Joint Research on a Small Scale Use Sewage Sludge Fuelization System (Minokamo City)

Year of research	2010～2011	Research of resource and energy in sustainability

(Purpose)

In Minokamo City, since the Hachiyagawa Clean Center began operating in April 2004, the quantity of dewatered sludge produced has increased steadily and there is a limit to the acceptance capacity of the industrial waste disposal site where the dewatered sludge is disposed of. These facts present two urgent challenges: obtaining a new acceptance site and ensuring new treatment methods.

In response to such circumstances, this research was undertaken to study a fuelization system using sludge pellets formed from sewage sludge which is a biomass resource as solid fuel at the same time as it recovers the drying use heat source from steam generated by a pellet steam boiler (below called “the boiler”), as a technology to be applied to a small scale sewerage treatment plant owned by Minokamo City, and to verify design specifications in preparation for introducing actual equipment through testing using a demonstration facility.

The research is scheduled to continue for about 2 years from August 2010 until March 2012, with knowledge gained during 2010 reported below.

(Technical Overview)

The principal components of the demonstration facility are the twin drum type sludge dryer (below called “the sludge dryer”), the pelletizer, and boiler.

Figure 1 is a general flow chart. Dewatered sludge with moisture content between 81% and 83% is fed continuously to the sludge dryer, where it is wound between and applied as a thin membrane to two rotating drums heated by boiler steam, drying to a moisture content of about 20%. Then the pelletizer transforms this product into column-shaped sludge pellets with diameter of 7mm and length of about 20mm. The sludge pellets are first mixed with wood pellets used as supplemental fuel then used as boiler fuel. The boiler has combustion capacity of about 30kg/h on a furnace bed area of 0.5m^2 or less, produces steam with heat energy obtained by combustion of the pellets at 800°C or more, and supplies this steam to the dryer.

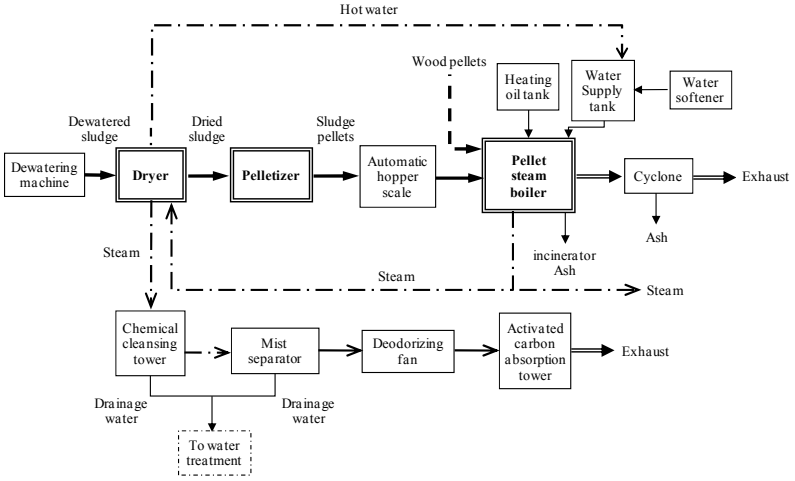

Figure 1. General Flow Chart of the Demonstration Facility

(Results)

(1)The dryer and pelletizer

- If the dewatered sludge moisture content rose, the width of the dewatered sludge expanded greatly on the surface of the drum as its thickness was reduced, so it dried easily, lowering the impact of the rise of the moisture content of the dewatered sludge on the moisture content of the dried sludge.

- The dried sludge moisture content range which good sludge pellets obtain is from 20% to 30%, and adjusting the clearance between the two drums of the dryer under constant steam pressure conditions obtained a moisture content in this range.
- The drying efficiency was an average of about 58% overall at the same level regardless of the drying steam pressure.

(2)The boiler
- The incineration residue which was discharged had a lower clinker content without the addition of polyferric sulfate to the existing dehydrator, but even without polyferric sulfate, clinkers were produced.
- The incineration residue which was discharged included partially carbonized unburnt combustible content, and in the future, it will be necessary to find a combustion method which removes the unburnt combustible content.

(Future plans)
Plans call for the discovery of the most appropriate combustion method for the boiler accompanied by a study of specifications for actual equipment based on the results so obtained.

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Key words	Small scale sewerage treatment plant, sludge drying, solid fuel, boiler