

A NOVEL APPROACH TO RECLAMATION OF STEEPLY DIPPING MINED OUT COAL SEAMS OF THE NORTH EASTERN COALFIELDS, INDIA: A CASE STUDY¹

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Abstract: Researchers have been striving to develop novel and innovative techniques for the reclamation of land, especially when the Coal seams are steeply dipping, in an Open Pit Coal mine. In this work, we study the development of a novel reclamation technique with reference to a Coal mine, nestling in the foothills of the Himalayas, in the strategically important North Eastern Coalfields of India where the ROM coal from this mine is of very good quality and its GCV ranges up to 7980 kCal/kg. The formation exhibits the tertiary stratigraphy sequence. The UVM% ranges from 42.50 – 46.90. However, the coal seam gradient is very steep- ranging up to 60 deg. The flip side of this steep coal seam gradient makes it imperative to meticulously take into account, the consideration for slope stabilization-prior to mapping out a comprehensive road map for land reclamation- an issue of paramount importance. In this work, we study the geo-mechanical features of the rock strata of this Coalfield, which are inherently soft & friable, and, consequently, lead to the nagging problem of slope stability. This, at times, becomes an avoidable hindrance while drawing up a comprehensive road map for the reclamation of the mined land, consequent to coal winning.

To combat this nagging problem, we make use of geo-textiles, and prudently select this such that it is able, depending on the peculiar strata conditions of the North Eastern Coalfields of India, to bear a load or undergo deformation. An applied load causes deformation. On the other hand, a deformation mobilizes a tension in the geotextile. It is not able to bear the compression forces in its plane and both the constituting elements-fibers and yarn (and the geotextile itself)- are very flexible and tend to buckle due to compression. The loading can be in the plane or perpendicular to the plane of the geotextile, for example, water and soil pressures. We make use of the fact that forces perpendicular to the plane of the geotextile can only be counteracted by a bulge deformation resulting in tensile forces in the plane of the geotextiles. We ensure that the soil mass loading, in this case, is exerted such that the stress distribution is uniform and that no concentration of stresses develops and a failure is negated. Once this problem of steep slope stabilization is taken care of, we chalk out a holistic plan and develop a comprehensive strategy of physical and biological reclamation of the mined out land. On a hindsight, we examine the feasibility of the applicability of geotextiles, particularly, in such cases, where the coal seam gradients are steep for steep slope stabilization and where strata are soft and friable.

Additional Key Words: Steeply dipping Coal, Geotextiles, holistic Reclamation Plan, Slope Stabilization

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