

Dredging Technology and the Environment in Europe

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ABSTRACT

The aim of this contribution is to highlight briefly the developments in Dredging Technology related to the environmental issues. Such environmental issues in offshore and near shore conditions, linked to geotechnical aspects of dredging, are important discussion topics to implement in this contribution. Important work dealing with the impact of the European Union environmental law on dredging (as discussed broadly by many experts recently) will be taken in consideration

KEY WORDS: Geotechnics, dredging, environment.

INTRODUCTION

The aim of the paper is to highlight briefly some key issues with respect to the developments in dredging technology, mainly with respect to environmental issues. Moreover and overview of the today's state of progress in Europe concerning the environmental legislation linked to such problems, is indicated.

BASIC CHARACTERISTICS OF UNDERWATER GEOMATERIAL

Out of the work of the TC5 committee of the ISSMGE (Kamon et al., 2005) one can summarise this topic as follows. Properties of waste sludges vary greatly due to differences in origin, sedimented area, dredging and excavation methods employed, additive materials, etc. One of the main characteristics of sludges is a high water content. In particular, sedimented sludges in lakes, rivers or seas, have extremely high gravimetric water contents on the order of 200 - 250%.

The unit densities of sludges also are closely related to their water contents, varying from 1 to 1.8. The upper part of sedimented sludges is very soft. The sludges also have high organic contents. The ignition-loss of most dredged materials ranges from 5 to 15 %. In particular, paper sludges in Japan have a high organic content with ignition losses

on the order of 45 %. Some discharged sludges with high water content can be treated by dehydration resulting in volume decrease. Many types of inorganic or organic flocculants have been developed and utilized in many dehydration plants.

DEVELOPMENTS IN DREDGING TECHNOLOGY RELATED TO ENVIRONMENTAL ISSUES

Environmental dredging technology has been developed in such a way that almost no spillage occurs during dredging operations. Dredging technology today is capable of greatly reducing turbidity and resuspension during the dredging of bottom sediment; however, special equipment has to be deployed and modified operational methods must be used (Herbich, 1992, Van Impe, 2001). It meanwhile became obvious that dredging remains the most efficient and cost-effective way to cleanup contaminated sediment. A number of appropriate dredging methods have been developed, principally in Italy, the Netherlands, Belgium and Japan.

All of the modern environmental dredgers have the ability to dredge to an accuracy of centimeters. This is important to ensure that neither too much nor too little silt is removed. Too much leads to wastage of storage and processing capacity, while too little means that the lake bed is not entirely clean. About one cm dredging can have major consequences. The extreme accuracy of the dredging operation is achieved using satellite-based positioning.

The new technique limits the maximum deviation to only one or two cm, both horizontally and vertically. During dredging activities it is normal for silt to be disturbed and to mix with the surrounding water (clouding), but the most modern techniques can avoid almost entirely. Spillage of contaminated silt is also reduced to a minimum with these environmental suction dredgers. Moreover, some equipment can remove high silt concentrations. This is important because it avoids water being dumped in the depot along with the silt.

A simple example of the dredging machine "Cleanup System" is shown in Figure 1. It was developed for dredging highly contaminated sedi-