

Aiming to Build a Resource Recycling System that Links Sewage Treatment and Waste Treatment

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1. Introduction

Sewage sludge generated in the sewage treatment process has high potential as fuel and fertilizer, and the sewage department is promoting the utilization of sludge. Meanwhile, in order to achieve a more sustainable resource-recycling society, it is necessary to promote further energy saving, energy creation, recovery of phosphorus and other materials, throughout the region. Accordingly, it is necessary to link sewage treatment and waste treatment and build a new resource recycling system that efficiently recovers energy and materials throughout the region and also reduces the amount of final disposal by accepting garbage, etc. incinerated at waste treatment facilities in the sewage system.

To achieve this, it is essential to conduct a technical study on the effect of accepting garbage, etc. in the sewerage system on sewerage facilities, and establish an evaluation method for the economic efficiency of the resource recycling system and environmental efficiency such as greenhouse gas reduction effects, etc. Hence, this research aims to establish and evaluation method and promote the construction of a sustainable resource recycling system.

This paper reports, based on the results of the survey on the actual status in advanced cases using questionnaires, etc., reports the results of organizing the important factors in realizing linkage and the impact on sewerage facilities, etc., as well as the patterns of linkage between sewage treatment and waste treatment typified based on the results of the actual status survey.

2. Outline of survey and organization methods, etc.

This year's research typified patterns of linkage between sewage treatment and waste treatment based on information extracted from the results of literature and questionnaire surveys focused on cities that are making advanced initiatives for linkage of sewage treatment and waste treatment. Specific research and organization methods are as follows.

(1) Literature survey and questionnaire survey

In order to grasp the actual status of resource recycling systems in advanced cities, focusing on facility and regional characteristics, we conducted a literature

survey and a questionnaire survey of 12 treatment plants and organized survey results, regarding mainly "site conditions of sewage treatment plants," "maintenance and management issues at sewage treatment plants," "garbage sorting methods," "effective use of resources," and "trigger and background of linkage," etc.

(2) Organize patterns of linkage between sewage treatment and waste treatment

Based on the results of the survey conducted in (1), patterns of linkage were typified and organized.

3. Survey results and review, and classification of linkage patterns

(1) Literature survey and questionnaire survey results
As a result of the survey, it was found that the site conditions require a large area in the sewage treatment plant, since a facility to accept garbage is essential for the linkage.

As for maintenance issues, there was no particular technical impact of the filtrate generated in the digestion process after the acceptance of garbage on water treatment, and no countermeasures were required. However, it is inferred that the impact of an increase in the amount of garbage accepted should be kept in mind.

On the other hand, many respondents indicated that residents must sort garbage regardless of the availability of sorting machines, which suggests the importance of educating residents about garbage sorting.

As for the effective use of resources, digestion gas power generation was conducted at eight treatment plants (**Fig. 1**).

As for other triggers and backgrounds of linkage, it was found that they are based on social demands for the formation of a recycling-oriented society, such as "effective use of resources" at six treatment plants (**Fig. 2**). It should be noted that about half of the respondents indicated that the timing of the renewal of facilities was a support for the realization of linkage in the process of consideration.

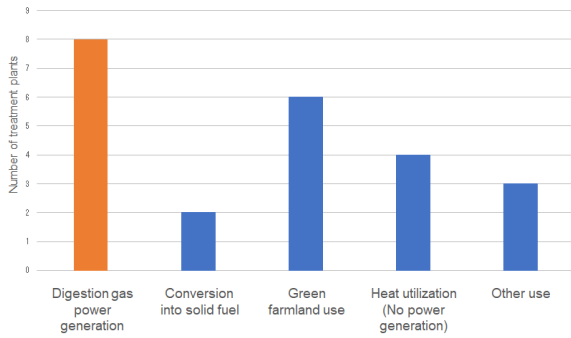


Fig. 1: Effective use of resources (with multiple responses)

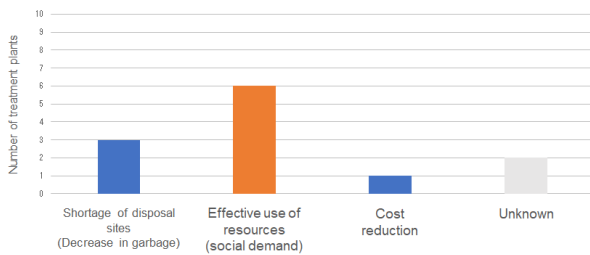


Fig. 2: Triggers and background of linkage

(2) Results of organizing patterns of linkage between sewage treatment and waste treatment

In typifying linkage patterns, we focused on the effective use of resources because the trigger for linkage is often a social demand for effective use of resources, and the facilities required differ depending on the method of effective use.

The resulting typified linkage patterns are shown below. Since digestion gas power generation is used in many of the linked treatment plants, the following categorization is made so that other resource uses can be additionally considered, while digestion gas power generation is the axis.

- (1) Implement "Only digestion gas power generation,"
- (2) "(1) + conversion of sludge into solid fuel,"
- (3) "(1) + conversion of sludge into fertilizer,"
- (4) "(1) + conversion of phosphorus into resources,"
- (5) "(1) + heat utilization (mainly waste heat utilization)."

As representative examples, the characteristics of the two patterns (1) and (3) are presented here (Fig. 3, Fig. 4).

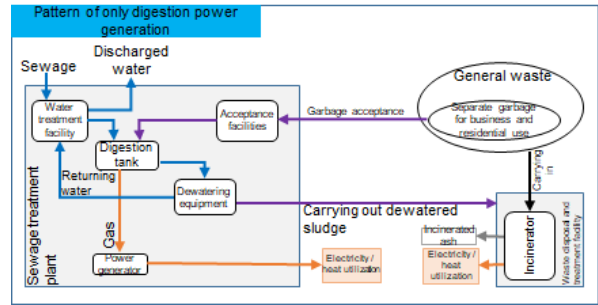


Fig. 3: (1) "Linkage pattern to implement digestion gas power generation"

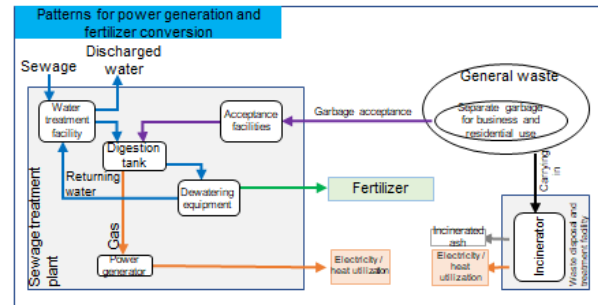


Fig. 4: (3) "(1) + Linkage pattern to convert sludge into fertilizer"

Pattern (1) is the simplest pattern, which only generates electricity from digestion gas. Therefore, unlike other patterns, it is easy to introduce. There are also advantages such as a case where even if the need for fertilizers and solid fuels decreases due to external factors in the region, it will not affect the continuation of the business.

Pattern (3) is a pattern in which, in addition to digestion gas generation, the remaining solid is converted to fertilizer. The main prerequisite for conversion to fertilizer is that there must be local need and drying facilities for fertilizer conversion are required. If these issues can be cleared, fertilizer can be used more effectively as a resource, and the burden of incineration and landfill could be reduced.

4. Future development

We plan to continue to verify each of the patterns typified this time in order to improve their accuracy, and study specific evaluation methods. The survey results also suggested that allowance in the site of sewage treatment plant, separation of garbage by residents, timing of facility renewal, etc. are important aspects in realizing the linkage. These findings will be used as points to keep in mind in addition to evaluation methods, as we formulate a study procedure for local governments in the future.