

## **THE NEED FOR LANDFILL RECLAMATION IN JAPAN**

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### **Introduction**

Japan with a population of around 125 million produced 51.5 million tons MSW and 500 million tons industrial waste in 1999. Out of total MSW generation, 78.1% was incinerated and 6.7% directly landfilled. 74% of industrial wastes went through intermediate processing including incineration, and 6% was directly landfilled. Japan has very little landfill capacity left, and acquiring a new landfill site is a challenging task due to objection from local residents and high land cost. Some large cities such as Tokyo, Osaka and Nagoya have already moved to constructing landfills in the sea (off-shore landfills) which account for 25% of total existing volume at present. Industrial landfills have left only less than three years capacity, and remaining capacity for MSW landfills is around 10 years. On the other hand, public concern over dioxin emissions, makes it increasingly difficult to build new incineration facilities. Hence, landfill shortage resulted in increased illegal dumpings of industrial wastes in the 1990s. On the other hand, on March 1998, Ministry of Health and Welfare has published a list of 538 inappropriate municipal landfill sites with no liner, leachate treatment facility, or both, and requiring immediate corrective action. Therefore, early stabilization and reclamation are now crucially important for combating the final disposal problem. A look at the distribution of the landfills according to their surface area indicates that landfills in Japan are comparatively smaller as the average area is 22,400 m<sup>2</sup>. Landfill sites with area less than 30,000 m<sup>2</sup> account for 85%, and those less than 10,000 m<sup>2</sup> for 60% (LSA, 2000). The percentage of smaller landfills would become even greater, if the landfills under 1000 m<sup>2</sup>, which did not require permission before 1997, are taken into account. This feature makes Japanese landfills more suitable for reclamation.

### **Current Situation of Landfill Reclamation**

While there are a few number of landfill reclamation works which involve excavation, separation, relocation and/or melting of the materials in Japan, they are either done for remediation of inappropriate sites, or for constructing some facilities over existing landfills. Their primary objective was not to recover extra landfill volume or land itself. It now seems that new landfill reclamation projects will come in near future aiming the creation of extra landfill volume. Ministry of Environment has announced "Landfill Renaissance" project which considers the partial support of a few number of landfill reclamation projects in 2003. However, the ministry considers supporting only the melting facility for the excavated material. It is speculated that the total amount of the grant will be about 8 million USD.

There are many unknowns for the legal aspects. Many local authorities and companies doubt about which regulations/laws will be applicable at different situations. For example, it is not clear whether a permit is necessary for excavation, or will the excavated materials be considered as municipal waste or industrial waste? On the other hand, it is not known what the response of the public for a landfill reclamation work will be. Since the Japanese society is very sensitive about the dioxins, it is a very important task to convince them for the safety of reclamation works at landfills where incineration residues are mostly disposed.

### Cost of Landfill Reclamation in Japan

A small-scale feasibility study for reclamation of an old landfill and melting of excavated material has been reported by Japan Environmental Sanitation Center (Jesc, 2001). The surface and volume of the landfill are 25,000 m<sup>2</sup> and 200,000 ton, respectively. The only alternative considered for management of excavated materials was melting. Slag produced is expected to be recycled such as road construction material etc. However, the cost of melting is extremely high as can be seen in Table 1. This case study indicates that, landfill reclamation costs in Japan will be significantly higher than those reported for USA and European countries.

Table 1. Estimated costs of landfill reclamation from a case study (adapted from JESC, 2001)

	Capital Cost \$/ton waste	Operation Cost \$/ton waste	Total \$/ton waste
Excavation and Separation	10-30	30-90	40-120
Melting	240-280	85-120	325-400
Total	250-310	115-210	365-520
Exchange rate: 1 USD ≈ 125 YEN			

### Conclusions

Landfill reclamation is a promising approach for managing the shortage of landfill space that Japan is facing today. However, for the applicability of this technology, the government should be sponsoring not only melting processes, but also all other aspects such as detailed site characterization surveys, enhancement of the stabilization and reducing the risk during excavation, separation and processing, and alternatives for management of excavated materials. Current legislation on landfills should be reviewed and updated for covering the landfill reclamation. A guideline/manual should be prepared for the success of the future projects.

### References

1. LSA, The Landfill System Technologies Research Association (2000), "Landfill Sites in Japan 2000", Tokyo, Japan
2. JESC, Japan Environmental Sanitation Center (2001), "Research Report on Landfill Reclamation Technologies", Kanagawa, Japan. (in Japanese)