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A PROJECT REPORT PROCESSED OVERBURDEN – UTILIZATION AS STOWING MATERIAL - ALTERNATIVE RIVER SAND

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Abstract

The reserve of river sand, the traditional stowing material used in Indian coal mines, is getting depleted due to over exploitation in civil works and low rate of replenishment due to construction of dams. As a result, though river sand has proved as the best natural material for stowing, its availability within economically transportable distance from the mines is never assured. Coal seams earlier developed in board and pillar method or other methods of underground mining had been standing on pillars for long in absence of stowing material causing mammoth loss of coal and its conservation. Amongst the various alternatives to sand as the fill material for mines, the first choice has been the overburden from closely located opencast mines due to their ready stock at practically no price and cheaper transport cost.

OBJECTIVE OF THE STUDY

1. River sand is the major source used for hydraulic stowing or back filling of underground coal mines cut rivers are not always available near to the mines and the reserves of river sand available in the neighbourhood of coal mines are limited.
2. The easiest available substitute of the river sand could be the overburden available from nearby opencast mines.
3. More than 1000 million cubic meters of overburden are available from the existing mines itself. Since opencast mines are likely to be deepened up to 150m depth, the availability of overburden would rise to nearly 4000 mm^3.
4. Recovery of 150million cubic meters of sand from this huge stock of overburden would hardly make any impact on any program of back filling of opencast mines.
5. Hence it becomes imperative to look for alternative to the river sand in helping the environment and the ecological system. There is a natural resource available in the form of overburden and so, the technology has been developed in order to make this overburden suitable for backfilling.
6. Drawing overburden (excluding top soil, sub soil and clay) from overburden dump yard. Processing the overburden in different stages. Disposal of clay and other rejects outside the plant.
7. Supplying sand to nearby mines for stowing.
8. The processed OB so prepared shall be suitable for stowing operations and flow smoothly through bunkers, hoppers, chutes, cones pipes and pipe fittings.

LITERATURE SURVEY :

This chapter presents an overview of literature

on the various experiments conducted by many authors on the replacement of fine aggregate by quarry dust, manufactured sand and the results thereof highlighting the significance of using the manufactured sand for replacing the natural sand in concrete. It includes the literature about mix design, fresh concrete properties, strength, durability aspects, micro structures and the structural behavior of concrete with the replacement of fine aggregate by manufactured sand (M SAND).

SCOPE OF STUDY

1. Drawing overburden (excluding top soil, sub soil and clay) from overburden dump yard.

Processing the overburden in different stages.

Disposal of clay and other rejects outside the plant.

Supplying sand to nearby mines for stowing.

5. The processed OB so prepared shall be suitable for stowing operations of SCCL and flow smoothly through bunkers, hoppers, chutes, cones pipes and pipe fittings.

CASE STUDY:

1. The dumpers with overburden will dump the Overburden in Hopper which is loaded from overburden dump yard.

. The Hopper will discharge the overburden into Vibro Feeder directly.

3. From the Vibro Feeder only the particles with a size less than of -500 mm will be sent to Primary Jaw Crusher through Belt Conveyor-1

4. Primary Jaw Crusher will reduce the size of particles in to 30 mm

5. From the Primary Jaw Crusher the particles with a size of 30 mm will sent to Secondary Roller Crusher through Belt Conveyor-2.

6. Secondary Roller Crusher will Crush the particles in to size of 18mm

7. From Secondary Roller Crusher the particles with a size of 18 mm will send to Scrubber.

8. Water will be added in Scrubber for easy separation of clay from sand.

9. From Scrubber the mixture of sand and clay will be send to FBC (Fluidized Bed Classifier).

10. In FBC both sand and clay will be separated.

11. From FBC sand will be sent to Sand Cyclone and clay will be sent to Clay Cyclone.

12. Sand Cyclone will dump the Sand in to Lorries.

13. Clay Cyclone will send clay in to Clay Pond.

14. From Clay Pond water will be separated from clay by adding chemical called Alum.

The pure water Separated from clay will be recycled (Sent back in to Scrubber)

PHYSIOLOGICAL PROPERTIES OF SAND

SOIL PHYSIOLOGICAL PROPERTIES:-

Physical properties of a soil greatly influence its use and behavior towards plant growth. The plant support, root penetration, drainage, aeration, retention of moisture, and plant nutrients are linked with the physical condition of the soil. Physical properties also influence the chemical and biological behavior of soil. The physical properties of a soil depend on the amount, size, shape, arrangement and mineral composition of its particles. These properties also depend on organic matter content and pore spaces.

IMPORTENT PHYSICAL PROPERTIES OF SOIL:-

1. Soil texture
2. Soil structure
3. Surface area
4. Soil porosity
5. Soil density
6. Soil color
7. Soil consistence

SOIL TEXTURE:

Soil texture refers to the relative proportion of particles or it is the relative percentage by weight of the three soil separates viz; sand, silt and clay or simply refers to the size of soil particles. The proportion of each size group in a given soil cannot be easily altered and it is considered as a basic property of soil. The soil separates are defined in terms diameter in millimeter of the particles soil particles less than 2 mm in dia are excluded from soil textural determinations.

Stone and gravels may influence the use and management of land because of tillage difficulties but these larger particles make little or no contribution to soil properties such as WHC and capacity to store plant nutrients and their supply.

Gravels: 2-4 mm

Pebbles: 4-64 mm

Cobbles: 64-256 mm

Boulders: >256 mm

The components of fine earth: SAND, SLIT AND CLAY.

SAND:

1. Usually consist of Quartz but may also contain fragments of feldspar, mica and occasionally heavy minerals viz; zircon, Tourmaline and homblende.
2. Has uniform dimensions.
3. Can be represented as spherical.
4. Not necessarily smooth and has jagged surface.

SLIT:-

1. Particle size intermediate between sand and clay.
2. Since the size is smaller, the surface area is more.
3. Coated with clay.
4. Has the physico-chemical properties as that of clay to a limited extent.

5. Sand and slit forms the SKELETON.

CLAY:-

1. Particle size less than 0.002mm.
2. Plate like or needle like in shape.
3. Belong to aluminosilicate group of minerals.
4. Sometimes considerable concentration of fine particles which does not belong to aluminium silicates.
5. These are secondary minerals derived from primary minerals in the rock.
6. Flesh of the soil.

SOIL TEXTURED CLASSES:

To convey an idea if the textural make up of soil and to give an indication of their physical properties, soil textural classes names are used. These are grouped in to three main function viz; sand, slit and clay.

According to the proportion of these three fractions a soil is given a name to indicate its textural composition. Such name gives an idea not only of the textural composition of a soil but also of its various properties in general.

On this basis soil are classified in to various textural classes like sand clays, silts, loams etc.

SAND:

The sand group includes all soils in which the sand separates make up at least 70% and the clay separates 15% or less of the material by weight. The properties of such soil are therefore characteristically those of sand in contrast to the stickier nature of clay. Two specific textural classes are recognized in this group sandy and loamy sand although in practice two subclasses are also used loamy fine sand and loamy very fine sand.

SILT:

The silt group includes soil with at least 80% silt and 12% or less clay. Naturally the properties of this group are dominated by those of silt. Only one textural class- silt is included in this group.

CLAY:

To be designated a clay a soil must contain at least 35% of the clay separates and in most cases not less than 40%. In such soil the characteristics of the clay separates are distinctly dominant, and the classes' names are clay, sandy clay sand silty clay. Sandy clays may contain more sand than clay. Likewise, the silt content of silty clays usually exceeds clay fractions.

1. . Jaw Crusher

Technical Data:

odel	ax. Feeding ze (mm)	scharge Size m)	pacity)	otor Power V)
250×400	0	-60	0	
400×600	0	-100	-60	
500×750	5	-100	-100	
600×900	0	-160	-130	
750×1060	0	-140	0-250	0
900×1200	0	-165	0-380	0
1000×1200	0	5-265	5-550	0
1200×1500	20	0-300	0-800	0-220
X250×750	0	-60	-40	
X250×1000	0	-60	-50	
X250×1200	0	-60	-60	

Table (ii) Jaw crusher Technical Data

Conclusion

In India crushed stone for underground stowing had been used in the limited scale primarily because there was easy availability of river sand in the past, non-availability of indigenously manufactured crusher and hence its spare parts and also non availably high wear resistant pipes for recirculation of crushed overburden hydraulically to underground mines. But the situation has undergone a sea change in the current scenario due to scarcity of sand as a stowing material and being faced in almost all the coal fields.

The underground coal mines of the Singareni Collieries Company Limited were also facing the shortage of river sand for stowing. The study was undertaken with the view to supply processed Overburden for stowing material in place of traditional river sand. The Processed overburden of this plant is a technological substitute to the natural river sand.

References:

1. A text book of “Engineering Rock Mechanics by PK MUKHARJI, (for sand physiological properties).
2. Sri Sandhya Industries Private Limited. (They helped in collecting of technical information of overburden processing plant).
3. Singareni Collieries Company Limited. (Where the processed over burden is used in PVK-5 incline (Kothagudem) for undergroundstowing).
4. For remaining information I took help from internet.