

## Study on the utilization of the technology of manufacturing permeable bricks with recycled sewage

Whole term

1994. 4 ~ 1998.3

### (Purpose)

The overall dewatered sludge generated at a rate of 270,000ton per year in Osaka City, has been incinerated, and the fine sand from the incinerated ash and the pipe dredging have been filled in the sea for years. However, dumping in the sea is not an ever applicable way of disposing the wastes from sludge incinerators. On the other hand, acquiring new landfill sites is becoming more demanding.

Therefore, the technology of producing permeable bricks by using sewage resources with an efficient energy use has been currently applied. The main resource is the incinerated ash while the main aggregate is the fine sand of the pipe dredging and the small pipe fragments generated in the construction process of pipes. The purpose of this technology is to use these things positively and use the digestion gas as a raw material for obtaining the plasticity of bricks.

This study on the utilization focused on establishing the technology of manufacturing permeable bricks, investigating the characteristics of the sewage resource using the pilot plant in Ohno Wastewater Treatment Plant of Osaka City in 1997, and evaluating unit operations and physical characteristics of the permeable bricks.

### (Results)

1. Sewage resources and the physical characteristics of the raw materials.

(1) The contraction rate of the incinerated coal used for plasticization in the pilot plant was 20.4%. The investigation on the fluctuation of the characteristics of sewage resources had showed 13-19%.

(2) The physical characteristics of the fine sand in terms of the water content, volatile solid, the particle diameter and the oil content were 21.6% 6.6%, 0.5-2.41 mm and 39.6%, respectively. Because fine particles less than 0.5 mm diameter are relatively abundant, the value of the percentage of water content and volatile solid were large.

2. Unit operation in the pilot plant

(1) Because water and oil were almost removed in the step of plasticization, the prescribed diameter could be adjusted in different steps.

(2) Pre-treatment process of a pipe was composed of grinding, plasticization and distribution. The particle diameter was adjusted as 0.5-2.41mm in different steps.

(3) The temperature pattern in the kiln was investigated and the result showed that the maximum temperature in the kiln should be set as 1,065 ° C to make the permeable brick satisfy the standard of the construction institute.

3. Evaluation on the production of permeable bricks

As evaluation on the production of the permeable bricks, ingredients of bricks that satisfy the standard of the Japan Construction Institute were determined as follows:

(1) The combination considering the generated quantity of sewage resource consists of incinerated ash, silt and aggregate in 45%, 4.5% and 50.5%, respectively, and the fine sand, clay pipe and porcelain in 25%, 10% and 65%, respectively. The ratio of fine sand of this combination is less than that of the basic combination.

(2) The combination for the maximum use of sewage resources is incinerated ash, silt and aggregate in 45%, 4.5% and 50.5%, respectively with fine sand and clay pipe in 25% and 80%, respectively. This is the basic combination.

4. Investigation on the effect of using sewage resources

(1) In the case of the mixture considering the quantity of resource generation, 62.7

percentage of the bottom part of the brick contained the materials generated from the sewage. In case of the mixture considering the maximum use of sewage resources, it was 95.5%.

(2) The amount of the digestion gas used was 140 Nm<sup>3</sup>/h in the plasticizing process of aggregate and 140 Nm<sup>3</sup>/h in the plasticizing process of bricks. The amount of 'A' heavy oil, if used instead of digestion gas, will be 2.5kL.

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Keywords

Incinerated ash, Washed sand, Pipe, Digestion gas, Permeable brick, Pilot plant