Proceedings of the Seventeenth (2007) International Offshore and Polar Engineering Conference
Lisbon, Portugal, July 1-6, 2007
Copyright © 2007 by The International Society of Offshore and Polar Engineers(ISOPE)
ISBN 978-1-880653-68-5; ISBN 1-880653-68-0(Set); ISSN 1098-6189 (Set)

Strength Characteristics of Reinforced Lightweight Soils for Recycling Dredged Soils

Y. T. Kim, H. J. Kim , W. J. Han
Dept. of Ocean Engineering, Pukyong National University
Busan, Republic of Korea

ABSTRACT

In order to reuse dredged soil as a construction material, the reinforced lightweight soil using geogrid was developed. The lightweight soil which was consisted of dredged clayey soil, cement and air-foam, was reinforced with geogrid in order to increase its compressive strength. This paper investigates strength characteristics and stress-strain behaviors of the geogrid-reinforced lightweight soil.
Test specimens were prepared on various mixing conditions including cement content, initial water content, air-foam content and geogrid layer and then several series of unconfined compression tests were carried out. From the experimental results, it was found that unconfined compressive strengths as well as stress-strain behaviors of lightweight soil were strongly influenced by mixing conditions. The more cement content that is added to the mixture, the greater its unconfined compressive strength. However, the more initial water content or the more air-foam content, the less its unconfined compressive strength. It was observed that the compressive strength of reinforced lightweight soil was increased due to the reinforcing effect by the geogrid for most cases. Stress-strain relation of geogrid-reinforced lightweight soil showed a ductile behavior rather than a brittle behavior. In reinforced lightweight soil, secant modulus (E_{50}) was also increased as its compressive strength increased due to the inclusion of geogrid.

KEY WORDS: Lightweight soil; Geogrid; Unconfined compressive strength

INTRODUCTION

The construction of Busan New Port is ongoing in the west of the estuary delta of the Nakdong River in Busan Metropolitan City, Korea, as shown in Fig. 1. A large amount of soft soils have been dredged at the navigation channels and the construction sites of large-scale port and harbor construction projects such as Busan New Port. Fig. 2 illustrates annual generation of dredged soils from 1990 to 2004 in Busan, which increases continuously due to large construction works for building industrial complexes.
Most of the dredged soils are clayey soils with high water content and are too soft to be used as a construction material without any treatment. Dredged soils are usually dumped in waste disposal site at the open sea. However, dumping is recently becoming in difficulty due to environmental pollution. Therefore there have been strong calls for recycling of dredged soil to port and harbor construction works due to social and environmental aspects.

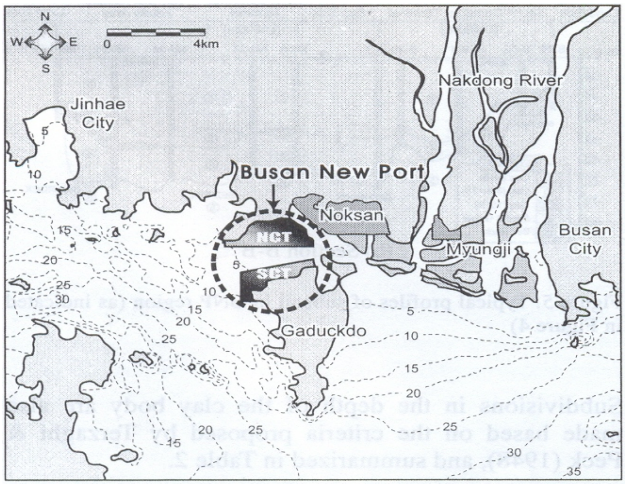

Fig. 1. Layout of Busan New Port and facility area

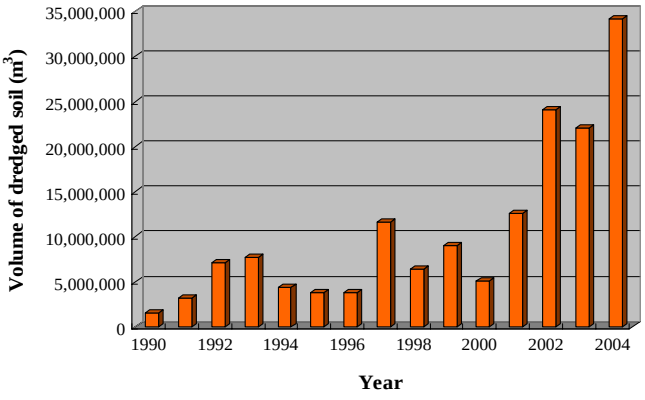

Fig. 2. Annual generation of dredged soil