Field Study in the Influence of Floating Mud over the Lasting Effect of Sand Capping Technique on Nutrient Release Reduction

Norio Katakura¹ and Kazuo Murakami²

¹Technology Center, Taisei Corporation, Tokyo, Japan
²Tokyo City University, Kanagawa, Japan

ABSTRACT

Nutrients release from the contaminated bottom sediments on the seabed is widely known to be a source of water pollution. In order to improve the sediment quality, sand capping technique had been utilized in several coastal regions in Japan. However, the effectiveness of this technique was seldom questioned due to new deposition on seabed. This study describes the lasting effect of sand capping techniques on nutrient release reduction from contaminated bottom sediments by field experiments at MM21 district in Yokohama Port. From the study, it is found that this effect is maintained but decreasing due to newly accumulated contaminated sediments on clean capping sand.

KEY WORDS: Sand capping; contaminated sediment; nutrient release; floating mud.

INTRODUCTION

Even in enclosed coastal sea where eutrophication is progressed such as Tokyo Bay, the water quality has been significantly improved by the substantial reduction of effluent load from the land. However, in summer when the water quality becomes worsened, red tide and blue tide are still observed frequently. The nutrient release from contaminated bottom sediments accumulated in the past is considered as one of the sources of the effluent load (Inoue et al., 2000a, 2002b, 2009, Jean et al., 1996, Nakamura et al., 1994, 2000, Natalia, 1999). In order to improve the sediment quality, the sand capping technique was utilized in various locations in all over the world. The purpose of the sand capping is to control the nutrient release from contaminated bottom sediments in Japan (Ishibashi et al., 2009, Kim et al., 2007, Ports and Harbors Bureau, Ministry of Transport, 2005), but is to control the elution of the toxic substance in many other countries (Hull et al., 1999, Rosa et al., 2006, U, S, Environmental Protection Agency, 2011). The sand capping construction zone is shown in Fig. 1. In order to reduce nutrient release from bottom sediments, 30 cm thick sand capping layer is shown to be required by Ports and Harbors Bureau, Ministry of Transport, 1993). The sand capping construction zone is shown in Fig. 1. In order to reduce nutrient release from bottom sediments, 30 cm thick sand capping layer is shown to be required by Ports and Harbors Bureau (Ports and Harbors Bureau, Ministry of Transport, 1985). In MM21 district 30 cm thick sand capping was planned and conducted. The sand capping thickness of about 30 to 50 cm was confirmed by boring surveys after the construction. The thickness range of 30 to 50 cm is due to the tolerances during the construction (Port of Yokohama, 2000).

Nevertheless, newly accumulated floating mud is observed on the capping sand. Floating mud is moved easily by a flow and promotes consumption of the oxygen by the microbe. The suppressant effect of the nutrient release from contaminated bottom sediment is decreasing and is assumed to be almost lost in the end. Starting from these viewpoints, the lasting effect of sand capping technique on nutrient release reduction and its influence on the surrounding water quality is studied with the experiments in the field and the laboratory.

IMPLEMENTATION METHOD

Area of Field Study

The sand capping constructions in MM21 district in Yokohama Port were carried out from 1994 to 1998 under “The Sea Blue Project” which aimed to improve the water and sediment quality in enclosed water and to create sea area which is Eco-friendly to the nature, creatures and human (Ports and Harbors Bureau, Ministry of Transport, 1993). The sand capping construction zone is shown in Fig. 1. In order to reduce nutrient release from bottom sediments, 30 cm thick sand capping layer is shown to be required by Ports and Harbors Bureau (Ports and Harbors Bureau, Ministry of Transport, 1985). In MM21 district 30 cm thick sand capping was planned and conducted. The sand capping thickness of about 30 to 50 cm was confirmed by boring surveys after the construction. The thickness range of 30 to 50 cm is due to the tolerances during the construction (Port of Yokohama, 2000).

Fig. 1. Sand Capping Construction Zone and Measurement Sites in MM21 District