water seeping through such dumps is laden with leached out chemicals making it difficult for drinking purposes.

Environment management of overburden

Top soil management - The best practices for topsoil management is to Scrap the topsoil prior to drilling and blasting, Scraped topsoil should be used immediately for plantation/agriculture, If it is not possible to use the topsoil immediately, then it should be stacked at a designated area, Storage must be done in a pyramidal form, with garland drains all around.

Overburden management - If an external overburden dump is unavoidable, then it should be stabilized with biological reclamation. Excavation of a new pit should begin if an existing pit has already been exhausted. This would ensure that the overburden and interburden generated is used for backfilling the

exhausted pit, instead of being dumped elsewhere. Till a pit is exhausted, the overburden should be compacted and stacked in specified locations in low lying, non-mineralized zones within the lease area.

Height & Slope - The height and slope of the overburden dumps should be maintained to prevent slope failure. Sedimentation tanks should be constructed to treat run-off from external overburden dumps. For external overburden dumps, the bench height should not exceed 10 meters and the final dump height should not be more than 60 meters. For Gondwana period rock strata, the slope should not exceed 28 degrees.

Bio Restoration of the Dump Area – Reclamation of Over Burden dumps is one of the most challenging areas in the Environment Management of opencast mines. The physical reclamation of the dumps need making the slope area mild enough (30 degree gradient) for supporting the attempt of water and soil conservation. The broad objectives of bio-restoration of the dumps are:

- ✓ Ecological restoration.
- ✓ Soil and water conservation.
- ✓ Preventing air and water from entering the layers of coal seams.
- ✓ Providing effective coverage to the mine area so that the pumping needs of the mine area is reduced.
- ✓ Bring improvement in the aesthetics of the area and moderate the ambient temperature.
- ✓ Providing fodder and fuel for the local population.
- ✓ To support economic activities of the area by providing timber, fruits and other raw materials.

Vegetation - Vegetation should be planted all around and over the dump slopes as early as possible.

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