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For Waste to Energy, Assessment of Fluff Type Solid Refuse Fuel by Thermal Characteristics Analyses

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Abstract

Waste to energy could be one of the greatest sources of renewable energy in Korea, especially municipal solid waste as it has high heat recovery rate and high energy density. Various types of waste to energy technology exist, including refining of waste oil, plastic pyrolysis, recovery of waste heat and SRF (Solid Refuse Fuel). Main advantages of waste to energy are commercialization in a short period and treatment of waste alongside energy recovery. SRF could be made from various source including MSW (Municipal Solid Waste), plastic, wood etc. SRF is also used as an auxiliary fuel of fossil fuel for cement kiln plants. Depending on the shape SRF could be fluff type and pellet type. Manufacturing processes of fluff type SRF are composed to screening and drying stages. In this study, an assessment on fluff type SRF made of MSW was conducted by thermal characteristics analyses. Thermal characteristics analyses include elementary analysis, TG (Thermogravimetry) analysis, HHV (Higher Heating Value) measurement and proximate analysis. For comparison, SRF with other fuel samples such as biomass, and coal were selected and we evaluated to determine whether SRF is good as fuel or not. In this experiment, representative of fossil fuel was bituminous coal and representative of biomass was EFB (Empty Fruit Bunch). Results of different characteristics analyses of fluff type SRF compared to other fuels, the feasibility of fluff type SRF to use as alternative fuels by waste to energy technology was good enough.

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1. Introduction

Industrial revolution that make an impact on the development of industrial based economy, human consistently consumed fossil fuel to develop heavy industry and production. As a result, possible time of using fossil fuel including oil and coal is less than 100 years. So, using renewable energy is inevitable. Specially waste and biomass, which are major sources of renewable energy (about 80% of renewable energy supply in Korea).

Various types of waste to energy conversion technology are available. Those technologies include incineration for recovery of heat energy, landfill for recovery of landfill gas, SRF for auxiliary fuel and so on. Specially, SRF made by waste technology is very simple and waste in Korea have high contents of combustible material like paper, wood vinyl, plastic and so on. So, SRF in Korea have high heating value. Finally, This SRF is useful for auxiliary fuel.

In this study, we conducted assessment about fluff type SRF for waste to energy. And, we selected other samples for comparison analysis. Categories of other samples were biomass and fossil fuel. We selected EFB as representative of biomass. In the palm oil industry, EFB is used to make crude palm oil. Coal was selected as representative of fossil fuel and category of coal was bituminous coal from China.

We conducted thermal characteristics analyses of samples. Thermal characteristics analyses include elementary analysis, TG analysis, HHV analysis and proximate analysis. These analyses help to conduct assessment thermal characteristics. And these results were used for thermal process like incineration, gasification and pyrolysis. TG and proximate analyses were conducted by TGA-701(LECO co.) and HHV analysis was conducted by AC-600(LECO co.) and calculated using Dulong equation.

In this study, we conducted assessment for fluff type SRF and if SRF show good result, we will apply thermal process like incineration and gasification in future study.

2. Materials and Method

Figure 1 shows samples used for this study. As representative of biomass and fossil fuel, we selected EFB and coal for comparing with SRF. And, we crushed samples for various analysis. Specially, we need to crush SRF for reliable analysis, because SRF is composed of various combustible materials like paper, vinyl, wood and etc.



(a) Biomass (EFB)



(b) Fossil fuel (Coal)

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