Title   Modeling of biomass drying and densification processes

Author   Sudhagar Mani, Shahab Sokhansanj, Xiaotao Bi and Lope G. Tabil

Abstract

In this study, biomass drying, size reduction and compaction were studied in detail theoretically and experimentally. Single pass rotary dryer was modeled using the lumped parameter approach and validated with industrial drying data. The developed model results were in agreement with the commercial dryer outlet conditions. A simple burner model was developed to predict the fuel requirement for the rotary dryer. Four fuel sources were used for energy and cost comparisons. Specific energy consumption of grinding biomass was estimated and correlated with hammer mill screen sizes. The specific energy required for compacting into pellets was calculated from the commercial pellet mill data. The total energy requirement for producing wood pellets was estimated using the above models with four different fuels. Cost of producing wood pellets was also estimated, when different burner fuels are used. The total energy consumption of the wood pellet plant was in the range of 3-3.8 GJ/t of pellet depending upon the type of burner fuel. Cost of producing pellet was in the range of US$ 56-71/t of pellet. It was found that sawdust or coal is the cheapest fuel to use for drying biomass.