

RESEARCH ON THE VOLUME AND THE WATER QUALITY CHARACTERISTIC OF LEACHATE BY DIFFERENCE OF LANDFILL DENSITY

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ABSTRACT

This research is changing landfill density and checked the volume of leachate, and change of water quality in the model experiment. The used landfill things are incineration ashes and crush incombustibles. The case of an experiment investigated volume of leachate, and water quality as the high density of incineration ashes, low density, and the high density and low density of a mixture of incineration ashes and crush incombustibles. When reclaimed land from incineration ashes with high density, it was hard to pass along water, and since the

permeability coefficient was small, stagnant water was carried out to the upper part, and water quality deteriorated. However, when reclaimed land from the mixture of incineration ashes and crush incombustibles by high density, the case where it reclaims land by low density, and water permeability high, almost similarly were shown, and volume of leachate and change of water quality also showed the same tendency. In order to secure from this the semi- aerobic landfill where to maintain breathability and permeability is desired and

to perform efficient reclamation, incineration ashes and crush incombustibles are mixed and it is considered to be one method to suppose that it is high-density.

INTRODUCTION

At landfill site, a "high-density landfill method" is in the limited landfill space as a method which can employ the limited reclamation space in the maximum efficiently. However, by this method, the function in the semi- aerobic landfill of promoting invasion of the air into reclaimed land is spoiled, and it is thought that there is a possibility of checking decomposition and stabilization of waste as a result. Then, two kinds of wastes with which a particle size is different were filled up with research into "high density" and "low density" at the model experiment tub, respectively, and secular change of the outflow characteristic of the leachate by rainmaking and leachate water quality was investigated.

OUTLINE OF AN EXPERIMENT

1) Experiment period

2003/1/17~2003/3/8

2) Experiment place

Eco-town empirical-study Area Wakamatsu-ku, Kitakyushu-shi

3) The experiment method

(1)Experiment equipment: The outline of experiment equipment is shown in Fig. -1. The model tub was manufactured in the vinyl chloride pipe (diameter ϕ 100mm, h= 100cm).

(2)Filling waste to a model tub: Filling waste to a model tub was used as incineration ashes and crush incombustibles. The case of an experiment made only a. incineration ashes two kinds of the mixture by b. incineration ashes and crush incombustibles. The incineration ashes and crush incombustibles which were used obtained and received cooperation of two self-governing bodies. Incineration ashes used the ashes of the stalker furnace of the cleaning factory of K city, and crush incombustibles used the thing of S association.

(3) Filling of waste: The model tub was filled up with waste by height of 70cm. The case of filling was made into four kinds (Table 1), the high density (the maximum dryness density grade of a bundle hardening examination) of incineration ashes, low density (about maximum dryness density x90%), incineration ashes and the high density in the mixture of crush incombustibles, and low density. Filling work was done in January 16, 2003 and two days on the 17th.

Tabl-1 The items of filling waste

Experiment tub	Waste	Filling density (g/cm ³)	
No.1	incineration ashes	High density	1.732
No.2		Low density	1.555
No.3	ashes and crush incombustibles ashes : crush incombustibles = 2:1	High density	1.583
No.4	ashes and crush incombustibles ashes : crush incombustibles = 2:1	Low density	1.464

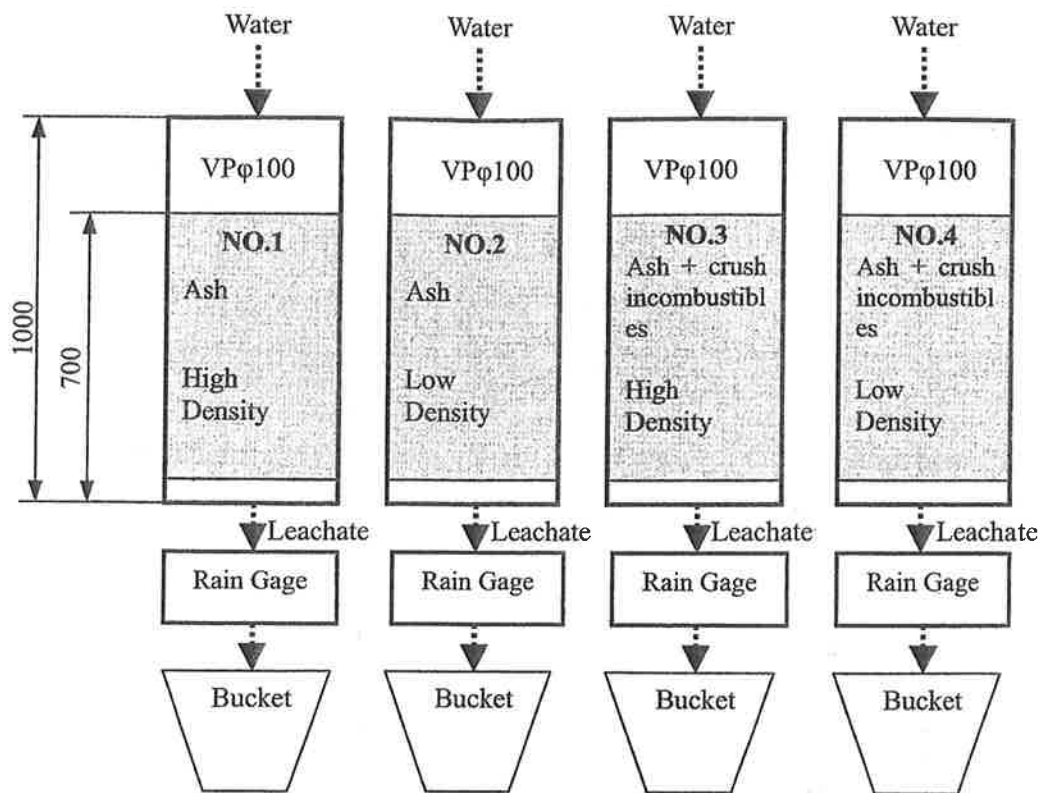


Fig1 figure of experiment equipment

(4) **Watering to a model tub:** Tap water was used, and watering divided the annual precipitation of an experiment place into 2 times per week in general, it watered and performed periodically water quality analysis of the leachate which flowed out. Moreover, it started from January 17, 2003 and watering was repeatedly performed at intervals of 2 times/week. It oozed, and amount of water was counted at intervals of

30 minutes by the automatic measurement (15.7ml per count) by the fall mass, and accumulated and calculated data by data ROGA. The amount of watering set up an equivalent for the annual precipitation of the experiment ground as watering. Since the experiment ground was Kitakyushu-shi, the thing of Kitakyushu Yawata of the nearest meteorological observing station was adopted.

Kitakyushu Yawata's annual precipitation: 1785.7mm → Precipitation per day 1.89mm

When the amount of watering per one-day tub is calculated, it is as the following formula.

$$Q = 0.30 \times 0.30 \times 3.14 \div 4 \times 0.00489 = 0.000346 \text{m}^3 = 346 \text{ml} = 0.35 \text{L}$$

The amount of watering was set as the part on the 3rd, and the part on the 4th as what is performed twice at one week.

The amount of watering of the part on the 3rd: 0.35L / day x 3 days = 1.05L → 1.0L

The amount of watering of the part on the 4th: 0.35L / day x 4 days = 1.40L → 1.5L

THE RESULT AND CONSIDERATION OF AN EXPERIMENT

1) The outflow form of leachate

It measured and oozed at the fall mass counter after watering, and volume of water was plotted for every unit time. In the model tub of No.2 and No.4, after watering, the following figure shows flowing out promptly. Moreover, the following figure shows that the peak of an outflow is 1 hour from 0.5 hours after watering. The following figure shows that the outflow pattern with the gently-sloping high density of the

mixture of No.3 is shown later than "No.2 and No.4." On the other hand, most high-density landfill tub of the incineration ashes of No.1 is the situations which is not flowing out, and is understood that water permeability is very low from the following figure. That is, the following figure shows that it is water permeability higher to mix crush incombustibles with incineration ashes than only incineration ashes. It turns out that it oozes by the difference between reclamation waste and density, and outflow of water differs greatly.

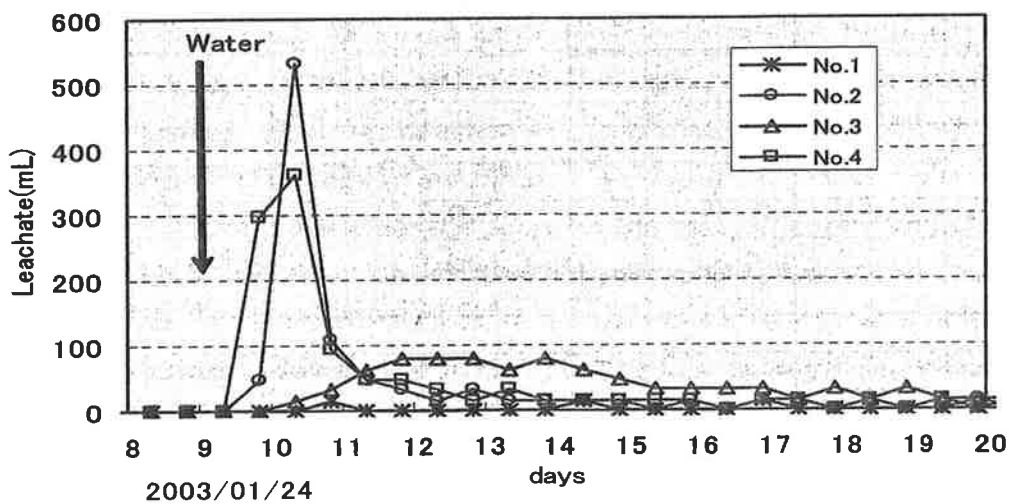


Fig2 Watering and the outflow pattern of leachate

2) The water quality analysis result of leachate

Water quality analysis -- the 12th day after an experiment start, the 26th day, the 35th day, the 54th day, the 143rd day, the 234th day, the 325th day, and 415th day -- it carried out 8 times. Since stay time will become long once it is hard to let water pass by the high-density reclamation of incineration ashes and water goes into incineration ashes by this experiment, it turns out that water quality becomes high concentration. With incineration ashes, the direction of low density's leachate water quality tends to deteriorate. However, at

the landfill site, if it becomes high-density, drainage in the surface will be large and the quantity which sinks into incineration ashes will decrease very much. Therefore, not becoming bad water quality is also expected. It turns out that what mixed crush incombustibles with incineration ashes shows water quality and the tendency almost same in respect of the amount of outflow loads although the outflow forms of water differ. When raising the air inflow and Water permeability in semi- aerobic landfill is considered, in mixture of incineration ashes and crush incombustibles,

it may be a thing with a change small also as high-density.

CONCLUSION

In this experiment, the difference of the outflow form of leachate or water quality became to some extent clear in high-density landfill and low-density landfill. When seen from water quality, it turns out that a thing with the long contact time of waste and water raises the concentration of water quality. At least, also by low density, when crush incombustibles were mixed with incineration ashes, even when it was high-density, there is no difference of big water quality and it was understood that the difference is small also in respect of the amount of outflow loads. That is, even if often mix, and it is high-density, it fastens, it hardens and it performs reclamation about incineration ashes and crush incombustibles, it is expected that there is little influence on semi-aerobic landfill. Since this experiment was conducted for a short period of time,

the detailed data about the outflow form and the water quality characteristic of leachate was not obtained. In order to obtain the more detailed data about these, it is necessary to experiment over a long period of time.

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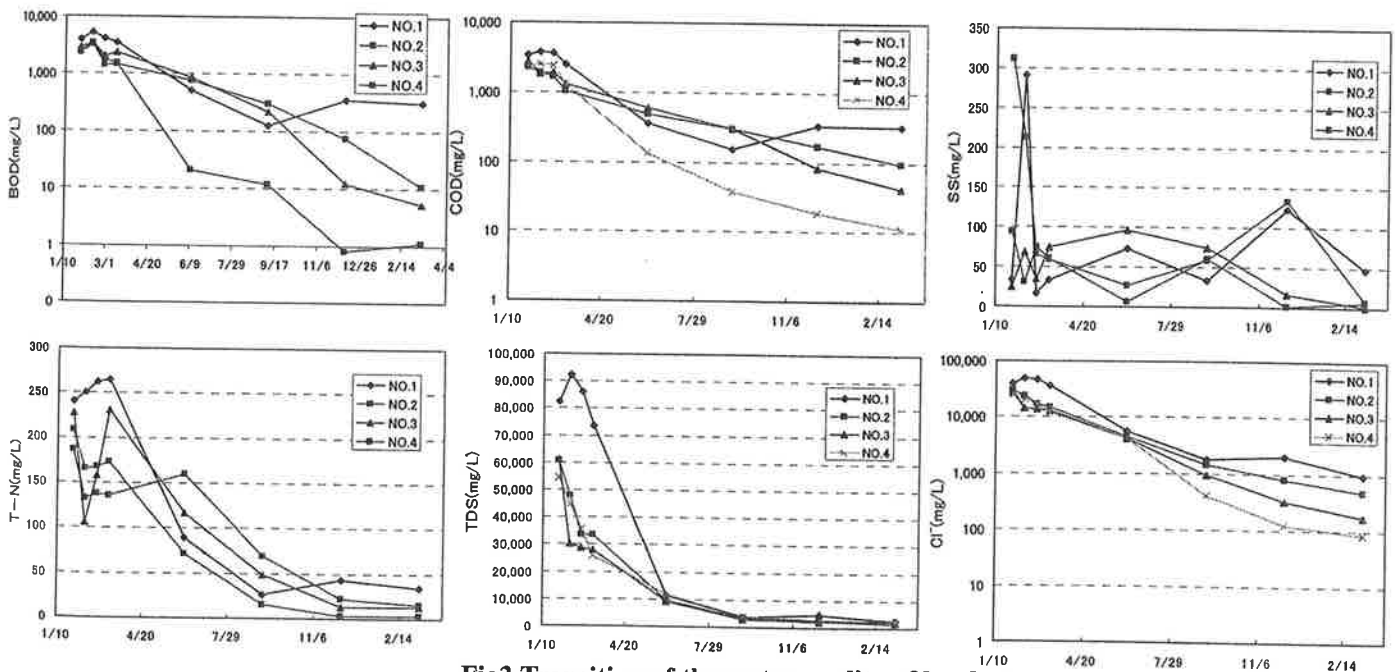


Fig3 Transition of the water quality of leachate

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