

## **Torrefaction of high moisture content biomass in an industrial rotary kiln combustion type reactor.**

### **ABSTRACT**

Biomass is one of the major choices for alternative energy sources. However, the drawbacks of raw biomass, including high moisture content, limit its use. Thus, pretreatment is necessary and torrefaction has emerged as an important step for upgrading biomass. In this study, torrefaction in an industrial rotary kiln combustion type reactor was investigated at three different temperatures (200°C, 250°C and 300°C) using fresh dairy manure with 84.1% moisture content. The results showed that fresh dairy manure must be heat-treated four times at 200°C, but only three times at 250°C and 300°C due to the longer time for torrefaction at the lower temperature. Mass yield, moisture content, ash-free solid and HHV of torrefied dairy manure were reduced at each sequential heat treatment at every temperature. The production efficiency was higher at 300°C due to less energy consumption and shorter torrefaction time.