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Analisis Pengaruh Campuran Tanah MH dan SC Terhadap Kinerja Hauling Road Pada Area Pit
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ABSTRAK

Kegiatan hauling pada operasi pertambangan berperan penting dalam mendistribusikan material seperti batubara dari area pit menuju *stockyard* atau fasilitas pengolahan. Namun, kinerja jalan hauling sering terganggu oleh kondisi tanah dasar yang bersifat ekspansif, sehingga jalan mengalami pengembangan akibat air hujan, ditambah dengan beban berulang dari kendaraan tambang berkapasitas besar. Di sisi lain, sifat jalan hauling yang temporer akan ditutup kembali setelah kegiatan penambangan selesai sehingga menuntut solusi perbaikan tanah yang efisien dari segi tenaga, waktu, dan biaya. Penelitian ini bertujuan untuk menganalisis pengaruh pencampuran tanah lokal jenis MH (Timur *Clay*) dengan SC (Timur *Sand*) terhadap karakteristik material, menentukan rekomendasi desain timbunan hauling road yang aman dan stabil, serta mengevaluasi metode pelaksanaan konstruksi yang efektif dan aplikatif di lapangan. Metode penelitian dilakukan melalui serangkaian pengujian laboratorium terhadap tanah MH dan SC, meliputi analisis prediksi gradasi butiran campuran, pengujian properties, pengujian mekanis, hingga perumusan desain dan metode pelaksanaan timbunan hauling road. Hasil penelitian menunjukkan bahwa penambahan tanah SC pada tanah MH mampu menurunkan nilai plastisitas dan potensi swelling, serta meningkatkan nilai CBR tanah campuran. Penerapan timbunan hauling road dengan sistem layer berbeda terbukti dapat menurunkan tegangan pada tanah dasar, meskipun disertai peningkatan nilai displacement. Berdasarkan temuan tersebut, disusun rekomendasi desain timbunan untuk variasi ketinggian 3, 5, dan 7 meter, disertai metode pelaksanaan yang memperhatikan efektivitas pencampuran di lapangan dan aspek keselamatan kerja. Penelitian ini menyimpulkan bahwa pencampuran tanah MH dan SC dapat meningkatkan sifat material tanah MH sehingga layak digunakan sebagai bahan timbunan hauling road, dengan tetap memperhatikan desain struktur dan metode pelaksanaan yang optimal.

Kata kunci: *hauling road*, tanah ekspansif, pencampuran tanah, pit batubara, perilaku timbunan

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ABSTRACT

Hauling activities in mining operations play an important role in distributing materials such as coal from the pit area to the stockyard or processing facility. However, the performance of haul roads is often disrupted by expansive subgrade soil conditions, causing the road to swell due to rainwater, compounded by repeated loading from heavy-capacity mining vehicles. On the other hand, the temporary nature of haul roads will be closed again once mining activities are completed, so demands soil improvement solutions that are efficient in terms of effort, time, and cost. This study aims to analyze the effect of mixing local MH-*type soil with* SC-*type soil on material characteristics, determine design recommendations for a safe and stable haul road embankment, and evaluate an effective and applicable construction implementation method for field conditions. The research method was carried out through a series of laboratory tests on* MH *and* SC *soils, including grain size gradation prediction analysis of the mixture, properties testing, mechanical testing, and the formulation of the design and implementation method for the haul road embankment. The results show that adding* SC *soil to* MH *soil is able to reduce plasticity values and swelling potential, as well as increase the CBR value of the mixed soil. The application of a haul road embankment with a layered system was proven to reduce stress on the subgrade, although accompanied by an increase in displacement values. Based on these findings, embankment design recommendations were developed for height variations of* 3, 5, *and* 7 *meters, along with an implementation method that considers mixing effectiveness in the field and occupational safety aspects. This study concludes that mixing* MH *and* SC *soils can improve the material properties of MH soil, making it suitable for use as haul road embankment material, while still considering optimal structural design and implementation methods.*

Keywords: *haul road, expansive soil, soil mixing, coal pit, embankment behavior.*