

Biomass Torrefaction: One-dimensional Reactor Modeling and Process Alternatives

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The biomass torrefaction is pre-treatment technique called mild pyrolysis or high temperature drying to improve fuel quality of the biomass. Many studies of mathematical model for biomass torrefaction have focused on biomass decomposition kinetic model from the experiments. But a kinetic model of the volatiles gas during torrefaction and a heat balance model are needed to develop the reactor design and the process design. This study used biomass decomposition model and volatile releasing model from Prins et. al and applied first principle model for heat balance. The one-dimensional model for torrefaction reactor is developed in this study. This reactor model is applied to develop the conventional torrefaction process model. The conventional process scheme has two opportunities to recover condenser heat loss and to improve quality of combustion gas. This study proposed new process scheme using this opportunities. Proposed design reduces the fuel consumption and generates more useful flue gas comparing with conventional design. This research was supported by a grant from the LNG Plant R&D Center funded by the Ministry of Land, Transportation and Maritime Affairs (MLTM) of the Korean government.