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Recycling and Recovery of Marine Dredged Sediments in a Reconstituted Road Material

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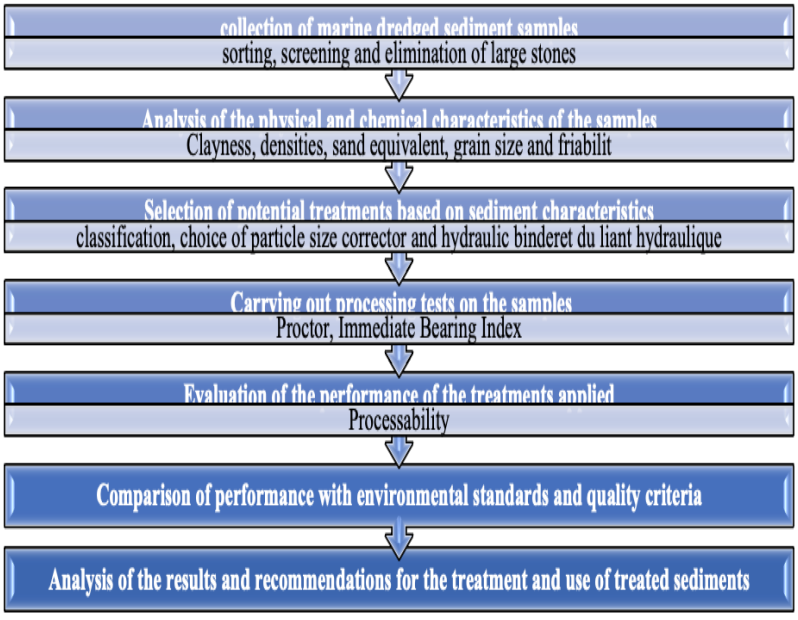
ABSTRACT

In order to optimize the onshore management of marine sediments considered as waste, their reclamation in the field of public works, and in particular in road bases, is undoubtedly an excellent alternative. The present formulation study was carried out in accordance with the recommendations of the GTR (Guide des terrassements Routiers); the material proposed for this study essentially consists of dredged sand whose grading skeleton has been corrected by adding fines, then treated with hydraulic road binder. A series of mechanical tests were carried out to assess the material's suitability for treatment. The results revealed a material that perfectly meets the conditions for use in road pavement base courses.

Keywords : Marine sediments, waste, dredging, recovery

1 Introduction

With the aim of optimizing the onshore management of marine sediments considered as waste, reclamation in the field of public works, and in particular in road engineering, is undoubtedly an excellent alternative to dumping these materials at sea or in landfill, which can not only cause potential environmental problems but also be costly for the companies carrying out the dredging work [01]. The dredging or de-silting of sand from port basins is a regular operation, with tons of sand extracted and deposited in port areas while awaiting the specifications that will determine its future. In Algeria, dredged sediments are most often immersed in the sea, as was the case for the ports of Salamandre in the wilaya of Mostaganem, where the total volume of sand extracted and immersed was 60,000m3, as well as 59951 m3 of sand from maintenance work at the port of Sidi Fredj in Algiers and over 525,000m3 obtained during deepening dredging at the port of Djendjen in the wilaya of Jijel. This work focuses on the reuse of dredged sediments, which, according to the GTR [02], are class B1 water-insensitive silty sands, non-organic and low in fines. The sediments are not contaminated with heavy metals, but cannot be used as they stand due to their poor mechanical properties. This sand can be reclaimed according to the GTR after correction of its granular skeleton and solidification with hydraulic road binder.



2 Experimental

The Study Approach :

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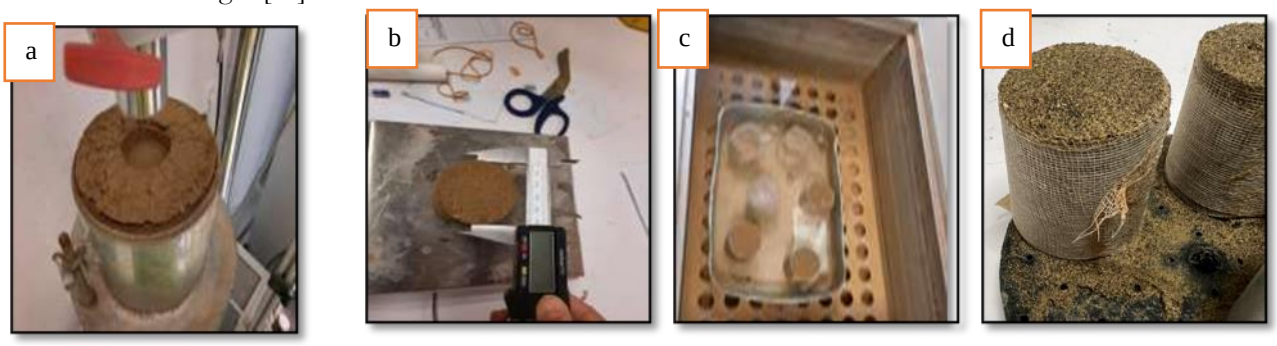
3 Results and Discussion

The formulation and study of the mechanical performance of the sediment, corrected with 7% clay and treated with 7% LHR, revealed a material that meets the requirements of road construction. The immediate bearing index (IPI) obtained using the CBR press (fig. a) exceeds 200%, with an imbibed CBR index in excess of 500%, indicating a stable material that is non-deformable and insensitive to water.

The 28-day simple compressive strength of 1.3MPa testifies to the stability of the material obtained. In addition, the material's suitability for processing (a number of sample preparation steps are shown in fig b c and d) is ensured by the checks on volume swelling and indirect tensile strength, which are in the order of 1.58% and 0.26 MPa respectively, within the limit values of 5% for swelling and 0.2 MPa for indirect tensile strength [03].



Figures1: a*IPI punching**; b*** Measurement of the specimen**; c*** Immersion of the samples in the thermostatic bath; **d*** Condition of the sample after 7 days of immersion.

4 Conclusions

According to the specifications relating to the use of materials in road technology and particularly the materials intended for subbase layers, the study showed very favorable results from the point of view of mechanical performance, thus it allows a considerable contribution to the preservation of the environment, on the one hand the reduction in the use of natural resources in noble materials, on the other hand, the reduction in the volumes of deposit of marine sediments in landfills.

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