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Potential use of stabilized bio-solids with admixtures as an embankment fill material

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Bio-solids are an end product of the wastewater treatment process and contain many of the constituents removed from the wastewater. The use of bio-solids and other waste materials in a sustainable manner is currently being investigated in several countries around the world. This paper assesses the viability of using bio-solids as engineered fill material for road embankments.

A series of geotechnical tests (index properties, particle size distribution tests, compaction tests and CBR tests) were conducted on bio-solids retrieved from the *Biyagama* Export Processing Water Treatment Plant to assess whether it could be compacted to be used in embankment fill material. Results of geotechnical experimentation implied that bio-solids demonstrate an acceptable level of geotechnical properties. However, the dry density requirement of the Road Development Authority (RDA), Sri Lanka was not satisfied although the rest of the geotechnical properties were at an acceptable level. Therefore, ways in which the dry density of bio-solids could be modified through chemical and mechanical stabilization were further investigated.

The admixtures used for chemical stabilization of bio-solids were crushed bricks, cement and lime. The standard Proctor compaction tests were carried out on each of these admixture stabilized bio-solids. The maximum dry densities obtained as per the Standard Proctor compaction test obtained for all the admixtures tested did not satisfy the RDA requirement. Therefore, the chemically stabilized samples were further mechanically stabilized by increasing the compaction effort by increasing the blows per layer in the Proctor Compaction test. The bio-solids stabilized with 30 % crushed bricks and 100 blows per layer equivalent to an energy level of 3300 kN/m^3 gave a maximum dry density of 1935 kg/m^3 which satisfies the dry density specified by the RDA to be applied as an embankment fill material.

The findings suggest that the stabilized bio-solid admixtures with crushed bricks could be potentially used in place of soil as an effective and low cost compacted embankment fill material. It was also revealed that chemically and mechanically stabilized bio-solids have improved dry densities than untreated bio-solids. Although cement and lime admixtures did not achieve the RDA requirement these could be used in applications such as backfilling material in pipe lines, foundations etc.

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