Study on the application of the technology of sludge carbonization in Mie Prefecture, Japan		
Whole term	1998. 4 ~ 1999. 3	

(Purpose)

    The amount of sludge generated in the sewerage of Mie Prefecture reached 21, 000 tones in 1996 and most of them were dumped on landfills in spite of promoting a part of it to be reused. According to the forecasts of future increase of sludge, the existing landfill-disposal method would not be able to cope with the increasing demand for more landfill areas, high cost for treatment and strict regulations on waste disposal.

    To solve these problems, Mie Prefecture had conducted research on treatment methods including high technology which was under development. As a result, the treatment of carbonization was evaluated as the best from economic and utility point of view, though it had not yet been applied to the real situation.

    In this research, the characteristics and problems of the treatment of carbonization of sludge were summarized, and the applicability of the method was investigated using small-scale experiments.

(Results)

1. Comparison between the two types of carbonization.

    The method of carbonization can be divided into two methods: one in which the dehydrated sludge cake is directly inserted to the furnace in which carbonization takes place; and the other which uses drying process before inserting the sludge. In addition, the type of carbonization is classified as the outer-heat method in which the gas from the carbonizing process is combusted in the outer-furnace of the carbonizing furnace, and the inner-heat method using the energy by heat transfer from gas combusted in the secondary furnace. Four of the carbonizing treatments including technology under development were compared.

2. Experiments using a small-scale carbonizing treatment.

    A small-scale experiment was performed using drying and carbonizing processes, each with the capacities of 30 kg/h and 100 kg/h of dehydrated sludge. The evaluated factors and their results are as follows:

(1) Evaluation on the carbonized sludge production

    - Mass balance: The carbonized sludge reached 7% (weight ratio) of the dehydrated cake.

    - Energy balance: The energy balances of the drying and carbonizing process were investigated.

    - The utility usage (electricity/treated water for ventilated gas and etc.) was investigated.

    - It is not necessary to desulfurize the ventilated gas to prevent from odor.

(2) Evaluation on the characteristics of carbonized sludge based on the effective usage.

    - Property of the carbonized sludge

    - According to the contents of effective ingredients and hazardous matters, it was discovered that it could be used as a secondary fertilizer.

    - The contents of 24 substances including heavy metals would correspond to the soil environmental standards.

3. Investigation on the applicability of the treatment method of carbonization.

    The investigation on the applicability using small-scale experiments was performed based on the following items.

    (1) Plant design flow

        The treatment flow at the optimal energy efficiency was suggested.

    (2) Examination on the characteristics and usage of the carbonized sludge.

        Restoration to farmlands, usage as an ingredient in cement, usage as flocculants and an

assistant agent were suggested.

    (3) Investigation on the surrounding environment

      The ingredients of the ventilated gas, heavy metals and the elution safety were examined.

    (4) Economic analysis

      The estimation of the construction and maintenance cost and the comparison with the cost for disposal for the existing facility indicated that the method was economical.

4. Future investigation

For the selection of carbonizing method, the investigation on the effective use of the carbonized sludge and reuse would have to be added. Specifically, investigations would be conducted on stable sources of supply and effective way of utilization.

Collaborators: Mie Prefecture

Personnel in charge of the study: Yoshio Oshima, Yuji mawatari, Hideo Yamaguchi

Keywords	Sludge, Dewatered cake, Effective use, Recycle, Carbonization, Reduction