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Study on Physicochemical Properties and its Effective Use of Asphalt Pavement Cutting Waste Water

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Abstract

While cutting asphalt pavement surfaces, cooling water is continuously given to the cutting machine blades to prevent the heat increase and to control the scatter of cutting dusts. As the results, asphalt pavement cutting waste water is generated. The amount of waste water generated at one construction site is by no means a lot, however, the water quality is not environmentally friendly. In view of above, the physical and chemical properties of cutting waste water were first investigated. Then the possibility of effective use of the cutting waste water was investigated using flocculants and granulation technique. The results show that the waste water quality can be improved by the effects of flocculants. Mud sediments after flocculated in the waste water can be granulated and the granules may be used as recycled sands or recycle crusher-runs aggregates.

Keywords: Asphalt pavement, Cutting waste water, Recycle, Water quality, Granulation

1 Introduction

While cutting asphalt pavement surfaces, cooling water is continuously applied to the machine blade to prevent it from burning and to control the dust produced. This generates asphalt cutting waste water as shown in Photo 1. Although the volume of cutting waste water produced at one construction site is never a lot, it does not satisfy environmental standards for water quality for the construction site drainage, and is an issue that cannot be ignored when the impact on environment is taken into account. For the purpose of water pollution control, the Ministry of Land, Infrastructure, Transport and Tourism in Japan issued a directive in 2012 that on national highways, cutting waste water must be collected and processed appropriately. This practice is expected to become more widespread in near future.

On the other hand, interests in recycling construction by-products have been increased in recent years, and as the results, recycling rates of asphalt and concrete mass in Japan were 98% or higher in

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2005. Therefore, the present study first has investigated the physiochemical properties of asphalt cutting waste water and also studied the possibility of recycling the waste water thorough the flocculation and granulation process.

a) Asphalt surface cutting site

b) Collected asphalt cutting waste water

Photo 1: Asphalt surface cutting and collected cutting waste water

2 Physiochemical Properties of Asphalt Cutting Waste Water

The physiochemical properties of asphalt cutting waste water were studied using test methods defined by the Japanese Geotechnical Society (JGS), specifically the soil water content test method (JGS, 2009a), soil particle density test method (JGS, 2009b), and soil liquid limit/plastic limit test method (JGS, 2009c). A pH and temperature meter was used to measure the pH of the cutting waste water. Suspended solids (SS) density of the waste water was also measured.

Figure 1 shows the soil particle density of four samples (denoted as "Waste water 1-4"). Particle density in the cutting waste water ranged from 2.2 to 2.4, and was lower compared to that of kaolinite or bentonite. It is believed that this is due to the attachment of asphalt on the particles' surface. Figure 2 shows the initial water contents of 13 samples of cutting waste water (denoted as "A-M"). A large

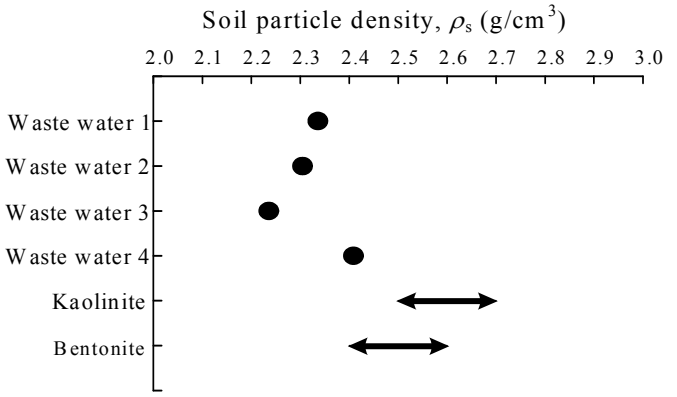

Figure 1: Density of soil particles in cutting waste water