Demonstration of Turning Technology from Sewage Sludge to Fuel/Fertilizer by Dehydration and Drying System (B-DASH)

(Research for FY 2016-17)

1. Purpose

This study deals with a single dehydration/drying system that enables various sewage sludge utilization as fertilizer or fuel. In the demonstration, real scale facilities are established to demonstrate the performance of the system.

This research is adopted as B-DASH Project[*1] 2017 of MLIT[*2]. The consortium of Tsukishima Kikai Co., Ltd.; Sun Eco Thermal Co., Ltd.; JS; Kanuma City, and Kanuma City Agriculture Public Corporation conducts the demonstration as an entrusted research project of NILIM[*3].

*1.B-DASH Project: Breakthrough by Dynamic Approach in Sewage High Technology Project
*2.MLIT: Ministry of Land, Infrastructure, Transportation, and Tourism
*3.NILIM: National Institute for Land and Infrastructure Management

2. Summary of the technology and the result of the last year

The demonstration technology consists of an inside double coagulation centrifugal dehydrator, a circular air flow dryer, various blowers, and an air-heating furnace. Dehydration and drying system enables not only sludge volume reduction but sludge generation with any water content rate of between 10-50% by adjusting the temperature of hot air.

The demonstration facilities were established in Kurokawa WWTP with an average capacity of 29,260m^3 per day (Kanuma City of Tochigi Prefecture)

last year. The performance evaluation mainly using digested sludge started in January 2017.

3.Achievements of this year

(1) The performance evaluation of dehydration/drying system

Dehydration/drying system was evaluated its year-round performance using digested sludge generated in each season. Researchers verified the system could adjust water content rate of dried sludge at any rate of between 10-50% by optimization of hot-air temperature.

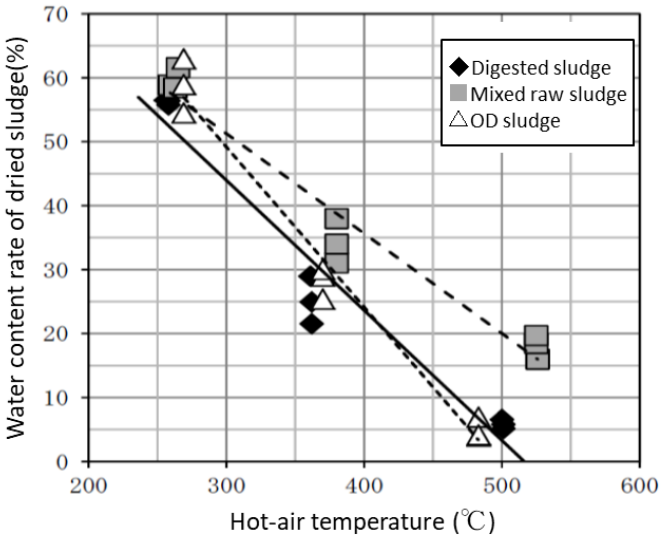

Figure 1: Performance evaluation

Another performance evaluation of the system was carried out using digested sludge, mixed raw sludge, and OD sludge. The digested sludge and mixed raw sludge are that generated at Kurokawa WWTP and OD sludge is from other WWTP adopting OD process in Kanuma City. It was verified that the system enabled the adjustment of the water content rate at 10-50% for three kinds of dried sludge by optimizing hot-air temperature at 250-550℃ though each sludge has a different dosing rate of coagulant(figure 1.)

(2) Evaluation of dried sludge utilization

Trial cultivation of soybeans was carried out in the actual field after component analysis required by Fertilizers Regulation Act. As a result, the trial cultivation had an equivalent harvest to chemical fertilizer. It was verified that dried sludge was applicable enough as an alternative to chemical fertilizer.

After another component analysis as fuel, dried sludge was used at actual combustion facilities to evaluate its safety of self-heating during storage, transportation facilities, and combustibility. The evaluation verified that dried sludge had a heating value and a water content rate that enough satisfy JIS (Japanese Industrial Standard) Z7312, and was enough applicable to solid fuel since it had no problem of safety and combustibility.

(3) Evaluation of adoption cost

LCC comparison was made between conventional dehydration system, conventional drying system, and the new system. As a result, the new system reduced LCC by 40% compared to the conventional dehydration method by reducing sludge disposal cost. It also reduced LCC by 50% compared to the conventional drying method by reducing construction and O&M costs.

4. Conclusion

It was verified that the dehydration/drying system could adjust water content rate of various sludge as 10-50% by optimizing hot-air temperature.

Besides, the new system was evaluated that its LCC could be reducible compared to the conventional systems.

Keywords: Fertilizer from dried sludge, Solid fuel, Circular air flow dryer